

Little Butte Creek

The north fork of Little Butte Creek

Name origin: Named after Snowy Butte (now Mount McLoughlin)

Country

United States

State

Oregon

County

Jackson County, Klamath County

Source

Near Lake Creek

Â -Â location

Cascade Range, Jackson County, Oregon

Â -Â elevation

1,647 ft (502 m) [a]

Â -Â coordinates

42Â°25â 211â 3N 122Â°37â 208â 3Wî»¿ / î»¿42.41972Â°N 122.61889Â°Wî»¿ / 42.41972; -122.61889Â [

Mouth

Rogue River

Â -Â location

about 3 miles (5Â km) southwest of Eagle Point, Jackson County, OregonÂ

Â -Â elevation

1,204 ft (367 m)

Â -Â coordinates

42Â°27â 203â 3N 122Â°52â 247â 3Wî»¿ / î»¿42.45083Â°N 122.87972Â°Wî»¿ / 42.45083; -122.87972Â

Length

17 mi (27 km)

Basin

373 sq mi (966 km2)

Discharge

for below Eagle Point

Â -Â average

232.3 cu ft/s (6.578 m3/s) [b]

Â -Â max

10,000 cu ft/s (283 m3/s) (January 7, 1948)

Â -Â min

5.8 cu ft/s (0.16 m3/s) (June 6, 1926)

The Little Butte Creek watershed

Wikimedia Commons: Little Butte Creek

Little Butte Creek is a 17-mile-long (27Â km) tributary of the Rogue River in the U.S. state of Oregon. Its drainage basin consists of approximately 354 square miles (917Â km2) of Jackson County and another 19 square miles (49Â km2) of Klamath County. The north fork of the creek begins at Fish Lake, while the south fork begins near Brown Mountain. The two forks flow generally west until they meet near Lake Creek. The main stem then flows through the communities of Brownsboro, Eagle Point, and White City, finally emptying into the Rogue River about 3 miles (5Â km) west of Eagle Point.

Little Butte Creek's watershed was originally settled by the Takelma, and possibly the Shasta tribes of Native Americans. In the Rogue River Wars of the 1850s, most of the Native Americans were either killed or forced onto Indian reservations. Early settlers named Little Butte Creek due to its proximity to Mount McLoughlin, formerly known as Snowy Butte. In the late 19th century, the watershed was primarily used for agriculture and lumber. The city of Eagle Point was incorporated in 1911, and remains the only incorporated town within the watershed's boundaries.

Large amounts of water are diverted from Little Butte Creek to aid in irrigation and water storage. Canal systems deliver the water to nearby Howard Prairie Lake and the Klamath River watershed, Agate Lake, and the Rogue Valley.

Despite being moderately polluted, the creek is one of the best

salmon-producing tributaries of the Rogue River. Coho and Chinook salmon migrate upstream each year; however, several dams hinder their progress. A fish ladder was built in 2005 to help fish swim past a dam constructed in Eagle Point in the 1880s, but was destroyed by flooding just three months later. It was rebuilt in 2008. Restoration of a 1.3-mile (2.1 km) artificially straightened section of the creek in the Denman Wildlife Area was completed in 2011.

[edit] Course

Little Butte Creek begins in the Cascade Range near Mount McLoughlin and Brown Mountain. It flows generally west over approximately 17 miles (27 km) to its confluence with the Rogue River. There are two main forks of Little Butte Creek: the North Fork and the South Fork. The South Fork's headwaters are at 5,713 feet (1,741 m) above sea level, while the North Fork's headwaters are considerably lower at 4,638 feet (1,414 m). [c] They meet each other at 1,647 feet (502.0 m), creating the main stem itself. [a] Little Butte Creek's mouth is at 1,204 feet (367.0 m) above sea level, giving the creek an overall drop of approximately 25 feet per mile (4.8 m/km).

The north fork begins at Fish Lake, near Mount McLoughlin. It flows west, collecting only minor tributaries, before merging with the south fork. The south fork's headwaters are just south of the 7,311-foot (2,228 m) tall Brown Mountain. The Pacific Crest Trail passes through this area. It flows west, receiving Beaver Dam Creek and Dead Indian Creek on the left bank. Beaver Dam Creek drains approximately 28 square miles (73 km<sup>2</sup>), while Dead Indian Creek has a watershed of about 22 square miles (57 km<sup>2</sup>). The Dead Indian Soda Springs are on Dead Indian Creek, about a mile south of its confluence with the south fork. The south fork then turns northwest, collecting water from Lost Creek on the left, near the Lost Creek Bridge, built in 1919. Lost Creek drains about 17 square miles (44 km<sup>2</sup>).

Just after the two forks merge about 15 miles (24 km) northeast of Medford, Little Butte Creek receives Lake Creek on the left bank, flowing through the community of the same name at river mile (RM) 17 or river kilometer (RK) 27. Lake Creek drains 15 square miles (39 km<sup>2</sup>). The creek is crossed by South Fork Little Butte Creek Road in Lake Creek. Water is diverted here into the Joint System Canal to provide irrigation for the Medford region and to fill Agate Lake. A few miles west, the creek receives Salt Creek and Lick Creek on the right bank, which have watersheds of 17 and 16 square miles (44 and 41 km<sup>2</sup>), respectively. Oregon Route 140 crosses the creek at RM 10 (RK 16).

The creek turns southwest, flowing through Eagle Point. Two roads span the stream in Eagle Point: East Main Street at RM 5 (RK 8), and Oregon Route 62 at RM 4 (RK 6). Near RM 3 (RK 5), Little Butte Creek receives Antelope Creek on the left. Antelope Creek is its largest tributary, draining 58 square miles (150 km<sup>2</sup>). Agate Lake on Dry Creek is in the Antelope Creek watershed. At RM 1.5 (RK 2.4) the creek is crossed by Agate Road. It then flows into the Rogue River 132 miles (212 km) from its mouth at the Pacific Ocean. Little Butte Creek's mouth is in the Denman Wildlife Area, approximately 3 miles (5 km) south of Eagle Point, and about a mile southeast of Upper Table Rock.

[edit] Discharge

The United States Geological Survey monitored the flow of Little Butte Creek at seven different stream gauges: two on the south fork, three on the north fork, and two on the main stem. The first opened in 1908 at the newly constructed Fish Lake Dam on the north fork, while the last opened in 1927 near the Big Elk Ranger Station on the south fork. By 1989, all seven were closed. The data recorded by the lowermost gauges of both forks and the main stem are listed below.

Discharge

Stream

Location

Drainage basin

Years recorded

Average flow[b]

Maximum flow

Minimum flow

North Fork

near mouth

52<sup>1</sup> sq<sup>1</sup> mi (130<sup>1</sup> km<sup>2</sup>)

1922<sup>1</sup> ^1931

57.0<sup>1</sup> cu<sup>1</sup> ft/s (1.61<sup>1</sup> m<sup>3</sup>/s)

1,750<sup>1</sup> cu<sup>1</sup> ft/s (49.55<sup>1</sup> m<sup>3</sup>/s)

(December 22, 1964)

0<sup>1</sup> cu<sup>1</sup> ft/s (0<sup>1</sup> m<sup>3</sup>/s)

(numerous times 1922<sup>1</sup> ^1968)

South Fork

near mouth

138<sup>1</sup> sq<sup>1</sup> mi (357<sup>1</sup> km<sup>2</sup>)

1922<sup>1</sup> ^1982

97.3<sup>1</sup> cu<sup>1</sup> ft/s (2.76<sup>1</sup> m<sup>3</sup>/s)

6,280<sup>1</sup> cu<sup>1</sup> ft/s (177.8<sup>1</sup> m<sup>3</sup>/s)

(May 25, 1942)

3.0<sup>1</sup> cu<sup>1</sup> ft/s (0.085<sup>1</sup> m<sup>3</sup>/s)

(July<sup>1</sup> ^August 1931)

Main stem

RM 4 (RK 6.5)

293<sup>1</sup> sq<sup>1</sup> mi (759<sup>1</sup> km<sup>2</sup>)

1908<sup>1</sup> ^1950

232.3<sup>1</sup> cu<sup>1</sup> ft/s (6.578<sup>1</sup> m<sup>3</sup>/s)

10,000<sup>1</sup> cu<sup>1</sup> ft/s (280<sup>1</sup> m<sup>3</sup>/s)

(January 7, 1948)

5.8<sup>1</sup> cu<sup>1</sup> ft/s (0.16<sup>1</sup> m<sup>3</sup>/s)

(June 6, 1926)

[edit] Watershed

Little Butte Creek drains approximately 373 square miles (966<sup>1</sup> km<sup>2</sup>) of southern Oregon. Farmland accounts for about 32<sup>1</sup> percent of the total area of the watershed, while 65<sup>1</sup> percent is forested. The remaining three percent is within the Eagle Point city limits. Elevations range from 1,204 feet (367.0<sup>1</sup> m) at the mouth of the creek to 9,495 feet (2,894<sup>1</sup> m) at the summit of Mount McLoughlin, with an average of 3,496 feet (1,066<sup>1</sup> m). Forty-eight percent of the watershed is federally owned, 50<sup>1</sup> percent is privately owned, and Eagle Point accounts for the remaining two percent. Over 10,000 people live within the watershed's boundaries.

Temperatures average from 90 <sup>1</sup>°F (32<sup>1</sup> <sup>1</sup>°C) in the summer to 20 <sup>1</sup>°F (â <sup>1</sup>6.7<sup>1</sup> <sup>1</sup>°C) in the winter. The region experiences a Mediterranean climate. The average precipitation in the area ranges from 19 inches (480<sup>1</sup> mm) in the lower regions to over 50 inches (1,300<sup>1</sup> mm) in the upper reaches. July through October are the driest months, while December through April are the wettest. Thirty-four percent of the surface runoff in the watershed is collected from rain, 31<sup>1</sup> percent from rain on snow, and 35<sup>1</sup> percent from snowmelt.

As of 2003, there were 581 water rights recorded in the watershed, with 394 of them related to irrigation. Four hundred sixty-six water diversions were also recorded. These factors have led to frequent water shortages along the lower portion of the creek. In the summer, many streams in the watershed have more rights to water than there is water in the stream.

The two main geologic regions in the Little Butte Creek watershed are the High Cascades and the western Cascades. The western Cascades make up the western two thirds of the watershed, generally below 4,800 feet (1,500<sup>1</sup> m) in elevation. Steep, rugged canyons are common in this region. The lower stretches of the watershed contain soils such as decomposed lavas, clay, and gravel. The High Cascades are in the eastern third of the watershed, including volcanoes such as Brown Mountain and Mount McLoughlin, and plateaus made of lava. In some places, streams descend over 300 feet per mile (60<sup>1</sup> m/km). Nearby watersheds include two Rogue River tributariesâ ~Big Butte Creek to the north and Bear Creek to the

southâ and small Klamath River tributaries to the east.

[edit] Flora and fauna

The flora in the Little Butte Creek watershed is predominately temperate coniferous forest, which makes up approximately 65 percent of the total area. The lower regions are covered with chaparral, and the upper regions by fir forests. The chaparral region is inhabited by oaks such as Garry Oak and California Black Oak, with an understory of Buckbrush and Manzanita. Coast Douglas-fir, Sugar Pine, Ponderosa Pine, California Incense-cedar, and White Fir are the most common trees found in the mixed coniferous forest. Shasta Red Fir, White Fir, and the Noble Fir grow in the higher elevations of the watershed. Mountain Hemlock, Lodgepole Pine, Sitka Mountain-ash, and Squashberry also grow in this region. Chinquapin can be found around Fish Lake. The most common species of plants above 6,000 feet (1,800 m) near the tree line on Mount McLoughlin and Brown Mountain include Whitebark Pine, Mountain Hemlock, Coast Range Supalpine Fir, Heather, and Mountain Heather.

Many species of birds have been spotted in the Little Butte Creek region. Twenty-two species are known to breed in the chaparral region, including several species of wrens, blackbirds, and sparrows. The mixed coniferous forest is home to White-headed Woodpeckers, Pygmy Nuthatches, Green-tailed Towhees, Northern Pygmy-owls, Vaux's Swifts, Winter Wrens, and MacGillivray's Warblers. The American Coot has also been spotted in several places along the creek. Williamson's Sapsuckers, Black-backed Woodpeckers, Gray Jays, and Hermit Warblers frequent the higher elevations. The near-threatened Olive-sided Flycatcher and Cassin's Finch also live in this area. Eurasian Three-toed Woodpeckers and Clark's Nutcrackers have been spotted near the tree line. The endangered Townsend's big-eared bat is also known to live in the watershed.

Little Butte Creek is known to be one of the best salmon producing tributaries of the Rogue River, and is also one of only a few streams in the Upper Rogue watershed to support salmon populations. The most common anadromous fish inhabiting the creek include Chinook salmon, Coho salmon, and sea-run cutthroat trout. Coho salmon are federally listed as a threatened species, and are known to spawn in 46 miles (74 km) of streams in the Little Butte Creek watershed. An estimated 35,131 Coho salmon lived in the creek in 2002. Resident fish include cutthroat trout, sculpins, rainbow trout, and brook trout.

[edit] History

The Little Butte Creek area was originally settled by the Takelma, and possibly the Shasta tribe of Native Americans. By the 1850s, the land was primarily used for agriculture and lumber in the upper regions. The first European American settlers arrived in the Eagle Point region in 1852. Little Butte Creek was named by the early settlers for its close proximity to Mount McLoughlin (also known as Snowy Butte), as was nearby Big Butte Creek. Due to conflicts with the Rogue River Indians, Major J. A. Lupton gathered 35 men from Jacksonville on October 8, 1855, and attacked the Native Americans near the mouth of Little Butte Creek, killing about 30 of them. Lupton was also killed, and eleven of his men were injured. On December 24 of the same year, Captain Miles Alcorn discovered and attacked a Native American camp on the north fork, killing eight. On Christmas the following day, another band of Native Americans were attacked near Little Butte Creek's mouth; some fled, while the rest were either captured or killed.

A sawmill was constructed on the north fork in the 1870s. In 1901, the Sunnyside Hotel was built by Alfred Howlett on the banks of the creek in Eagle Point. Eagle Point was later incorporated in 1911, and remains the only incorporated town in the watershed. In 1917, manganese ore was discovered near the confluence of South Fork Little Butte Creek and its tributary, Lost Creek. Mined nodules consisted of approximately 55 percent manganese and weighed up to 50 pounds (23 kg). Cinnabar was also discovered in the area.[42] In 1922, the 58-foot (18 m) long Antelope Creek Covered Bridge was constructed on Antelope Creek. It was moved to Little Butte Creek in Eagle Point in 1987.

[edit] Diversions and dams

Some of the water in the Little Butte Creek watershed is diverted to irrigate

the Rogue Valley and to supplement Bear Creek, both roughly 15 miles (24 km) to the southwest. In the late 19th century, many orchards were planted near Ashland. They were initially irrigated by Bear Creek; however, there was not enough water to satisfy the orchards' needs. In 1898, the Fish Lake Water Company was established to aid the situation. The company proposed the creation of Fourmile Lake and the enlargement of Fish Lake by impounding Fourmile Creek and North Fork Little Butte Creek, respectively, and connecting them via the Cascade Canal. Construction of the temporary Fish Lake Dam began in 1902. Around this time, construction of the Joint System Canal to the west also began. Construction of Fourmile Lake Dam started in 1906, along with the Cascade Canal. Many other small canals, such as Hopkins Canal and the Medford Canal, were also built in the Rogue Valley around this time. Fish Lake Dam was completed in 1908, creating the 7,836-acre-foot (9,666,000 m<sup>3</sup>) reservoir.

The Cascade Canal was completed in 1915, delivering about 5,462 acre feet (6,737,000 m<sup>3</sup>) of water from Fourmile Lake in the Klamath River watershed 4.5 miles (7.2 km) southwest to Fish Lake in the Rogue River watershed. The temporary Fish Lake Dam was also replaced by a permanent earthfill dam. It was later modified in 1922 and 1955. In 1996 an auxiliary spillway was added. The dam stands 50 feet (15 m) high and has a length of 960 feet (293 m).

In 1956, the United States Bureau of Reclamation awarded a contract to Portland, Oregon-based Lord Brothers to build the Deadwood Tunnel. The tunnel was finished in 1957. Howard Prairie Lake was completed in 1958, and is about 18 miles (29 km) east of Ashland. Excess water is diverted from the South Fork, Beaver Dam Creek, and two of its tributaries 8.6 miles (14 km) south into the Deadwood Tunnel to supplement the lake and the surrounding regions. Dead Indian Creek is also diverted into Howard Prairie Lake. About 21.4 cubic feet per second (0.606 m<sup>3</sup>/s) annually, or about 16,500 acre feet (20,400,000 m<sup>3</sup>), was diverted into the Klamath River watershed between 1962 and 1999.

The Howard Prairie Delivery Canal was completed in 1959, along with Keene Creek Reservoir, Cascade Tunnel, and Greensprings Tunnel. Water from Howard Prairie Lake is diverted into the canal west to Keene Creek Reservoir, about 16 miles (26 km) east of Ashland. Nearby Hyatt Reservoir also provides water. It is then piped through the mile long Cascade Tunnel to the Greensprings Power Plant, which generates about 18 megawatts of power. Afterward, the water is conveyed from the power plant 2 miles (3 km) through the Greensprings Tunnel into Emigrant Creek, a tributary of Bear Creek. An average of approximately 38,620 acre feet (47,640,000 m<sup>3</sup>) of water flows through the tunnel. The water eventually ends up in Emigrant Lake, about 8 miles (10 km) southeast of Ashland, where it either continues along Bear Creek, or is diverted for irrigation.

#### [edit] Butte Creek Mill

The Butte Creek Mill, originally named Snowy Butte Mill, was built in 1872 on the banks of Little Butte Creek about 5.5 miles (8.9 km) from its mouth. A diversion dam was built in the 1880s to provide water for the turbine that powers the mill. This dam has been rated as the fifth worst fish barrier in the watershed. In 2005, the Rogue Basin Fish Access Team built a \$250,000 concrete fish ladder to allow fish past the dam. A small weir made of boulders was built at the base of the ladder, creating a 9-inch (20 cm) jump between the creek and the ladder; however, the boulders were washed away in a severe storm just three months later, making the distance between them over 24 inches (61 cm). The weir was rebuilt in 2008 for about \$122,500. This time, it was built with concrete instead of boulders.

The mill is now included on the National Register of Historic Places, and is the only gristmill in Oregon to still grind flour. It is also the oldest water-powered gristmill west of the Mississippi River.

#### [edit] Restoration

Intense flooding occurred throughout the Rogue Valley in 1955, and Little Butte Creek's meanders in the Denman Wildlife Area between Eagle Point and the Rogue River were blamed for severe erosion. The 1.3-mile (2.1 km) section of the creek was subsequently bulldozed and straightened in the late 1950s and

early 1960s. The straightness forced water downward instead of outward like a typical creek, scouring the stream bed down to bedrock and creating an unsuitable habitat for wild salmon. In 2007, a plan to divert the creek back into its old meanders was proposed. The \$700,000 project involved building engineered riffles and log jams and adding boulders, extending the creek by approximately 3,500 feet (1,100 m). It was completed in September 2011.

[edit] Pollution

The Oregon Department of Environmental Quality (DEQ) has monitored Little Butte Creek for eight different parameters that affect water quality: temperature, oxygen saturation, pH, nutrients, bacteria, chemical contaminants such as pesticides and metals, turbidity, and alkalinity. Streams that exceed the standard level are then placed on the DEQ 303d list in accordance with the Clean Water Act. About 40 percent of the streams in the Little Butte Creek watershed were listed on the 2002 DEQ 303d list. The entire main stem exceeded the standard level for temperature, oxygen saturation, fecal coliforms (bacteria), and turbidity. The lower 6.5 miles (10 km) of the North Fork were listed for high temperature and elevated levels of *Escherichia coli*, while the upper region was affected by chlorophyll a and pH levels. The South Fork was listed for turbidity and temperature.

Overall, high temperature is the most common problem in the Little Butte Creek watershed. This is most likely caused by depleted riparian zones and water diversion. Approximately 53 percent of riparian zones in the watershed are depleted due to agriculture or deforestation, while 43 percent are classified as healthy. Another threat to healthy riparian zones are invasive blackberries, which provide little shade. The resulting higher water temperatures can be very harmful to anadromous fish. High concentration of bacteria is also an issue. In 2003, the Little Butte Creek Watershed Council rated the health of the Little Butte Creek watershed on a scale of 1 (slightly degraded) to 5 (severely degraded). Overall, the watershed received 2.95, or moderately degraded.

On the Oregon Water Quality Index (OWQI) used by DEQ, water quality scores can vary from 10 (worst) to 100 (ideal). The average for Little Butte Creek at RM 1.4 (RK 2.3) between 1998 and 2007 was 72 (poor) in the summer and 82 (fair) in the fall, winter, and spring.

[edit] Recreation

The Little Butte Creek watershed contains several points of interest. Popular activities in and around Fish Lake include fishing, swimming, and boating. Two campgrounds are on the banks of the lake: Doe Point and the Fish Lake Resort. Several trails in the area lead to the much larger Pacific Crest Trail. Two snowparks are on Oregon Route 140.

The Eagle Point Golf Course is in the watershed, built in 1995 by the world renowned golf course architect Robert Trent Jones, Jr. Another course, Stone Ridge Golf Course, is near Agate Lake. The Butte Creek Mill and the Antelope and Lost Creek covered bridges are also popular attractions. Several historic structures can be found in Eagle Point, including the Eagle Point Museum, built in 1925 as the Long Mountain School, and the Walter Wood House, constructed in 1879. The Denman Wildlife Area is at the mouth of Little Butte Creek, as is nearby TouVelle State Park.

[edit] See also

<sup>^</sup> a b c Source elevation derived from the GNIS mouth elevations of the north and south forks.

<sup>^</sup> a b The average discharge rate for this location was calculated by adding the average annual discharge rates for the total number of water years for which data was available and dividing by the total number of water years.

<sup>^</sup> Source elevation derived from Google Earth search using Geographic Names Information System (GNIS) source coordinates.

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[edit] External links

Talbot Baines Reed (3 April 1852Â â ^ 28 November 1893) was an English writer of boys' fiction who established a genre of school stories that endured into the

second half of the 20th century. Among his best-known work is *The Fifth Form at St. Dominic's*. He was a regular and prolific contributor to *The Boy's Own Paper* (B.O.P.), in which most of his fiction first appeared. Through his family's business, Reed became a prominent typesetter, and wrote a classic *History of the Old English Letter Foundries*.

Reed's father, Charles Reed, was a successful London printer who later became a Member of Parliament (MP). Talbot attended the City of London School before leaving at 17 to join the family business at the Fann Street type foundry. His literary career began in 1879, when the B.O.P. was launched. The family were staunchly Christian, pillars of the Congregational Church, and were heavily involved in charitable works. However, Reed did not use his writing as a vehicle for moralising, and was dismissive of those early school story writers, such as Dean Farrar, who did. Reed's affinity with boys, his instinctive understanding of their standpoint in life and his gift for creating believable characters, ensured that his popularity survived through several generations. He was widely imitated by other writers in the school story genre.

In 1881, following the death of his father, Reed became head of the Fann Street foundry. By then he had begun his monumental *Letter Foundries history* which, published in 1887, was hailed as the standard work on the subject. Along with his B.O.P. obligations Reed wrote regular articles and book reviews for his cousin Edward Baines's newspaper, the *Leeds Mercury*. He was busy elsewhere, as a co-founder and first honorary secretary of the Bibliographical Society, as a deacon in his local church, and as a trustee for his family's charities. All this activity may have undermined his health; after struggling with illness for most of 1893, Reed died in November that year, at the age of 41. Tributes honoured him both for his contribution to children's fiction and for his work as the definitive historian of English typesetting.

[edit] Family background

The Reeds were descended from John Reed, a colonel in Oliver Cromwell's army during the English Civil War. The family was based in Maiden Newton in the county of Dorset before moving to London at the end of the 18th century. Talbot Reed's grandfather, Andrew Reed (1787â ^1862), was a minister of the Congregational Church and the founder of several charitable institutions, including the London Orphan Asylum and a hospital for the incurably sick. He was also a hymn-writer of repute; his "Spirit Divine, attend our prayers" is still found in several 20th and 21st century hymnals.[1][n 1]

Andrew Reed had five sons, the third of whom, Charles Reed (1819â ^81), was apprenticed in 1836 to a wool manufacturer in Leeds, Yorkshire, where he also became secretary of the local Sunday School union. Through this work he met Edward Baines, proprietor of the *Leeds Mercury* one of the town's two MPs. The Baines family had a strong tradition of public and political service; both of Edward Baines's sons followed him into Parliament, the elder, Matthew Talbot Baines, eventually reaching Cabinet rank.[3] Charles Reed was attracted to the youngest Baines offspring, a daughter, Margaret, whom he married in 1844. By this time Charles had left the wool industry and returned to London, where he founded his first business, a printing firm.[1]

The family settled in the London district of Hackney where Charles was active in public and religious affairs, with a particular interest in education. He became a member, and later chairman, of the London School Board, and helped to establish the Congregational Church Board of Education. From 1868 to 1881 he was one of Hackney's MPs. He also raised a family of five sons, the third of whom, named Talbot Baines after his distinguished uncle, was born at the family home, "Earlsmead", on 3 April 1852. Over the years, Charles expanded his business interests, and by 1861 had prospered sufficiently to acquire the Thorowgood type foundry in Fann Street, City of London.[1]

[edit] Early life

Talbot Baines Reed grew up in a happy household, dominated by Charles Reed's religious zeal and his belief that hardy outdoor sports were the best means for bringing up boys.[1] This atmosphere of "simple, cheerful Puritanism" was, according to a friend, "eminently suited to [Talbot's] character and

disposition".[4] Talbot began his education at Priory House School, Clapton,[5] and in 1864 became a day pupil at the City of London School, a relatively new foundation that had been established in Milk Street, Cheapside, in 1837.[6] Talbot's eldest brother, Charles junior, had been notably successful there, as captain of the school and a leading figure in its cricket and football teams. Talbot soon made his own mark, particularly on the sporting field; a contemporary describes him as "full of life and vigour" ... his strength of muscle, length of limb, boldness of attack, absolute fearlessness and perfection of nerve always made him conspicuous". Reed later showed some reticence about his academic achievements, asserting that one of his few successes was winning "the comfortable corner desk near the fire", reserved for the bottom place in Mathematics. In fact, in keeping with the school's record of producing men of letters and language scholars, Reed had excellent results in French, Greek and Latin, and had competed for the Sixth Form Latin prize. One of his school contemporaries was Herbert Henry Asquith, the future British prime minister. Reed and Asquith were participants in a sixth form debate on the motion that "the execution of Mary Queen of Scots was unjustifiable".[7]

Despite evidence of considerable academic ability, Reed did not follow his brother Charles, who went on from the school to Trinity College, Cambridge. Instead, in 1869, Reed left the school to join the family firm at the Fann Street foundry, beginning the association with the printing trade that would continue for the rest of his life. He found time, however, to pursue many other interests, physical, artistic and intellectual. Twice he walked the 53 miles (85 km) from London to Cambridge, each time leaving on Friday afternoon and arriving at St John's College for breakfast on Saturday. Reed was a competent swimmer, and won a Royal Humane Society medal for saving a cousin from drowning in rough seas.[7] He was an accomplished pianist, a skilful pen-and-ink illustrator, and had an engaging style of writing. These artistic talents were put to service in the production of a family magazine, *The Earlsfield Chronicle*, which Reed edited (and largely wrote) from the mid-1870s. The magazine circulated only among the extended Reed family, and included serious articles ("Is total abstinence a moral duty?") alongside comic verses and cartoons.[7][8]

[edit] Printer and typefounder

Although Reed would later jokingly describe his work for the family firm as "drudgery",[9] in reality he was enthusiastic about the trade and worked hard to master it. Early in his career he met the leading printer and bibliographer of the day, William Blades, from whom he acquired a lasting fascination with the printing and typefounding crafts.[10] While still relatively inexperienced, Reed was asked by Blades to help organise a major exhibition to mark the 400th anniversary of William Caxton's printing of *The Game and Playe of the Chesse*. This was thought to be the first book printed in England, and the exhibition was originally planned for 1874. However, Blades's research proved that Caxton's first printing in England had in fact been in 1477, of a different book, so the quatercentenary celebrations were rescheduled accordingly.[11] The exhibition was held during the summer of 1877, at South Kensington, and was opened by William Gladstone, the former and future prime minister.[12] It included displays of Caxton's printed works, together with many examples of printing through the intervening years. Reed's main contribution was to the exhibition's catalogue, for which he wrote an essay entitled "The Rise and Progress of Typography and Type-Founding in England". The exhibition was supported by leading London printers, publishers, booksellers, antiquarians and scholars, and attracted wide public interest.[13][14]

Sir Charles Reed, who had been knighted on Gladstone's recommendation in 1874, died in 1881. A few months later, Talbot's elder brother Andrew retired from the business because of ill health. As a result, at the age of 29, Talbot became the sole managing director of the Fann Street business, a position he held until his death.[15] This was, however, by no means Reed's sole activity in connection with the trade. In 1878, in response to a suggestion from Blades, he had begun work on a general history of typefounding in England, a task which

occupied him intermittently for ten years. Published by Elliot Stock in 1887 under the title of *History of the Old English Letter Foundries*, the book became the standard text on the subject.[4] Its 21 chapters are illustrated throughout with examples of typefaces and symbols used for four centuries. The text is presented in modern style, but with the initial letter of each chapter ornately drawn from a 1544 pattern.[16][n 2] Also in 1887 Reed produced a revised and enlarged specimen book for the Fann Street foundry, with many new typeface designs and artistic ornamentations.[15] As an acknowledged expert in his field, Reed was in demand as a lecturer to learned societies. Among the papers he delivered were "Old and New Fashions in Typography", to the Royal Society of Arts in 1890, and "On the Use and Classification of a Typographical Library", to the Library Association in 1892.[18] After Blades's death in 1890, Reed prepared his former mentor's unfinished *Pentateuch of Printing* for publication, adding a long memorial tribute to Blades.[4]

[edit] The Boy's Own Paper

The Reed family had longstanding connections with The Religious Tract Society (RTS), which had been founded in 1799 to publish and disseminate material of a Christian nature.[19] Talbot's grandfather Andrew Reed, at the age of 12, had attended the Society's inaugural meeting; Charles Reed and his eldest son, Charles junior, were both active members.[4] On 23 July 1878 an RTS subcommittee (including both Charles Reeds) recommended the publication of "a magazine for Boys to be issued weekly at a price of one penny".[20] Although the Society had frequently expressed a desire to counter the "cheap and sensational" magazines that were read by young people, its main committee was initially hesitant about this proposal, fearing its financial implications. Finally, however, it felt obliged "to attempt an enterprise from which others shrank".[20] Thereafter the committee moved swiftly, and the first issue of the new publication, *The Boy's Own Paper*, was on sale on 18 January 1879.[21]

Although at that time his writing experience was limited, Reed was asked by his father and brother to contribute to the new venture, a challenge he accepted enthusiastically.[22] Apart from his stories for *The Earlsfield Chronicle*, his sole prior experience of magazine writing had been an article entitled "Camping Out", for the Edinburgh-based young peoples' magazine *Morning of Life*. This account of a boating excursion on the Thames had appeared in 1875.[23] For the first issue of the B.O.P., Reed wrote a school story, "My First Football Match" which, accompanied by a half-page illustration, appeared on the front page "by An Old Boy". The story was very well received, and prompted demands for more about "Parkhurst", the school where the football match was played. Reed responded with several more tales, among which were "The Parkhurst Paper Chase" and "The Parkhurst Boat Race".[24]

In the new magazine's first year Reed was a regular contributor of articles and stories on a range of subjects, joining distinguished writers such as G. A. Henty,[25] R.M. Ballantyne and Jules Verne.[24] A prominent illustrator for the magazine was the artist and mountaineer Edward Whymper.[26] Reed's association with the B.O.P. lasted for the remainder of his life; the magazine would be the initial publisher for almost all his subsequent output of fiction. This commitment to the B.O.P. delayed progress on his *History of the Old English Letter Foundries*, especially as Reed began writing regular columns and book reviews for the *Leeds Mercury*,[4] now edited by his cousin, the younger Edward Baines.[27]

The 1880s was a decade of growing prosperity, and increasing numbers of families from the expanding middle classes were sending their sons to boarding schools. B.O.P. editor George Hutchison felt that such schools would provide the ideal setting for stories in which a boy hero (or heroes) could display Christian principles and strength of character in the face of temptations, and planned to run a long serial story. Reed, who had not himself attended a boarding school, was not the obvious choice as the writer. However, the skill and imagination he had displayed in his short school stories convinced Hutchinson that Reed should be given the assignment.[28]

[edit] School stories

Reed's first response to the request for school stories for The Boy's Own Paper was The Adventures of a Three-Guinea Watch, which ran for 19 instalments from October 1880 to April 1881. The travels of a schoolboy's pocket watch are charted through school, university and, finally, India at the time of the Indian Rebellion of 1857.[29] The school, "Randlebury", is believed to be based, like "Parkhurst", on information Reed received from friends who had boarded at Radley.[30] The success of the story encouraged the B.O.P.'s editors to ask Reed to attempt a longer and more ambitious work. The result was The Fifth Form at St. Dominic's, which became the favourite and most influential of all Reed's stories.[31] Extended over 38 episodes, each a self-contained unit within an overall plot, this was the first of a sequence of school stories, all serialised in the B.O.P. The boarding school milieu was repeated, with a few variations, in The Willoughby Captains (serialised 1883â ^84), The Master of the Shell (1887â ^88), The Cock-House at Fellsgarth (1891)[n 3] and Tom, Dick and Harry (1892â ^93). Reed followed the suggestion of his editors by setting My Friend Smith (1882â ^83) in a different kind of school, a "modest establishment for the backward and troublesome".[32] It was, however, the boarding school stories that endured and which became the standard model for school stories for many decades.[33] All the serials were quickly issued in book form, and most were reprinted for the benefit of successive generations of boys, up to the 1950s.[4] The model was imitated or copied by other writers for the next half century; according to historian Isabel Quigly, "Reed was a better writer than his followers, and has been diminished by their imitations." [34]

In a biographical sketch written in 2004, historian Jeffrey Richards characterises Reed's work as a mixing of the earlier school story traditions established by Dean Farrar and Thomas Hughes, crafted with a vivid readability.[4] Reed dismissed Farrar's Eric, or, Little by Little as a religious tract thinly disguised as a school story, and sought to produce something more "manly".[31] Many of the incidents and characterisations introduced by Reed in St. Dominic's became standard elements in his subsequent stories, and in those of his imitators. Quigly lists among other recurrent features the stolen exam paper, the innocent who is wrongly accused and ultimately justified after much proud suffering, the boating accident, the group rivalries, the noble friendships. Adult characters are largely stereotypes: a headmaster known as "the Doctor" and modelled on Thomas Arnold of Rugby, "the jabbering French master (pointed beard and two-tone shoes)", the popular games master, the dry pedant, the generally comic domestic staff.[35] Reed established a tradition in which the fictional boarding school was peopled by such characters and was almost invariably represented in terms of "dark passages, iron bedsteads, scratched desks, chill dormitories and cosy, shabby studies.[36] Quigly suggests that one reason for the success of Reed's stories and their longlasting appeal is that they are not so much books about school as books about people.[37] John Sime of the RTS, in a memorial tribute to Reed after his death, notes that the boys in the stories are recognisably of flesh and blood, with "just that spice of wickedness ... without which a boy is not a boy".[38]

[edit] Personal life and other activities

In 1876 Reed married Elizabeth Greer, the daughter of Samuel Greer, a County Court judge and former MP for the County of Londonderry in the north of Ireland. Their first child, a daughter, died in infancy, but three healthy children followed: Charles in 1879, Margaret in 1882 and Talbot in 1886.[39] The connection with Ireland was of great value to Reed, and the family regularly spent annual holidays on the shores of Lough Swilly in County Donegal.[40]

Reed was constantly busy; he held the loaferâ ~defined by him as "anyone who worked from nine to five and did nothing with the rest of the day"â ~in contempt.[9] Alongside his heavy schedule of duties at the foundry and his prolific writing, he took his share in the supervision of the various charities founded by his grandfather Andrew Reed, and was a deacon at his local Congregational Church.[39] In 1892 he was a co-founder of the Bibliographical

Society and its first honorary secretary, an office he modestly agreed to hold "pro tem in the hopes of your finding a better man".[41]

Physically active and energetic, Reed keenly followed his old school's fortunes on the sports field, on one occasion writing anxiously to the school about its apparent loss of enthusiasm for football and cricket.[7] As part of a busy social life he regularly attended City of London Old Boys' reunion dinners, and was a member of two London clubs, the Savile and the Reform. In politics Reed was a lifelong Liberal, although he disagreed with Gladstone's Irish Home Rule policy.[42] Reed's busy and fulfilling life was punctuated from time to time by private tragedies. The loss of his baby daughter was followed, soon after, by the death of his younger brother Kenneth, drowned with a companion in Lough Allen in County Leitrim, while exploring the River Shannon. In 1883 his elder brother, The Rev. Charles Reed, "my 'father confessor' in times of all trouble", died after a fall during a walking holiday in Switzerland.[43]

[edit] Death and legacy

Reed generally enjoyed vigorous good health. However, early in 1893 there were signs that his workload was taking its toll. In January of that year he left London for an extended stay in Ireland, hoping to recover his energies. He returned to his various duties in May, but later in the summer became seriously ill with what was identified at the time as "consumption", and was probably pulmonary tuberculosis.[44][45] He relinquished the secretaryship of the Bibliographical Society and returned to Ireland where, though largely confined indoors, he continued writing his regular weekly column for the Leeds Mercury and finished his final novel, Kilgorman. Letters to friends at home indicated that he remained in good spirits and was hopeful of recovery.[46] However, his condition worsened, and he was advised to return home for urgent medical treatment. Back in London he wrote his final piece for the Mercury, a review of *Seventy Years of Irish Life* by W.R. Le Fanu. He died at his home in Highgate on 28 November 1893, aged 41, and was buried in Abney Park Cemetery, by the side of his father and grandfather.[44][47]

Among the many tributes paid to Reed, Joseph Sime spoke for "the boys of the English-speaking world" who had "lost one of their best friends". Sime wrote of Reed's particular empathy with the young: "He possessed in himself the healthy freshness of heart of boyhood... and could place himself sympathetically at the boy's standpoint in life." [38] Reed's grave was visited by boys and their families for many years. He died a wealthy man,[n 4] although long before his death he had transferred the copyright of his books to the Religious Tract Society for a nominal sum.[49] After his death, Elizabeth Reed agreed that Reed's considerable personal library should be given to the St Bride Foundation Institute, whose collection of typographic literature included the library of Reed's early mentor, William Blades.[50][51]

Reed's regular readers included the young P.G. Wodehouse, who particularly loved the school stories.[52] Wodehouse's literary biographer Benny Green, while excoriating Reed as a "hereditary prig" and a "religious huckster", accepts that he influenced Wodehouse, and cites in particular *The Willoughby Captains*. Green also echoes Quigly in asserting that none of Reed's successors could match his abilities as a storyteller.[53] Quigly summarises Reed's legacy to future school story writers: he established a genre by "alter[ing] the shapeless, long-winded, garrulous and moralistic school story" into something popular and readable, a convention followed by all his successors.[54] Reed himself expressed the guiding principles of his life in a letter addressed to a new Boys' Club in Manchester: "The strong fellows should look after the weak, the active must look after the lazy, the merry must cheer up the dull, the sharp must lend a helping hand to the duffer. Pull together in all your learning, playing and praying." [47]

The grave in Abney Park was eventually surmounted by a memorial stone in the style of a Celtic cross. Although Reed biographer Stanley Morison suggests that Reed's legacy is his *History of the Old English Letter Foundries*, [50] Jack Cox, historian of the B.O.P, asserts that the school stories first serialised in the

magazine are the writer's true memorial.[55]

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This does not include Reed's uncollected short stories, journalism or trade publications. All the school stories, and much of the other fiction, first appeared in *The Boy's Own Paper*.

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^ This hymn is No. 239 in the revised (1950) version of *Hymns Ancient and Modern*.<sup>[2]</sup>

^ A new edition was brought out in 1952 to mark the centenary of Reed's birth.<sup>[17]</sup>

^ The term "Cock-House" refers to the champion house within the school. English schools were (and are) often divided into "houses" who compete against each other, particularly in games. See, for example, "Cock House trophy". Sir Thomas Rich's School. <http://www.strs.org.uk/house/main.html>. Retrieved 9 October 2010.<sup>[dead link]</sup>

^ The probate value of Reed's estate was £21,305,<sup>[4]</sup> which on the basis of the Retail Price Index (RPI) was worth approximately £1.75 million in 2010, or around £10 million on an average earnings basis.<sup>[48]</sup>

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 ^ Morison, p. 28  
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 ^ This is the description given by Hutchinson in his preface to the first book  
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 ^ Quigly, pp. 83â ^85  
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 ^ Quigly, pp. 27 and 87  
 ^ Quigly, p. 88  
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 ^ Sime, pp. xviâ ^xvii  
 ^ Morison, pp. 66â ^70  
 ^ Sime, pp. xii and xxi  
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[edit] External links

Persondata

Name

Reed, Talbot Baines

Alternative names

Short description

English author

Date of birth

3 April 1852

Place of birth

Hackney

Date of death

28 November 1893

Place of death

Highgate, London

*Adiantum viridimontanum*, commonly known as Green Mountain maidenhair fern, is a rare fern found only in outcrops of serpentine rock in New England and Canada. The leaf blade is cut into finger-like segments, themselves once-divided, which are borne on the outer side of a curved, dark, glossy rachis (the central stalk of the leaf). These finger-like segments are not individual leaves, but parts of a single compound leaf. The "fingers" may be drooping or erect, depending on whether the individual fern grows in shade or sunlight. Spores are borne under false indusia (rolled flaps of tissue) at the edge of the subdivisions of the leaf, a characteristic unique to the genus *Adiantum*.

Until 1991, *A. viridimontanum* was grouped with the western maidenhair fern, *A. aleuticum*, which grows both in western North America and as a disjunct on serpentine outcrops in eastern North America. At one time, *A. aleuticum* itself was classified as a variety (*A. pedatum* var. *aleuticum*) of the northern maidenhair fern, *A. pedatum*. However, after several years of study, botanist Cathy Paris recognized that *A. aleuticum* was a distinct species, and that some of the specimens that had been attributed to that taxon (group of organisms) were a third, hybrid species intermediate between *A. pedatum* and *A. aleuticum*. She named the new species *A. viridimontanum* for the site of its discovery in the Green Mountains in Vermont; it has since been located in Quebec and in one site on serpentine in coastal Maine.

*A. viridimontanum* is difficult to distinguish from its parent species in the field. It can generally be separated from *A. pedatum* by the shape of the ultimate segments (the smallest divisions of the leaf), and by its habitat on

thin, exposed serpentine soils rather than in rich woodlands. It more closely resembles *A. aleuticum*; however, the stalks of the ultimate segments and the false indusia are longer and the spores larger.

Due to its limited distribution and similarity to other *Adiantum* species within its range, little is known of its ecology. It thrives on sunny, disturbed areas where ultramafic rock is covered with thin soil, such as road cuts, talus slopes, and asbestos mines. Individual plants seem long-lived, and new individuals only infrequently reach maturity. It is one of four species endemic to serpentine in eastern North America and is considered globally threatened due to its habitat restrictions.

[edit] Description

*Adiantum viridimontanum* is a medium-sized, deciduous, terrestrial fern, about 2 feet (60 cm) wide and 1 to 2 feet (30 to 60 cm) high. Its fronds range from 30 to 75 cm (12 to 30 in) in length from the base of the stem to the tip. Like many ferns, the frond of *A. viridimontanum* is divided into a series of leaflets, known as pinnae, and the pinnae are further divided into pinnules. The shape of the frond in *A. pedatum*, *A. aleuticum*, and *A. viridimontanum* is very similar. They are usually described as having a rachis that forks into two branches, which curve outwards and backwards. Several pinnae grow from the outer side of the curve of each rachis branch, with the longest pinnae located closest to the fork of the rachis. The fingerlike pinnae are pinnately divided into short-stalked pinnules.

However, this interpretation of the frond architecture (pedately divided into pinnae, then pinnately divided into pinnules) presents a problem: no other species of *Adiantum*, nor any other member of the Polypodiaceae sensu lato (the family in which *Adiantum* was once included) has a forking rachis. In fact, these species are not pedate, but pseudopedate. What appears to be a fork in the rachis is in fact the junction between the rachis and a basal pinna. That basal pinna makes up one of the two curving branches; the rachis runs straight up the first fingerlike segment on the other branch, while the remainder of that curving branch is made up of the other basal pinna. Both basal pinnae are further divided and subdivided to create the other fingerlike segments. Therefore, even though they appear structurally similar, the longest and most central fingerlike segment represents the tip of the frond, pinnately divided into pinnae (the first level of division of the frond), while the two shorter fingerlike segments immediately on either side of it are pinnae, pinnately divided into pinnules (the second level of division). Each fingerlike segment thereafter represents a level of division one greater than the one that precedes it. Therefore, the final, pinnate subdivisions of each fingerlike segment may be referred to as "ultimate segments" to avoid the technical inaccuracy of calling them pinnules.

The rhizome shows little branching, with intervals of 4.0 to 7.5 mm between nodes. It measures 2.0 to 3.5 mm in diameter. The rhizome and the stipe (the part of the stem below the leaf) have bronze-colored scales. The stipe and rachis range from chestnut brown to dark purple in color and are glabrous; the stipe is about 2 to 3 mm in diameter while the rachis is smaller, 1 to 2 mm. The basal pinnae are from three to seven times pinnate (due to the pseudopedate structure of the blade), while the apical parts of the blade (and the corresponding segments of the basal pinnae) are once-pinnate. The penultimate segments of the blade (the apparent "pinnae", or fingerlike segments) are typically lanceolate in shape. The overall arrangement of the penultimate segments ranges from drooping and fan-shaped on plants growing in the shade to funnel-shaped on plants growing in full sun; under the latter conditions, the segments stand stiffly erect.

The ultimate segments of the divided blade (the apparent "pinnules") are borne on short, dark stalks of 0.6 to 1.5 mm, with the dark color often spreading into the base of each segment. They are long and obliquely triangular, the basiscopic margin forming the hypotenuse. The tip of the segments is typically acute, but entire (not pointed). They measure from 9.5 to 22.5 mm in length and 4.2 to 7.5 mm in breadth, the average length being about 2.5 times the breadth.

Their tissue is herbaceous (firmly leafy) to chartaceous (parchment-like) in texture, and bright green to bluish-green in color. As in other members of *Adiantum*, the glabrous leaves shed water when young. Under shady conditions, the ultimate segments lie within the plane of the blade, but tend to twist out of the plane when grown in the sun. The acroscopic margins of these segments are lobed, with narrow (less than 1.0 mm) incisions lying between lobes. In fertile segments, these lobes are recurved to form false indusia beneath the leaf. These are transversely oblong, from 2 to 5 mm in length and from 0.6 to 1.4 mm in width.

The sporangia (the fern's spore-bearing structures) are borne on the underside of the leaf beneath the false indusium, a trait found in all members of *Adiantum* and not in any species outside it. The sori are round, and are found on veins ending in the false indusium, below the veins' ends. The spores are tetrahedral to globose, yellow in color, and measure 41 to 58 micrometers ( $\hat{1}\mu\text{m}$ ) in diameter (averaging 51.4  $\hat{1}\mu\text{m}$ ), on average larger than other species in the *A. pedatum* complex. Spores appear in the summer and fall. The species has a chromosome number of 116 in the sporophyte.

#### [edit] Identification

*Adiantum viridimontanum* closely resembles the other species in the *A. pedatum* complex (*A. pedatum* and *A. aleuticum*), and distinguishing the three in the field is difficult. Paris and Windham, in their study of the complex, noted that while each species, collectively, can be distinguished from the others, no single morphological character was absolutely distinctive among species. Sterile triploid hybrids between *A. viridimontanum* and the other two species may occur, further complicating field identification.

One potentially distinguishing character is the shape of the ultimate segments in the middle part of the leaf blade, which are oblong in *A. pedatum* and long-triangular or reniform (kidney-shaped) in *A. viridimontanum* and some specimens of *A. aleuticum*. Furthermore, *A. viridimontanum* can grow in both shade and sun, while *A. pedatum* grows in shade only.

*Adiantum viridimontanum* can be separated from the morphologically similar individuals of *A. aleuticum* by the greater length of the stalks on the medial ultimate segments and of the false indusia, measuring greater than 0.9 mm and greater than 3.5 mm, respectively, in *A. viridimontanum*. Spore size is also a useful character (although not easily measured in the field); the average *A. viridimontanum* spore measures 51.4  $\hat{1}\mu\text{m}$  in diameter. While *A. aleuticum* spores can reach up to 53  $\hat{1}\mu\text{m}$ , they average about 43  $\hat{1}\mu\text{m}$ . In *A. aleuticum* growing as a disjunct on eastern serpentine (the specimens most likely to be confused with *A. viridimontanum*), the rhizome is much more frequently branched, with intervals of 1.0 to 2.0 mm between nodes.

#### [edit] Taxonomy

All species in the genus *Adiantum* are currently placed in the subfamily Vittarioideae of family Pteridaceae on the basis of molecular phylogenetic evidence.

The work which led to the recognition of *Adiantum viridimontanum* as a distinct taxon began in the early 20th Century. Following the discovery of disjunct specimens of western maidenhair fern, then classified as *A. pedatum* var. *aleuticum*, on the serpentine tableland of Mount Albert by Merritt Lyndon Fernald in 1905, botanists began to search for western maidenhair on ultramafic outcrops elsewhere in Quebec and Vermont. It was first identified in Vermont by L. Frances Jolley in 1922 at Belvidere Mountain in Eden. In 1983, William J. Cody referred *A. pedatum* growing on serpentine, both in eastern and western North America, to *A. pedatum* ssp. *calderi* instead. Many of the stations for the fern in Vermont were described in 1985, in a survey of ultramafic outcrops in that state.

From 1983 to 1985, Cathy A. Paris, then a graduate student, gathered specimens of *A. pedatum* from non-serpentine soils in the Midwest and Vermont, and from serpentine soils in New England and Canada, for biosystematic analysis. In 1988, Paris and Michael D. Windham published the results of this analysis, revealing *A. pedatum* in North America to be a cryptic species complex. They

showed that *A. pedatum sensu lato* included two well-distinguished diploid taxa, one found in the Eastern woodlands, and the other found both in the Western mountains and as a disjunct on serpentine in the East. However, not all of the serpentine disjuncts proved to belong to the Western taxon. Several of them, including most of the specimens in Vermont, were found to be tetraploid, forming a taxon distinguishable from the two diploids. Isozyme banding patterns suggested that the tetraploid had arisen by hybridization between the eastern subspecies of non-serpentine woodlands and the western and serpentine taxon, followed by a duplication of the hybrid genome through polyploidy (allowing the chromosomes to pair and restoring sexual fertility). This allotetraploid was also morphologically intermediate between the two taxa, although it more closely resembled the serpentine taxon (hence its referral to var. *A. aleuticum* before Paris's work). Paris formally described the tetraploid as a new species, *A. viridimontanum*, in 1991, and also separated the western and serpentine taxon from *A. pedatum* as the species *A. aleuticum*. The type specimen of *A. viridimontanum* was collected from a talus slope at the old asbestos mine on Belvidere Mountain on August 28, 1985. The sequencing of several chloroplast DNA loci has revealed that the *A. viridimontanum* chloroplast genome most closely resembles that of *A. aleuticum*, suggesting that *A. aleuticum* was the maternal parent of *A. viridimontanum*.

[edit] Distribution and habitat

*Adiantum viridimontanum* is narrowly distributed in New England and Quebec. Seven stations in Vermont lie in the Missisquoi Valley, in the northern Green Mountains, giving the fern its common name. The ultramafic rocks of this area extend northwards into Quebec, where eight stations are known in southern Quebec and six in the Thetford Mines area. It is also known from one station on serpentine on Deer Isle, Maine.

The fern thrives in thin serpentine soils on sunny, disturbed habitats such as roadcuts and talus slopes, in dunite and other ultramafic rocks. Anthropogenic disturbance has removed thicker soils and increased sun exposure in many of these sites; for instance, many of the Quebec stations are in asbestos mines, both abandoned and active. In more natural habitats, frost weathering and erosion may promote rock fall and maintain suitable habitat.

The eastern serpentine outcrops where *A. viridimontanum* thrives have relatively few endemics, compared to serpentine exposures globally. *A. viridimontanum* is one of only five taxa (four species and a variety) that are strictly endemic to serpentine in eastern North America, and two of these, *A. aleuticum* and *Aspidotis densa*, grow on non-serpentine substrates elsewhere in North America.

[edit] Ecology

*Adiantum viridimontanum* largely reproduces asexually by branching rather than sexually through spores. While wind-blown spores can result in sexual reproduction for the species, most spores probably fall within a relatively short radius of the plant. In addition, reproduction through spore dispersal requires the spore to land in suitable conditions for generating a gametophyte, typically in bright sunlight on thin serpentine soils. These requirements allow *A. viridimontanum* to colonize recently disturbed sites on ultramafic outcrops, where bedrock has been exposed and competing plants have been removed. The populations appear stable, with the long life of individuals compensating for low recruitment rates.

Little is known about the role of *A. viridimontanum* in the ecosystem. In general, ferns are less susceptible to herbivory than flowering plants due to higher levels of toxic and distasteful compounds in their foliage. *A. viridimontanum* is not known to be threatened by a particular predator or disease.

[edit] Conservation

Under the NatureServe conservation status system, *A. viridimontanum* is considered globally vulnerable (G3). It is considered imperiled (S2) in Vermont and vulnerable (S3) in Quebec; it has not yet been classified in Maine.

Conservation of *A. viridimontanum* is primarily limited by its restricted

habitat on serpentine cliffs and talus slopes. However, these sites are also of little value to humans. The most likely threat to the species is expansion of asbestos mining, which often occurs near populations of the fern, or other reuse of abandoned asbestos mines. Road construction might also threaten some sites, although this is mitigated by the fern's ability to flourish on disturbed serpentine. None of the sites are as yet known to be invaded by non-native plants. It is considered more difficult to cultivate than either of its parent species.

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"Homer's Phobia" is the fifteenth episode of the eighth season of the American animated television series *The Simpsons*. It first aired on the Fox network in the United States on February 16, 1997. In this episode, Homer dissociates himself from new family friend John after discovering that John is gay. Homer fears that John will have a negative influence on his son Bart and decides to ensure Bart's heterosexuality by taking him hunting.

It was the first episode written by Ron Hauge and was directed by Mike B. Anderson. George Meyer pitched "Bart the homo" as an initial idea for an episode while show runners Bill Oakley and Josh Weinstein were planning an episode involving Lisa "discovering the joys of campy things". Oakley and Weinstein combined the two ideas and they eventually became "Homer's Phobia". Fox censors originally found the episode unsuitable for broadcast because of its controversial subject matter, but this decision was reversed after a turnover in the Fox staff. Filmmaker John Waters guest-starred, providing the voice of the new character, John.

"Homer's Phobia" was the show's first episode to revolve entirely around gay themes and received a positive critical response both for its humor and anti-homophobia message. It won four awards, including an Emmy Award for Outstanding Animated Program (For Programming One Hour or Less) and a GLAAD Media Award for "Outstanding TV â ^ Individual Episode".

Needing money to pay for the gas repair bill, the Simpson family visits "Cockamamie's", an offbeat collectibles shop, hoping that it will purchase one of the family's heirlooms. Homer meets John, the antiques dealer, who explains that much of the merchandise is there because of its camp value. Bart and Lisa are impressed with John, and Homer invites him to the Simpsons' house to see the campy items that the family owns. The next morning, Homer tells Marge that he likes John and suggests they invite him and "his wife" over. Marge hints repeatedly to an oblivious Homer that John is gay, and when Homer finally understands, he is horrified. Homer's attitude towards John changes completely, and he turns against him, refusing to join his tour of Springfield. The rest of the family joins John and has a good time, but Homer is upset with the family upon their return. The rest of the Simpson family continue to enjoy John's company, especially Bart, who starts wearing Hawaiian shirts and dancing in a woman's wig. This makes Homer uneasy, and he begins to fear Bart is gay.

Homer endeavors to make Bart more masculine by forcing him to look at a cigarette billboard featuring scantily clad women in hopes Bart will be attracted to girls, but instead Bart gets the urge to smoke "anything slim." Homer then escorts him to see a steel mill to show Bart a manly environment, however, much to his surprise and dismay, the entire workforce is gay, and during their breaks they turn the mill into *The Anvil*, a gay disco. A desperate Homer insists on taking Bart deer hunting with Moe and Barney. When they cannot find any deer, they decide instead to go to "Santa's Village" and shoot the reindeer in the corral, despite a tearful Bart being reluctant to do so. This backfires when the reindeer attack them. John, with the help of Lisa and Marge, uses a Japanese Santa Claus robot to scare off the reindeer and save the hunting party. Homer accepts John, more or less, and tells Bart, who is still unaware of his father's concerns, that any way he lives his life is fine with him. After Lisa informs Bart that Homer thinks he is gay, Bart is stunned. The episode ends with everyone driving off in John's car.

Just before the end credits a dedication to the steelworkers of America is shown, reading "Keep reaching for that rainbow!"

[edit] Production

The original concept for the episode came from a few lines of show ideas

written by George Meyer. One of them read "Bart the homo", and Ron Hauge was selected to write the episode, with the story stemming from that line.[5] The idea of using filmmaker John Waters as a guest star had been around for a while. Many of the staff were fans of his work, and showrunners Bill Oakley and Josh Weinstein had planned to use him in an episode called "Lisa and Camp", which revolved around Lisa "discovering the joys of campy things".[6] Their idea was combined with Meyer's and it became this episode. The episode was originally titled "Bart Goes to Camp", but was renamed because the joke was too oblique.[5] Mike B. Anderson directed the episode, telling The Gold Coast Bulletin: "When I read the script I was enthralled, not only because of the visual possibilities, but also because the story felt very solid. It was engaging and surprising and I really put heart into that episode." [7]

Waters accepted his invitation to be a guest star instantly, stating that if it was good enough for the actress Elizabeth Taylor, who appeared in the season four episodes "Lisa's First Word" and "Krusty Gets Kancelled", it was good enough for him. He joked, however, about a negative reaction if his character would be made to look like fitness personality Richard Simmons.[1] John's design was based largely on Waters' own appearance; for animation reasons, Waters' moustache was changed from straight to curvy, so that it did not look like a mistake.[2][1] As thanks for his performance, the show's staff sent Waters an animation cel from the episode which he now has hanging in his office.[8]

According to Oakley, the Fox censor objected to "Homer's Phobia" being aired. The normal procedure is for an episode's script to be sent to the censor and then faxed back with a list of lines and words that should be substituted. However this episode came back with two pages of notes about almost every single line in the show. The censors stated that they did not like the use of the word "gay", or the discussion of homosexuality at all, and closed with a paragraph which stated that "the topic and substance of this episode are unacceptable for broadcast". Usually the censor notes are ignored as the offending lines and problems are dealt with after the episode has been animated. In this case the entire episode was deemed a problem, so it could not be solved in this way.[6] The staff asked Waters if he thought the gay community would find the episode offensive. Homer's use of the word "fag" to insult John was his only problem, so the writers changed it to "queer".[9] The censor problems ultimately came to nothing as when the episode came back from animation in South Korea, the then-Fox president had just been fired and replaced, with the censors being replaced as well. The new censors sent back merely one line: "acceptable for broadcast".[6]

The "gay steel mill" scene was written by Steve Tompkins. He first pitched that Homer and Bart would encounter longshoremen, but it was too much work to animate the lading of ships, so a steel mill was used instead.[10] Tompkins also wrote a different third act for the episode which was never produced. Instead of Homer, Bart, Barney and Moe going deer hunting and ending up at "Santa's Village" they would go back to the steel mill. There, Homer would attempt to prove his heterosexuality by having a human tractor pulling contest with some of the steel mill workers. It was decided that it "didn't really service the story" and was dropped.[11]

[edit] Cultural references

The episode features numerous cultural references. The song "Gonna Make You Sweat (Everybody Dance Now)" by C+C Music Factory is played twice during the episode: first as the steel mill transforms into a disco, and second over the closing credits.[4] Homer's record collection includes music by The New Christy Minstrels and The Wedding of Lynda Bird Johnson, the albums Loony Luau and Ballad of the Green Berets by Staff Sgt. Barry Sadler.[3][4] The song that John picks out and he and Homer dance to is "I Love the Nightlife" by Alicia Bridges, and the song that Bart dances to is "The Shoop Shoop Song (It's in His Kiss)" by Betty Everett.[4] When John is introduced there is a plastic pink flamingo lying in the background, a reference to John Waters's film Pink Flamingos.[3] Items in John's store include several buttons endorsing



Presidential candidates Richard Nixon, Dan Quayle and Bob Dole as well as an issue of TV Guide owned by Jacqueline Kennedy Onassis which features the titular characters from the sitcom Laverne & Shirley on the cover.[3]

[edit] Reception

[edit] Ratings and awards

In its original American broadcast, "Homer's Phobia" finished tied for 47th place in the weekly ratings for the week of February 10<sup>th</sup>, 1997 with a Nielsen rating of 8.7. It was the fourth highest rated show on the Fox Network that week.[12] The episode won the Emmy for Outstanding Animated Program (For Programming One Hour or Less) in 1997.[13] Mike Anderson won the Annie Award for Best Individual Achievement: Directing in a TV Production,[14] and the WAC Award for Best Director for Primetime Series at the 1998 World Animation Celebration.[7][15] Gay and Lesbian Alliance Against Defamation called it "a shining example of how to bring intelligent, fair and funny representations of our community onto television"[16] and awarded it the GLAAD Media Award for Outstanding TV - Individual Episode.[17] Several of the episode's animation cels were selected for display at the Silver K Gallery in Melbourne, Australia in 2001.[7]

[edit] Critical reviews and analysis

"Homer's Phobia" has been cited as a significant part of The Simpsons' exploration of lesbian, gay, bisexual, and transgender (LGBT) themes.[18] The series made several references to homosexuality before the episode aired.[19] In the 1990 episode "Simpson and Delilah", the character Karl (voiced by Harvey Fierstein) kisses Homer, while the recurring character Waylon Smithers is often shown to be in love with his boss, Montgomery Burns, initially suggestively and since then more overtly.[20] However, "Homer's Phobia" was the first episode to revolve entirely around homosexual themes. Two later episodes that explored LGBT issues were "Three Gays of the Condo" and "There's Something About Marrying".[21]

When the episode aired, the production team received "very few" complaints about its content, with most of the response being positive.[11] Alan Frutkin gave the episode a positive write-up in the LGBT-interest magazine The Advocate, calling it "vintage Simpsons." [22] Warren Martyn and Adrian Wood stated in their book I Can't Believe It's a Bigger and Better Updated Unofficial Simpsons Guide, that: "Only The Simpsons could do this so tongue-in-cheek that nobody could get in a tizzy about it. Very good indeed." [4] In the book Leaving Springfield, Matthew Henry praised the episode's critiquing of "the most common misconception about homosexuality: namely that gayness is somehow contagious", as well as its other themes.[17] Catharine Lumby of the University of Sydney cited the episode as an example of good satire as it "managed to explore a lot of [homosexual] issues in quite a deep way [...] without being overtly political" which she claimed, along with the episode's humor, made its anti-homophobia message more successful than that of other gay-themed shows like Queer as Folk.[23] In his review of The Simpsons - The Complete Eighth Season DVD, Todd Gilchrist said that "Homer's Phobia" "certainly qualifies as one of the all-time greatest episodes." [24]

It was placed fifth on Entertainment Weekly's top 25 The Simpsons episode list.[25] In 2003, USA Today published a top 10 chosen by the webmaster of The Simpsons Archive, which had this episode listed in tenth place,[26] and it was again placed tenth on AskMen.com's "Top 10: Simpsons Episodes" list.[27] IGN.com ranked John Waters's performance as the ninth best guest appearance in the show's history,[28] with TV Guide naming him the third best film related guest star.[29] In a 2008 article, Entertainment Weekly named Waters as one of the sixteen best Simpsons guest stars.[30] John Patterson of The Guardian wrote that Waters' appearance "felt to me like a summit meeting between the most influential pop-culture figures of the last 25 years." [31]

In 2002, Off the Telly writers Steve Williams and Ian Jones named "Homer's Phobia" one of the five worst episodes of The Simpsons, stating that it "leaves such a nasty taste in the mouth", as Homer is "quite simply a bastard" throughout the course of the episode. The pair concluded by saying "this is a

side of the show we'd not seen before, nor particularly wanted to see." [32] In June 2003, Igor Smykov sued the Russian television channel REN TV on claims that The Simpsons, along with Family Guy, were "morally degenerate and promoted drugs, violence and homosexuality." As evidence, "Homer's Phobia" was shown to the judge to prove that The Simpsons promoted homosexuality, and thus should not be aired again on the channel. The case was thrown out after one day. [33]

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[edit] External links

Intelligent design (ID) is a form of creationism promulgated by the Discovery Institute, a politically conservative think tank. The Institute defines it as the proposition that "certain features of the universe and of living things are best explained by an intelligent cause, not an undirected process such as natural selection."<sup>[1][2]</sup> It is a contemporary adaptation of the traditional teleological argument for the existence of God, presented by its advocates as "an evidence-based scientific theory about life's origins" rather than "a religious-based idea".<sup>[3]</sup> All the leading proponents of intelligent design are associated with the Discovery Institute <sup>[n 1]</sup><sup>[4]</sup> and believe the designer to be the Christian deity.<sup>[n 2]</sup>

Scientific acceptance of Intelligent Design would require redefining science to allow supernatural explanations of observed phenomena, an approach its proponents describe as theistic realism or theistic science. It puts forth a number of arguments in support of the existence of a designer, the most prominent of which are irreducible complexity and specified complexity.<sup>[5]</sup> The scientific community rejects the extension of science to include supernatural explanations in favor of continued acceptance of methodological naturalism,<sup>[n 3][n 4][6][7]</sup> and has rejected both irreducible complexity and specified complexity for a wide range of conceptual and factual flaws.<sup>[8][9][10][11]</sup> Intelligent design is viewed as a pseudoscience by the scientific community, because it lacks empirical support, offers no tenable hypotheses, and aims to describe natural history in terms of scientifically untestable supernatural causes.

Intelligent design was developed by a group of American creationists who revised their argument in the creationâ evolution controversy to circumvent court rulings such as the United States Supreme Court's *Edwards v. Aguillard* decision, which barred the teaching of "Creation Science" in public schools on the grounds of breaching the separation of church and state.<sup>[12][n 5][13]</sup> The first publication of the phrase "intelligent design" in its present use as an alternative term for creationism was in *Of Pandas and People*, a 1989 textbook intended for high-school biology classes.<sup>[14][15]</sup> From the mid-1990s,

intelligent design proponents were supported by the Discovery Institute, which, together with its Center for Science and Culture, planned and funded the "intelligent design movement".[16][n 1] They advocated inclusion of intelligent design in public school biology curricula, leading to the 2005 Kitzmiller v. Dover Area School District trial, where U.S. District Judge John E. Jones III ruled that intelligent design is not science, that it "cannot uncouple itself from its creationist, and thus religious, antecedents", and that the school district's promotion of it therefore violated the Establishment Clause of the First Amendment to the U.S. Constitution.[17]

[edit] History

[edit] Origin of the concept

The teleological argument, also known as the design argument, is one of three basic religious arguments for the existence of God which have been advanced for centuries (the others being the ontological argument and the cosmological argument). In the 13th century Thomas Aquinas argued that natural things act to achieve the best result, and as they cannot do this without intelligence, an intelligent being must exist, setting the goal and providing direction, and this being is God. The version formulated in 1802 by the theologian William Paley used the watchmaker analogy to argue that complexity and adaptation in nature demonstrated God's benevolent and perfect design, for the good of humans. Paley's natural theology strongly influenced scientists of the time, including Charles Darwin, who began with the assumption that God had designed nature and were open to a deistic interpretation that this design was implemented by laws. While Darwin's natural selection explained complexity and adaptation without the need for a designer, he was still inclined to think that everything resulted from designed laws,[18] by which Nature's God shaped life. Intelligent design has Paley's religious argument from design at its centre, but unlike Paley's openness to deistic design through God given laws, the point of intelligent design is to seek scientific confirmation of repeated miraculous interventions in the history of life.[19]

By 1910 evolution was not a topic of major religious controversy in America, but in the 1920s Fundamentalist Christianity engaged in the Fundamentalistâˆ™Modernist Controversy took up opposition to evolution,[19] and effectively suspended teaching of evolution in U.S. public schools. In the 1960s, after evolution was reintroduced into the curriculum, Young Earth creationists promoted Creation Science as "an alternative scientific explanation of the world in which we live", which frequently invoked the design argument to explain complexity in nature. These explanations prefigured the intelligent arguments of irreducible complexity, even featuring the bacterial flagellum. Attempts to introduce this in schools led to court rulings that Creation Science is religious in nature, and thus cannot be taught in public school science classrooms. Intelligent design is also presented as science invoking Paley's religious argument from design. It shares other arguments with Creation Science but differs in avoiding overt literal Biblical references such as the age of the Earth and Noah's Flood.[14]

Philosopher Barbara Forrest writes that the intelligent design movement began in 1984 with the publication by Jon A. Buell's the Foundation for Thought and Ethics of *The Mystery of Life's Origin* by Charles B. Thaxton, a chemist and creationist. Thaxton held a conference in 1988, "Sources of Information Content in DNA", which attracted creationists such as Stephen C. Meyer.[20]

In March 1986, a review by Meyer used information theory to suggest that messages transmitted by DNA in the cell show "specified complexity" specified by intelligence, and must have originated with an intelligent agent.[21] In November of that year Thaxton described his reasoning as a more sophisticated form of Paley's argument from design.[22] At the Sources of Information Content in DNA conference in 1988 he said that his intelligent cause view was compatible with both metaphysical naturalism and supernaturalism.[23]

Intelligent design avoids identifying or naming the intelligent designerâˆ™it merely states that one (or more) must existâˆ™but leaders of the movement have said the designer is the Christian god.[n 2][24][n 6][n 7] Whether this lack of

specificity about the designer's identity in public discussions is a genuine feature of the concept, or just a posture taken to avoid alienating those who would separate religion from the teaching of science, has been a matter of great debate between supporters and critics of intelligent design. The *Kitzmiller v. Dover Area School District* court ruling held the latter to be the case.

[edit] Origin of the term

The phrase "intelligent design" has been found in literature unrelated to the modern usage of the term.[26][27] While intelligent design proponents have pointed out examples, they have failed to show that these usages had any influence on those who instigated the intelligent design movement. The phrase did appear in explicitly creationist writings such as *The Natural Limits to Biological Change* published in 1984 by Lester and Bohlin. The creationist author A. E. Wilder-Smith has been cited as an influence by intelligent design proponents, and in a 1968 publication he argued that the mammary glands in whales could not have arisen by chance mutations, but were more plausibly the work of "an intelligent nipple designer". However, the first place that the term was systematically used, defined in a glossary and claimed to be other than creationism was in the 1989 textbook *Of Pandas and People*. [26][28]

[edit] Of Pandas and People

The modern use of the words "intelligent design" as a term intended to describe a field of inquiry began after the Supreme Court of the United States ruled in the case of *Edwards v. Aguillard* (1987) that creationism is unconstitutional in public school science curricula.[29]

A Discovery Institute report says that Charles Thaxton, editor of *Of Pandas and People*, had picked the phrase up from a NASA scientist, and thought "That's just what I need, it's a good engineering term".[30] In drafts of the book over one hundred uses of the root word "creation", such as "creationism" and "Creation Science", were changed, almost without exception, to "intelligent design", [15] while "creationists" was changed to "design proponents" or, in one instance, "cdesign proponentsists" [sic].[29] In June 1988 Thaxton held a conference titled "Sources of Information Content in DNA" in Tacoma, Washington,[23] and in December decided to use the label "intelligent design" for his new creationist movement.[31] Stephen C. Meyer was at the conference, and later recalled that "the term came up".[32]

*Of Pandas and People* was published in 1989, and was the first book to make frequent use of the phrases "intelligent design", "design proponents", and "design theory", thus representing the beginning of the modern "intelligent design" movement.[33] "Intelligent design" was the most prominent of around fifteen new terms it introduced as a new lexicon of creationist terminology to oppose evolution without using religious language.[34] It was the first place where the phrase "intelligent design" appeared in its present use, as stated both by its publisher Jon Buell,[14][35] and by William A. Dembski in his expert witness report.[36]

The National Center for Science Education has criticized the book for presenting all of the basic arguments of intelligent design proponents and being actively promoted for use in public schools before any research had been done to support these arguments.[33] Although presented as a scientific textbook, philosopher of science Michael Ruse considers the contents "worthless and dishonest". An ACLU lawyer described it as a political tool aimed at students who did not "know science or understand the controversy over evolution and creationism." One of the authors of the science framework used by California Schools, Kevin Padian, condemned it for its "sub-text", "intolerance for honest science" and "incompetence".[25]

[edit] Concepts

[edit] Irreducible complexity

The term "irreducible complexity" was introduced by biochemist Michael Behe in his 1996 book *Darwin's Black Box*, though he had already described the concept in his contributions to the 1993 revised edition of *Of Pandas and People*. [33] Behe defines it as "a single system which is composed of several well-matched

interacting parts that contribute to the basic function, wherein the removal of any one of the parts causes the system to effectively cease functioning".[37]

Behe uses the analogy of a mousetrap to illustrate this concept. A mousetrap consists of several interacting piecesâ ~the base, the catch, the spring and the hammerâ ~all of which must be in place for the mousetrap to work. Removal of any one piece destroys the function of the mousetrap. Intelligent design advocates assert that natural selection could not create irreducibly complex systems, because the selectable function is present only when all parts are assembled. Behe argued that irreducibly complex biological mechanisms include the bacterial flagellum of *E. coli*, the blood clotting cascade, cilia, and the adaptive immune system.[38][39]

Critics point out that the irreducible complexity argument assumes that the necessary parts of a system have always been necessary and therefore could not have been added sequentially.[8] They argue that something that is at first merely advantageous can later become necessary as other components change. Furthermore, they argue, evolution often proceeds by altering preexisting parts or by removing them from a system, rather than by adding them. This is sometimes called the "scaffolding objection" by an analogy with scaffolding, which can support an "irreducibly complex" building until it is complete and able to stand on its own.[n 8] Behe has acknowledged using "sloppy prose", and that his "argument against Darwinism does not add up to a logical proof".[n 9] Irreducible complexity has remained a popular argument among advocates of intelligent design; in the Dover trial, the court held that "Professor Behe's claim for irreducible complexity has been refuted in peer-reviewed research papers and has been rejected by the scientific community at large".[9]

[edit] Specified complexity

In 1986 Charles Thaxton, a physical chemist and creationist, used the term "specified complexity" from information theory when claiming that messages transmitted by DNA in the cell were specified by intelligence, and must have originated with an intelligent agent.[21] The intelligent design concept of "specified complexity" was developed in the 1990s by mathematician, philosopher, and theologian William Dembski.[40] Dembski, Research Professor of Philosophy and Director of the Center for Cultural Engagement at Southwestern Baptist Theological Seminary, states that when something exhibits specified complexity (i.e., is both complex and "specified", simultaneously), one can infer that it was produced by an intelligent cause (i.e., that it was designed) rather than being the result of natural processes. He provides the following examples: "A single letter of the alphabet is specified without being complex. A long sentence of random letters is complex without being specified. A Shakespearean sonnet is both complex and specified".[41] He states that details of living things can be similarly characterized, especially the "patterns" of molecular sequences in functional biological molecules such as DNA.

Dembski defines complex specified information (CSI) as anything with a less than 1 in 10<sup>150</sup> chance of occurring by (natural) chance. Critics say that this renders the argument a tautology: complex specified information cannot occur naturally because Dembski has defined it thus, so the real question becomes whether or not CSI actually exists in nature.[43][n 10][44]

The conceptual soundness of Dembski's specified complexity/CSI argument has been widely discredited by the scientific and mathematical communities.[10][45] Specified complexity has yet to be shown to have wide applications in other fields, as Dembski asserts. John Wilkins and Wesley Elsberry characterize Dembski's "explanatory filter" as eliminative, because it eliminates explanations sequentially: first regularity, then chance, finally defaulting to design. They argue that this procedure is flawed as a model for scientific inference because the asymmetric way it treats the different possible explanations renders it prone to making false conclusions.[46]

Richard Dawkins, another critic of intelligent design, argues in *The God Delusion* that allowing for an intelligent designer to account for unlikely complexity only postpones the problem, as such a designer would need to be at least as complex.[47] Other scientists have argued that evolution through

selection is better able to explain the observed complexity, as is evident from the use of selective evolution to design certain electronic, aeronautic and automotive systems that are considered problems too complex for human "intelligent designers".[48]

[edit] Fine-tuned Universe

Intelligent design proponents have also occasionally appealed to broader teleological arguments outside of biology, most notably an argument based on the fine-tuning of universal constants that make matter and life possible and which are argued not to be solely attributable to chance. These include the values of fundamental physical constants, the relative strength of nuclear forces, electromagnetism, and gravity between fundamental particles, as well as the ratios of masses of such particles. Intelligent design proponent and Center for Science and Culture fellow Guillermo Gonzalez argues that if any of these values were even slightly different, the universe would be dramatically different, making it impossible for many chemical elements and features of the Universe, such as galaxies, to form.[49] Thus, proponents argue, an intelligent designer of life was needed to ensure that the requisite features were present to achieve that particular outcome.

Scientists have generally responded that these arguments are poorly supported by existing evidence.[50][51] Victor J. Stenger and other critics say both intelligent design and the weak form of the anthropic principle are essentially a tautology; in his view, these arguments amount to the claim that life is able to exist because the Universe is able to support life.[52][53][54] The claim of the improbability of a life-supporting universe has also been criticized as an argument by lack of imagination for assuming no other forms of life are possible. Life as we know it might not exist if things were different, but a different sort of life might exist in its place. A number of critics also suggest that many of the stated variables appear to be interconnected and that calculations made by mathematicians and physicists suggest that the emergence of a universe similar to ours is quite probable.[55]

[edit] Intelligent designer

Intelligent design arguments are formulated in secular terms and intentionally avoid identifying the intelligent agent (or agents) they posit. Although they do not state that God is the designer, the designer is often implicitly hypothesized to have intervened in a way that only a god could intervene. Dembski, in *The Design Inference*, speculates that an alien culture could fulfill these requirements. Of Pandas and People proposes that SETI illustrates an appeal to intelligent design in science. In 2000, philosopher of science Robert T. Pennock suggested the Raëlian UFO religion as a real-life example of an extraterrestrial intelligent designer view that "make[s] many of the same bad arguments against evolutionary theory as creationists".[56] The authoritative description of intelligent design,[n 11] however, explicitly states that the Universe displays features of having been designed. Acknowledging the paradox, Dembski concludes that "no intelligent agent who is strictly physical could have presided over the origin of the universe or the origin of life".[57] The leading proponents have made statements to their supporters that they believe the designer to be the Christian god, to the exclusion of all other religions.[n 2][24]

Beyond the debate over whether intelligent design is scientific, a number of critics argue that existing evidence makes the design hypothesis appear unlikely, irrespective of its status in the world of science. For example, Jerry Coyne asks why a designer would "give us a pathway for making vitamin C, but then destroy it by disabling one of its enzymes" (see pseudogene) and why he or she would not "stock oceanic islands with reptiles, mammals, amphibians, and freshwater fish, despite the suitability of such islands for these species". Coyne also points to the fact that "the flora and fauna on those islands resemble that of the nearest mainland, even when the environments are very different" as evidence that species were not placed there by a designer.[58] Previously, in Darwin's Black Box, Behe had argued that we are simply incapable of understanding the designer's motives, so such questions

cannot be answered definitively. Odd designs could, for example, "have been placed there by the designer ... for artistic reasons, to show off, for some as-yet undetectable practical purpose, or for some unguessable reason". Coyne responds that in light of the evidence, "either life resulted not from intelligent design, but from evolution; or the intelligent designer is a cosmic prankster who designed everything to make it look as though it had evolved".[58]

Intelligent design proponents such as Paul Nelson avoid the problem of poor design in nature by insisting that we have simply failed to understand the perfection of the design. Behe cites Paley as his inspiration, but he differs from Paley's expectation of a perfect Creation and proposes that designers do not necessarily produce the best design they can. Behe suggests that, like a parent not wanting to spoil a child with extravagant toys, the designer can have multiple motives for not giving priority to excellence in engineering. He says that "the argument for imperfection critically depends on a psychoanalysis of the unidentified designer. Yet the reasons that a designer would or would not do anything are virtually impossible to know unless the designer tells you specifically what those reasons are." This reliance on inexplicable motives of the designer makes intelligent design scientifically untestable. Phillip E. Johnson puts forward a core definition that the designer creates for a purpose, giving the example that in his view AIDS was created to punish immorality and was not caused by HIV, but such motives cannot be tested by scientific methods.[59]

Asserting the need for a designer of complexity also raises the question "What designed the designer?"[60] Intelligent design proponents say that the question is irrelevant to or outside the scope of intelligent design.[n 12] Richard Wein counters that the unanswered questions an explanation creates "must be balanced against the improvements in our understanding which the explanation provides. Invoking an unexplained being to explain the origin of other beings (ourselves) is little more than question-begging. The new question raised by the explanation is as problematic as the question which the explanation purports to answer".[44] Richard Dawkins sees the assertion that the designer does not need to be explained, not as a contribution to knowledge, but as a thought-terminating cliché.[61][62] In the absence of observable, measurable evidence, the very question "What designed the designer?" leads to an infinite regression from which intelligent design proponents can only escape by resorting to religious creationism or logical contradiction.[63]

[edit] Movement

The intelligent design movement is a direct outgrowth of the creationism of the 1980s.[13] The scientific and academic communities, along with a U.S. federal court, view intelligent design as either a form of creationism or as a direct descendant that is closely intertwined with traditional creationism;[65][n 13][66][67][68][69] and several authors explicitly refer to it as "intelligent design creationism".[13][70][n 14][71][72]

The movement is headquartered in the Center for Science and Culture (CSC), established in 1996 as the creationist wing of the Discovery Institute to promote a religious agenda[n 15] calling for broad social, academic and political changes. The Discovery Institute's intelligent design campaigns have been staged primarily in the United States, although efforts have been made in other countries to promote intelligent design. Leaders of the movement say intelligent design exposes the limitations of scientific orthodoxy and of the secular philosophy of naturalism. Intelligent design proponents allege that science should not be limited to naturalism and should not demand the adoption of a naturalistic philosophy that dismisses out-of-hand any explanation that includes a supernatural cause. The overall goal of the movement is to "defeat [the] materialist world view" represented by the theory of evolution in favor of "a science consonant with Christian and theistic convictions".[n 15]

Phillip E. Johnson stated that the goal of intelligent design is to cast creationism as a scientific concept.[n 6][n 16] All leading intelligent design proponents are fellows or staff of the Discovery Institute and its Center for



Science and Culture.[73] Nearly all intelligent design concepts and the associated movement are the products of the Discovery Institute, which guides the movement and follows its wedge strategy while conducting its Teach the Controversy campaign and their other related programs.

Leading intelligent design proponents have made conflicting statements regarding intelligent design. In statements directed at the general public, they say intelligent design is not religious; when addressing conservative Christian supporters, they state that intelligent design has its foundation in the Bible.[n 16] Recognizing the need for support, the institute affirms its Christian, evangelistic orientation: "Alongside a focus on influential opinion-makers, we also seek to build up a popular base of support among our natural constituency, namely, Christians. We will do this primarily through apologetics seminars. We intend these to encourage and equip believers with new scientific evidences that support the faith, as well as to 'popularize' our ideas in the broader culture."[n 15]

Barbara Forrest, an expert who has written extensively on the movement, describes this as being due to the Discovery Institute's obfuscating its agenda as a matter of policy. She has written that the movement's "activities betray an aggressive, systematic agenda for promoting not only intelligent design creationism, but the religious world-view that undergirds it".[74]

[edit] Religion and leading proponents

Although arguments for intelligent design are formulated in secular terms and intentionally avoid positing the identity of the designer,[n 17] the majority of principal intelligent design advocates are publicly religious Christians who have stated that, in their view, the designer proposed in intelligent design is the Christian conception of God. Stuart Burgess, Phillip E. Johnson, William Dembski, and Stephen C. Meyer are evangelical Protestants; Michael Behe is a Roman Catholic; and Jonathan Wells is a member of the Unification Church. Non-Christian proponents include David Klinghoffer, who is Jewish,[75]Michael Denton, who is agnostic,[76][77][78] and Muzaffar Iqbal, a Pakistani Muslim.[79][80] Phillip E. Johnson has stated that cultivating ambiguity by employing secular language in arguments that are carefully crafted to avoid overtones of theistic creationism is a necessary first step for ultimately reintroducing the Christian concept of God as the designer. Johnson explicitly calls for intelligent design proponents to obfuscate their religious motivations so as to avoid having intelligent design identified "as just another way of packaging the Christian evangelical message".[n 18] Johnson emphasizes that "the first thing that has to be done is to get the Bible out of the discussion"; "after we have separated materialist prejudice from scientific fact [...] only then can 'biblical issues' be discussed".[n 19]

The strategy of deliberately disguising the religious intent of intelligent design has been described by William Dembski in *The Design Inference*.<sup>[81]</sup> In this work Dembski lists a god or an "alien life force" as two possible options for the identity of the designer; however, in his book *Intelligent Design: The Bridge Between Science and Theology*, Dembski states that "Christ is indispensable to any scientific theory, even if its practitioners don't have a clue about him. The pragmatics of a scientific theory can, to be sure, be pursued without recourse to Christ. But the conceptual soundness of the theory can in the end only be located in Christ."<sup>[82]</sup> Dembski also stated, "ID is part of God's general revelation [...] Not only does intelligent design rid us of this ideology (materialism), which suffocates the human spirit, but, in my personal experience, I've found that it opens the path for people to come to Christ".<sup>[83]</sup> Both Johnson and Dembski cite the Bible's Gospel of John as the foundation of intelligent design.<sup>[24]</sup>[n 16]

Barbara Forrest contends such statements reveal that leading proponents see intelligent design as essentially religious in nature, not merely a scientific concept that has implications with which their personal religious beliefs happen to coincide.[n 20] She writes that the leading proponents of intelligent design are closely allied with the ultra-conservative Christian Reconstructionism movement. She lists connections of (current and former)

Discovery Institute Fellows Phillip Johnson, Charles Thaxton, Michael Behe, Richard Weikart, Jonathan Wells and Francis Beckwith to leading Christian Reconstructionist organizations, and the extent of the funding provided the Institute by Howard Ahmanson Jr., a leading figure in the Reconstructionist movement.[84]

[edit] Reaction from other creationist groups

Not all creationist organizations have embraced the intelligent design movement. According to Thomas Dixon, "Religious leaders have come out against ID too. An open letter affirming the compatibility of Christian faith and the teaching of evolution, first produced in response to controversies in Wisconsin in 2004, has now been signed by over ten thousand clergy from different Christian denominations across America. In 2006, the director of the Vatican Observatory, the Jesuit astronomer George Coyne, condemned ID as a kind of 'crude creationism' which reduced God to a mere engineer." [85] Hugh Ross of Reasons to Believe, a proponent of Old Earth creationism, believes that the efforts of intelligent design proponents to divorce the concept from Biblical Christianity make its hypothesis too vague. In 2002 he wrote: "Winning the argument for design without identifying the designer yields, at best, a sketchy origins model. Such a model makes little if any positive impact on the community of scientists and other scholarsâ | The time is right for a direct approach, a single leap into the origins fray. Introducing a biblically based, scientifically verifiable creation model represents such a leap." [86]

Likewise, two of the most prominent Young Earth creationism organizations in the world have attempted to distinguish their views from intelligent design. Henry M. Morris of the Institute for Creation Research (ICR) wrote, in 1999, that ID, "even if well-meaning and effectively articulated, will not work! It has often been tried in the past and has failed, and it will fail today. The reason it won't work is because it is not the Biblical method." According to Morris: "The evidence of intelligent designâ | must be either followed by or accompanied by a sound presentation of true Biblical creationism if it is to be meaningful and lasting." [87] In 2002, Carl Wieland, then of Answers in Genesis (AiG), criticized design advocates who, though well-intentioned, "left the Bible out of it" and thereby unwittingly aided and abetted the modern rejection of the Bible. Wieland explained that "AiG's major 'strategy' is to boldly, but humbly, call the church back to its Biblical foundationsâ | [so] we neither count ourselves a part of this movement nor campaign against it." [88]

The unequivocal consensus in the scientific community is that intelligent design is not science and has no place in a science curriculum. [89] The U.S. National Academy of Sciences has stated that "creationism, intelligent design, and other claims of supernatural intervention in the origin of life or of species are not science because they are not testable by the methods of science." [90] The U.S. National Science Teachers Association and the American Association for the Advancement of Science have termed it pseudoscience. [91] Others in the scientific community have denounced its tactics, accusing the ID movement of manufacturing false attacks against evolution, of engaging in misinformation and misrepresentation about science, and marginalizing those who teach it. [92] More recently, in September 2012, Bill Nye ("The Science Guy") warned that creationist views threaten science education and innovations in The United States. [93] [94]

Several surveys were conducted prior to the December 2005 decision in *Kitzmiller v. Dover*, which sought to determine the level of support for intelligent design among certain groups. According to a 2005 Harris poll, 10% of adults in the United States viewed human beings as "so complex that they required a powerful force or intelligent being to help create them". [95] Although Zogby polls commissioned by the Discovery Institute show more support, these polls suffer from considerable flaws, such as having a very low response rate (248 out of 16,000), being conducted on behalf of an organization with an expressed interest in the outcome of the poll, and containing leading questions. [96] [97] [98]

A series of Gallup polls in the United States from 1982 through 2008 on

"Evolution, Creationism, Intelligent Design" found support for "human beings have developed over millions of years from less advanced forms of life, but God guided the process" of between 35% and 40%, support for "God created human beings in pretty much their present form at one time within the last 10,000 years or so" varied from 43% to 47%, and support for "human beings have developed over millions of years from less advanced forms of life, but God had no part in the process" varied from 9% to 14%. The polls also noted answers to a series of more detailed questions.[99]

The film *Expelled: No Intelligence Allowed* sparked further controversy in 2008. This documentary film, hosted by Ben Stein, presents allegations that the mainstream science establishment, in a conspiracy to keep God out of science laboratories and classrooms, suppresses academics who believe they see evidence of intelligent design in nature or criticize evidence of evolution.[100] The film includes interviews with scientists and academics who were misled into taking part by misrepresentation of the topic and title of the film. Michael Shermer describes his experience of being repeatedly asked the same question without context as "surreal". Review screenings were restricted to churches and Christian groups, and at a special pre-release showing one of the interviewees, PZ Myers, was refused admission. The production company, Premise Media, also has helped finance some religious films such as *The Passion of the Christ*. The Anti-Defamation League denounced the film's allegation that evolutionary theory influenced The Holocaust.[101][102]

[edit] Criticism

[edit] Scientific criticism

Advocates of intelligent design seek to keep God and the Bible out of the discussion, and present intelligent design in the language of science as though it were a scientific hypothesis.[n 17][n 19] For a theory to qualify as scientific,[n 21][103][n 22] it is expected to be:

Consistent

Parsimonious (sparing in its proposed entities or explanations, see Occam's Razor)

Useful (describes and explains observed phenomena, and can be used in a predictive manner)

Empirically testable and falsifiable (potentially confirmable or disprovable by experiment or observation)

Based on multiple observations (often in the form of controlled, repeated experiments)

Correctable and dynamic (modified in the light of observations that do not support it)

Progressive (refines previous theories)

Provisional or tentative (is open to experimental checking, and does not assert certainty)

For any theory, hypothesis or conjecture to be considered scientific, it must meet most, and ideally all, of these criteria. The fewer criteria are met, the less scientific it is; and if it meets only a few or none at all, then it cannot be treated as scientific in any meaningful sense of the word. Typical objections to defining intelligent design as science are that it lacks consistency,[104] violates the principle of parsimony,[n 23] is not scientifically useful,[n 24] is not falsifiable,[n 25] is not empirically testable,[n 26] and is not correctable, dynamic, provisional or progressive.[n 27][n 28][n 29]

Intelligent design proponents seek to change this fundamental basis of science[105] by eliminating "methodological naturalism" from science[106] and replacing it with what the leader of the intelligent design movement, Phillip E. Johnson, calls "theistic realism".[n 30] Intelligent design proponents argue that naturalistic explanations fail to explain certain phenomena and that supernatural explanations provide a very simple and intuitive explanation for the origins of life and the universe.[n 31] Many intelligent design followers believe that "Scientism" is itself a religion that promotes secularism and materialism in an attempt to erase theism from public life, and they view their

work in the promotion of intelligent design as a way to return religion to a central role in education and other public spheres.

The failure to follow the procedures of scientific discourse and the failure to submit work to the scientific community that withstands scrutiny have weighed against intelligent design being accepted as valid science.[107] The intelligent design movement has not published a properly peer-reviewed article supporting ID in a scientific journal, and has failed to publish supporting peer-reviewed research or data.[107] The only article published in a peer-reviewed scientific journal that made a case for intelligent design was quickly withdrawn by the publisher for having circumvented the journal's peer-review standards.[108] The Discovery Institute says that a number of intelligent design articles have been published in peer-reviewed journals,[109] but critics, largely members of the scientific community, reject this claim and state intelligent design proponents have set up their own journals with peer review that lack impartiality and rigor,[n 32] consisting entirely of intelligent design supporters.[n 33]

Further criticism stems from the fact that the phrase intelligent design makes use of an assumption of the quality of an observable intelligence, a concept that has no scientific consensus definition. William Dembski, for example, has written that "Intelligence leaves behind a characteristic signature". The characteristics of intelligence are assumed by intelligent design proponents to be observable without specifying what the criteria for the measurement of intelligence should be. Critics say that the design detection methods proposed by intelligent design proponents are radically different from conventional design detection, undermining the key elements that make it possible as legitimate science. Intelligent design proponents, they say, are proposing both searching for a designer without knowing anything about that designer's abilities, parameters, or intentions (which scientists do know when searching for the results of human intelligence), as well as denying the very distinction between natural/artificial design that allows scientists to compare complex designed artifacts against the background of the sorts of complexity found in nature.[n 34]

Among a significant proportion of the general public in the United States, the major concern is whether conventional evolutionary biology is compatible with belief in God and in the Bible, and how this issue is taught in schools.[110] The Discovery Institute's "Teach the Controversy" campaign promotes intelligent design while attempting to discredit evolution in United States public high school science courses.[13][111][112][113][114][115] The scientific community and science education organizations have replied that there is no scientific controversy regarding the validity of evolution and that the controversy exists solely in terms of religion and politics.[116][117][118]

[edit] Arguments from ignorance

Eugenie Scott, along with Glenn Branch and other critics, has argued that many points raised by intelligent design proponents are arguments from ignorance. In the argument from ignorance, a lack of evidence for one view is erroneously argued to constitute proof of the correctness of another view. Scott and Branch say that intelligent design is an argument from ignorance because it relies on a lack of knowledge for its conclusion: lacking a natural explanation for certain specific aspects of evolution, we assume intelligent cause. They contend most scientists would reply that the unexplained is not unexplainable, and that "we don't know yet" is a more appropriate response than invoking a cause outside science. Particularly, Michael Behe's demands for ever more detailed explanations of the historical evolution of molecular systems seem to assume a false dichotomy, where either evolution or design is the proper explanation, and any perceived failure of evolution becomes a victory for design. Scott and Branch also contend that the supposedly novel contributions proposed by intelligent design proponents have not served as the basis for any productive scientific research.[119]

In his conclusion to the Kitzmiller trial, Judge Jones wrote that "ID is at bottom premised upon a false dichotomy, namely, that to the extent evolutionary

theory is discredited, ID is confirmed." This same argument had been put forward to support creation science at the McLean v. Arkansas trial which found it was "contrived dualism", the false premise of a "two-model approach". Behe's argument of irreducible complexity puts forward negative arguments against evolution but does not make any positive scientific case for intelligent design. It fails to allow for scientific explanations continuing to be found, as has been the case with several examples previously put forward as supposed cases of irreducible complexity.[120]

[edit] Theological issues

The insistence of intelligent design on repeated miraculous interventions rather than designed laws raises theological difficulties for those who believe that God's design must be perfect and should not need such changes. The claim to be scientific implies that science can test religion, and the problem of evil raises the issue of a lack of miraculous intervention to reduce suffering.[19] Intelligent design proponents avoid the problem of poor design in nature by insisting that we have simply failed to understand the perfection of the design, or by proposing that designers do not necessarily produce the best design they can, and may have unknowable motives for their actions.[59]

[edit] God of the gaps

Intelligent design has also been characterized as a God-of-the-gaps argument,[121] which has the following form:

There is a gap in scientific knowledge.

The gap is filled with acts of God (or intelligent designer) and therefore proves the existence of God (or intelligent designer).[121]

A God-of-the-gaps argument is the theological version of an argument from ignorance. A key feature of this type of argument is that it merely answers outstanding questions with explanations (often supernatural) that are unverifiable and ultimately themselves subject to unanswerable questions.[122] Historians of science observe that the astronomy of the earliest civilizations, although astonishing and incorporating mathematical constructions far in excess of any practical value, proved to be misdirected and of little importance to the development of science because they failed to inquire more carefully into the mechanisms that drove the heavenly bodies across the sky.[123] It was the Greek civilization that first practised science, although not yet a mathematically oriented experimental science, but nevertheless an attempt to rationalize the world of natural experience without recourse to divine intervention.[124] In this historically motivated definition of science any appeal to an intelligent creator is explicitly excluded for the paralysing effect it may have on the scientific progress.

[edit] Kitzmiller trial

Kitzmiller v. Dover Area School District was the first direct challenge brought in the United States federal courts against a public school district that required the presentation of intelligent design as an alternative to evolution. The plaintiffs successfully argued that intelligent design is a form of creationism, and that the school board policy thus violated the Establishment Clause of the First Amendment to the United States Constitution.[1]

Eleven parents of students in Dover, Pennsylvania, sued the Dover Area School District over a statement that the school board required be read aloud in ninth-grade science classes when evolution was taught. The plaintiffs were represented by the American Civil Liberties Union (ACLU), Americans United for Separation of Church and State (AU) and Pepper Hamilton LLP. The National Center for Science Education (NCSE) acted as consultants for the plaintiffs. The defendants were represented by the Thomas More Law Center.[125] The suit was tried in a bench trial from September 26 to November 4, 2005, before Judge John E. Jones III. Ken Miller, Kevin Padian, Brian Alters, Robert Pennock, Barbara Forrest and John Haught served as expert witnesses for the plaintiffs. Michael Behe, Steve Fuller and Scott Minnich served as expert witnesses for the defense.

On December 20, 2005, Judge Jones issued his 139-page findings of fact and decision, ruling that the Dover mandate was unconstitutional, and barring intelligent design from being taught in Pennsylvania's Middle District public school science classrooms. The eight Dover school board members who voted for the intelligent design requirement were all defeated in a November 8, 2005, election by challengers who opposed the teaching of intelligent design in a science class, and the current school board president stated that the board does not intend to appeal the ruling.[126]

In his finding of facts, Judge Jones made the following condemnation of the Teach the Controversy strategy:

"Moreover, ID's backers have sought to avoid the scientific scrutiny which we have now determined that it cannot withstand by advocating that the controversy, but not ID itself, should be taught in science class. This tactic is at best disingenuous, and at worst a canard."

[edit] Reaction

Judge Jones himself anticipated that his ruling would be criticized, saying in his decision that:

"Those who disagree with our holding will likely mark it as the product of an activist judge. If so, they will have erred as this is manifestly not an activist Court. Rather, this case came to us as the result of the activism of an ill-informed faction on a school board, aided by a national public interest law firm eager to find a constitutional test case on ID, who in combination drove the Board to adopt an imprudent and ultimately unconstitutional policy. The breathtaking inanity of the Board's decision is evident when considered against the factual backdrop which has now been fully revealed through this trial. The students, parents, and teachers of the Dover Area School District deserved better than to be dragged into this legal maelstrom, with its resulting utter waste of monetary and personal resources."[127]

As Jones had predicted, John G. West, Associate Director of the Center for Science and Culture at Discovery Institute, said:

"The Dover decision is an attempt by an activist federal judge to stop the spread of a scientific idea and even to prevent criticism of Darwinian evolution through government-imposed censorship rather than open debate, and it won't work. He has conflated Discovery Institute's position with that of the Dover school board, and he totally misrepresents intelligent design and the motivations of the scientists who research it."[128]

Newspapers have noted with interest that the judge is "a Republican and a churchgoer".[129][130][131][132]

Subsequently, the decision has been examined in a search for flaws and conclusions, partly by intelligent design supporters aiming to avoid future defeats in court. In the Spring of 2007 the University of Montana Law review published three articles.[133] In the first, David K. DeWolf, John G. West and Casey Luskin, all of the Discovery Institute, argued that intelligent design is a valid scientific theory, the Jones court should not have addressed the question of whether it was a scientific theory, and that the Kitzmiller decision will have no effect at all on the development and adoption of intelligent design as an alternative to standard evolutionary theory.[134] In the second Peter Irons responded, arguing that the decision was extremely well reasoned and spells the death knell for the intelligent design efforts to introduce creationism in public schools,[135] while in the third, DeWolf et al. answer the points made by Irons.[136] However, fear of a similar lawsuit has resulted in other school boards abandoning intelligent design "teach the controversy" proposals.[13]

In April 2010, the American Academy of Religion issued Guidelines for Teaching

About Religion in K-12 Public Schools in the United States, which included guidance that Creation Science or intelligent design should not be taught in science classes, as "Creation science and intelligent design represent worldviews that fall outside of the realm of science that is defined as (and limited to) a method of inquiry based on gathering observable and measurable evidence subject to specific principles of reasoning." However, they, as well as other "worldviews that focus on speculation regarding the origins of life represent another important and relevant form of human inquiry that is appropriately studied in literature or social sciences courses. Such study, however, must include a diversity of worldviews representing a variety of religious and philosophical perspectives and must avoid privileging one view as more legitimate than others." [137]

[edit] Status outside the United States

[edit] Europe

In June 2007 the Council of Europe's "Committee on Culture, Science and Education" issued a report, The dangers of creationism in education, which states "Creationism in any of its forms, such as 'intelligent design', is not based on facts, does not use any scientific reasoning and its contents are pathetically inadequate for science classes." [138] In describing the dangers posed to education by teaching creationism, it described intelligent design as "anti-science" and involving "blatant scientific fraud" and "intellectual deception" that "blurs the nature, objectives and limits of science" and links it and other forms of creationism to denialism. On October 4, 2007, the Council of Europe's Parliamentary Assembly approved a resolution stating that schools should "resist presentation of creationist ideas in any discipline other than religion", including "intelligent design", which it described as "the latest, more refined version of creationism", "presented in a more subtle way". The resolution emphasises that the aim of the report is not to question or to fight a belief, but to "warn against certain tendencies to pass off a belief as science". [139]

In the United Kingdom, public education includes Religious Education as a compulsory subject, and there are many faith schools that teach the ethos of particular denominations. When it was revealed that a group called Truth in Science had distributed DVDs produced by the Discovery Institute affiliate Illustra Media [n 35] featuring Discovery Institute fellows making the case for design in nature, [140] and claimed they were being used by 59 schools, [141] the Department for Education and Skills (DfES) stated that "Neither creationism nor intelligent design are taught as a subject in schools, and are not specified in the science curriculum" (part of the National Curriculum, which does not apply to independent schools or to education in Scotland). [142] [143] The DfES subsequently stated that "Intelligent design is not a recognised scientific theory; therefore, it is not included in the science curriculum", but left the way open for it to be explored in religious education in relation to different beliefs, as part of a syllabus set by a local Standing Advisory Council on Religious Education. [144] In 2006 the Qualifications and Curriculum Authority produced a Religious Education model unit in which pupils can learn about religious and nonreligious views about creationism, intelligent design and evolution by natural selection. [145] [146]

On June 25, 2007, the UK Government responded to an e-petition by saying that creationism and intelligent design should not be taught as science, though teachers would be expected to answer pupils' questions within the standard framework of established scientific theories. [147] Detailed government "Creationism teaching guidance" for schools in England was published on September 18, 2007. It states that "Intelligent design lies wholly outside of science", has no underpinning scientific principles, or explanations, and is not accepted by the science community as a whole. Though it should not be taught as science, "questions about creationism and intelligent design which arise in science lessons, for example, as a result of media coverage, could provide the opportunity to explain or explore why they are not considered to be scientific theories and, in the right context, why evolution is considered to

be a scientific theory". However, "Teachers of subjects such as RE, history or citizenship may deal with creationism and intelligent design in their lessons".[n 4]

The British Centre for Science Education lobbying group has the goal of "countering creationism within the UK" and has been involved in government lobbying in the UK in this regard.[148] Northern Ireland's Department for Education says that the curriculum provides an opportunity for alternative theories to be taught. The Democratic Unionist Party (DUP)â ~which has links to fundamentalist Christianityâ ~has been campaigning to have intelligent design taught in science classes. A DUP former Member of Parliament, David Simpson, has sought assurances from the education minister that pupils will not lose marks if they give creationist or intelligent design answers to science questions.[149][150] In 2007, Lisburn city council voted in favor of a DUP recommendation to write to post-primary schools asking what their plans are to develop teaching material in relation to "creation, intelligent design and other theories of origin".[151]

Plans by Dutch Education Minister Maria van der Hoeven to "stimulate an academic debate" on the subject in 2005 caused a severe public backlash.[152] After the 2007 elections she was succeeded by Ronald Plasterk, described as a "molecular geneticist, staunch atheist and opponent of intelligent design".[153] As a reaction on this situation in the Netherlands, in Belgium the President of the Flemish Catholic Educational Board (VSKO) Mieke Van Hecke declared that: "Catholic scientists already accepted the theory of evolution for a long time and that intelligent design and creationism doesn't belong in Flemish Catholic schools. It's not the tasks of the politics to introduce new ideas, that's task and goal of science."[154]

[edit] Relation to Islam

Muzaffar Iqbal, a notable Muslim in Canada, signed the Scientific Dissent list of the Discovery Institute.[155] Ideas similar to intelligent design have been considered respected intellectual options among Muslims, and in Turkey many intelligent design books have been translated. In Istanbul in 2007, public meetings promoting intelligent design were sponsored by the local government,[156] and David Berlinski of the Discovery Institute was the keynote speaker at a meeting in May 2007.[157]

[edit] Relation to ISKCON

In 2010 the ISKCON Bhaktivedanta Book Trust published an intelligent design book titled *Rethinking Darwin: A Vedic Study of Darwinism and Intelligent Design* chapters included contributions from intelligent design advocates William Dembski, Jonathan Wells and Michael Behe as well as from Hindu creationists Leif A. Jansen and Michael Cremo.[158]

[edit] Australia

The status of intelligent design in Australia is somewhat similar to that in the UK (see Education in Australia). When the former Australian Federal Education Minister, Brendan Nelson, raised the notion of intelligent design being taught in science classes, the public outcry caused the minister to quickly concede that the correct forum for intelligent design, if it were to be taught, is in religious or philosophy classes.[159] The Australian chapter of Campus Crusade for Christ distributed a DVD of the Discovery Institute's documentary *Unlocking the Mystery of Life* to Australian secondary schools.[160] The head of one of Australia's leading private schools supported use of the DVD in the classroom at the discretion of teachers and principals.[161]

[edit] See also

^ a b "Q. Has the Discovery Institute been a leader in the intelligent design movement? A. Yes, the Discovery Institute's Center for Science and Culture. Q. And are almost all of the individuals who are involved with the intelligent design movement associated with the Discovery Institute? A. All of the leaders are, yes." Barbara Forrest, 2005, testifying in the *Kitzmiller v. Dover Area School District* trial. TalkOrigins Archive. *Kitzmiller v. Dover Area School District Trial transcript: Day 6 (October 5), PM Session, Part 1.*; 2005 [cited



2012-06-16].

"The Discovery Institute is the ideological and strategic backbone behind the eruption of skirmishes over science in school districts and state capitals across the country". In: Jody Wilgoren. Politicized Scholars Put Evolution on the Defensive. The New York Times. August 21, 2005 [cited 2012-06-16].

American Civil Liberties Union. Who is behind the ID movement?; September 16, 2005 [cited 2012-06-16].

Kahn, JP. The Evolution of George Gilder. The Author And Tech-Sector Guru Has A New Cause To Create Controversy With: Intelligent Design. The Boston Globe. July 27, 2005 [cited 2012-06-16].

"Who's Who of Intelligent Design Proponents" (PDF). Science & Theology News. November 2005.

<http://www.discovery.org/scripts/viewDB/filesDB-download.php?command=download&pid=602>. Retrieved 2007-07-20.

"The engine behind the ID movement is the Discovery Institute". Attie, Alan D.; Elliot Sober, Ronald L. Numbers, Richard M. Amasino, Beth Cox<sup>4</sup>, Terese Berceau, Thomas Powell and Michael M. Cox (2006). "Defending science education against intelligent design: a call to action". Journal of Clinical Investigation 116:1134âˆ™1138 (A publication of the American Society for Clinical Investigation.) 116 (5): 1134âˆ™8. doi:10.1172/JCI28449. PMCâˆ™1451210. PMIDâˆ™16670753. <http://www.jci.org/articles/view/28449>. Retrieved 2012-06-16.

^ a b c "the writings of leading ID proponents reveal that the designer postulated by their argument is the God of Christianity". Kitzmiller v. Dover Area School District, 04 cv 2688 (December 20, 2005). , Ruling p. 26. A selection of writings and quotations of intelligent design supporters demonstrating this identification of the Christian god with the intelligent designer are found in the pdf Horse's Mouth by Brian Poindexter, dated 2003. William A. Dembski, a senior fellow of the Discovery Institute's Center for Science and Culture, when asked in an interview whether his research concluded that God is the Intelligent Designer, stated "I believe God created the world for a purpose. The Designer of intelligent design is, ultimately, the Christian God". Devon Williams (December 14, 2007). "CitizenLink: Friday Five: William A. Dembski". Focus on the Family.

<http://www.uncommondescent.com/education/dembski-interviewed-over-design-of-life/>. Retrieved 2012-06-15.

^ See: 1) List of scientific societies explicitly rejecting intelligent design 2) Kitzmiller v. Dover page 83. 3) The Discovery Institute's A Scientific Dissent From Darwinism petition begun in 2001 has been signed by "over 700 scientists" as of August 20, 2006. A four day A Scientific Support for Darwinism petition gained 7733 signatories from scientists opposing ID. The AAAS, the largest association of scientists in the U.S., has 120,000 members, and firmly rejects ID. More than 70,000 Australian scientists and educators condemn teaching of intelligent design in school science classes List of statements from scientific professional organizations on the status intelligent design and other forms of creationism. According to The New York Times "There is no credible scientific challenge to the theory of evolution as an explanation for the complexity and diversity of life on earth". Dean, Cordelia (September 27, 2007). "Scientists Feel Miscast in Film on Life's Origin". The New York Times.

[http://www.nytimes.com/2007/09/27/science/27expelled.html?\\_r=2&oref=slogin&mp;oref=slogin](http://www.nytimes.com/2007/09/27/science/27expelled.html?_r=2&oref=slogin&mp;oref=slogin). Retrieved 2012-06-16.

^ a b "Teachernet, Document bank". Creationism teaching guidance. UK Department for Children, Schools and Families. September 18, 2007. Archived from the original on 2008-01-08.

<http://webarchive.nationalarchives.gov.uk/20071104143905/http://www.teachernet.gov.uk/docbank/index.cfm?id=11890>. Retrieved 2007-10-01. "The intelligent design movement claims there are aspects of the natural world that are so intricate and fit for purpose that they cannot have evolved but must have been created by an 'intelligent designer'. Furthermore they assert that this claim is scientifically testable and should therefore be taught in science lessons.

Intelligent design lies wholly outside of science. Sometimes examples are quoted that are said to require an 'intelligent designer'. However, many of these have subsequently been shown to have a scientific explanation, for example, the immune system and blood clotting mechanisms. Attempts to establish an idea of the 'specified complexity' needed for intelligent design are surrounded by complex mathematics. Despite this, the idea seems to be essentially a modern version of the old idea of the "God-of-the-gaps". Lack of a satisfactory scientific explanation of some phenomena (a 'gap' in scientific knowledge) is claimed to be evidence of an intelligent designer."

^ "ID is not a new scientific argument, but is rather an old religious argument for the existence of God. He traced this argument back to at least Thomas Aquinas in the 13th century, who framed the argument as a syllogism: Wherever complex design exists, there must have been a designer; nature is complex; therefore nature must have had an intelligent designer." "This argument for the existence of God was advanced early in the 19th century by Reverend Paley" (the teleological argument) "The only apparent difference between the argument made by Paley and the argument for ID, as expressed by defense expert witnesses Behe and Minnich, is that ID's 'official position' does not acknowledge that the designer is God." *Kitzmiller v. Dover Area School District*, 04 cv 2688 (December 20, 2005). , Ruling, p. 24.

^ a b Elizabeth Nickson (2004). "Let's Be Intelligent About Darwin".

Christianity.ca. Archived from the original on 2007-07-08.

<http://web.archive.org/web/20070608233455/http://www.christianity.ca/news/social-issues/2004/03.001.html>. "Phillip Johnson: Our strategy has been to change the subject a bit so that we can get the issue of Intelligent Design, which really means the reality of God, before the academic world and into the schools."

"This isn't really, and never has been a debate about science. It's about religion and philosophy." Johnson 1996. World magazine. Witnesses For The Prosecution. "So the question is: "How to win?" That's when I began to develop what you now see full-fledged in the "wedge" strategy: "Stick with the most important thing"â ~the mechanism and the building up of information. Get the Bible and the Book of Genesis out of the debate because you do not want to raise the so-called Bible-science dichotomy. Phrase the argument in such a way that you can get it heard in the secular academy and in a way that tends to unify the religious dissenters. That means concentrating on, "Do you need a Creator to do the creating, or can nature do it on its own?" and refusing to get sidetracked onto other issues, which people are always trying to do."

Johnson 2000. Touchstone magazine. Berkeley's Radical An Interview with Phillip E. Johnson at the Wayback Machine (archived June 9, 2007)

^ Stephen C. Meyer: "I think the designer is God" (Darwin, the marketing of Intelligent Design. Nightline, ABC News, with Ted Koppel, August 10, 2005);

Nancy Pearcey: "By contrast, design theory demonstrates that Christians can sit in the supernaturalist's "chair" even in their professional lives, seeing the cosmos through the lens of a comprehensive biblical worldview. Intelligent Design steps boldly into the scientific arena to build a case based on empirical data. It takes Christianity out of the ineffectual realm of value and stakes out a cognitive claim in the realm of objective truth. It restores Christianity to its status as genuine knowledge, equipping us to defend it in the public arena". (Total Truth, Crossway Books, June 29, 2004, ISBN 1-58134-458-9, pp. 204â ^205)

^ For example, Bridgham et al. showed that gradual evolutionary mechanisms can produce complex protein-protein interaction systems from simpler precursors. Bridgham et al.. Evolution of Hormone-Receptor Complexity by Molecular Exploitation. Science. 2006;312(5770):97â ^101. doi:10.1126/science.1123348. PMID 16601189.

^ Devolution. The New Yorker. May 30, 2005. This article draws from the following exchange of letters in which Behe admits to sloppy prose and non-logical proof: Discovery Institute. Has Darwin met his match? Lettersâ ~An exchange over ID; March 26, 2003 [cited 2006-11-30].

^ Some of Dembski's responses to assertions of specified complexity being a

tautology can be found at William A. Dembski. "Another way to detect design". ARN. [http://www.arn.org/docs/dembski/wd\\_anotherwaytodetectdesign.htm](http://www.arn.org/docs/dembski/wd_anotherwaytodetectdesign.htm). Retrieved 2012-06-16.

^ Dembski. Discovery Institute. Questions About Intelligent Design [cited 2012-06-16]. "The theory of Intelligent Design holds that certain features of the universe and of living things are best explained by an intelligent cause, not an undirected process such as natural selection."

^ IDEA "One need not fully understand the origin or identity of the designer to determine that an object was designed. Thus, this question is essentially irrelevant to intelligent design theory, which merely seeks to detect if an object was designed ... Intelligent design theory cannot address the identity or origin of the designerâ ~it is a philosophical / religious question that lies outside the domain of scientific inquiry. Christianity postulates the religious answer to this question that the designer is God who by definition is eternally existent and has no origin. There is no logical philosophical impossibility with this being the case (akin to Aristotle's 'unmoved mover') as a religious answer to the origin of the designer..." FAQ: Who designed the designer? FAQ: Who designed the designer?

^ National Science Teachers Association, a professional association of 55,000 science teachers and administrators "National Science Teachers Association Disappointed About Intelligent Design Comments Made by President Bush" (Press release). National Science Teachers Association. August 3, 2005. <http://www.nsta.org/about/pressroom.aspx?id=50794>. "We stand with the nation's leading scientific organizations and scientists, including Dr. John Marburger, the president's top science advisor, in stating that intelligent design is not science....It is simply not fair to present pseudoscience to students in the science classroom."

^ Robert T. Pennock. Wizards of ID: Reply to Dembski. In: Robert T. Pennock. Intelligent Design Creationism and Its Critics: Philosophical, Theological, and Scientific Perspectives. Cambridge, Massachusetts: MIT Press; 2001. ISBN 0-262-66124-1. "Dembski chides me for never using the term 'intelligent design' without conjoining it to 'creationism'. He implies (though never explicitly asserts) that he and others in his movement are not creationists and that it is incorrect to discuss them in such terms, suggesting that doing so is merely a rhetorical ploy to 'rally the troops'. (2) Am I (and the many others who see Dembski's movement in the same way) misrepresenting their position? The basic notion of creationism is the rejection of biological evolution in favor of special creation, where the latter is understood to be supernatural. Beyond this there is considerable variability..." p. 645â ^667.

^ a b c "The social consequences of materialism have been devastating. As symptoms, those consequences are certainly worth treating. However, we are convinced that in order to defeat materialism, we must cut it off at its source. That source is scientific materialism. This is precisely our strategy. If we view the predominant materialistic science as a giant tree, our strategy is intended to function as a 'wedge' that, while relatively small, can split the trunk when applied at its weakest points. The very beginning of this strategy, the 'thin edge of the wedge,' was Phillip Johnson's critique of Darwinism begun in 1991 in Darwinism on Trial, and continued in Reason in the Balance and Defeating Darwinism by Opening Minds. Michael Behe's highly successful Darwin's Black Box followed Johnson's work. We are building on this momentum, broadening the wedge with a positive scientific alternative to materialistic scientific theories, which has come to be called the theory of intelligent design (ID). Design theory promises to reverse the stifling dominance of the materialist worldview, and to replace it with a science consonant with Christian and theistic convictions". Wedge Document Discovery Institute, 1999. (PDF file)

^ a b c "I have built an intellectual movement in the universities and churches that we call The Wedge, which is devoted to scholarship and writing that furthers this program of questioning the materialistic basis of science. [...] Now the way that I see the logic of our movement going is like this. The first

thing you understand is that the Darwinian theory isn't true. It's falsified by all of the evidence and the logic is terrible. When you realize that, the next question that occurs to you is, well, where might you get the truth? [...] I start with John 1:1. In the beginning was the word. In the beginning was intelligence, purpose, and wisdom. The Bible had that right. And the materialist scientists are deluding themselves." Johnson 1999. Reclaiming America for Christ Conference. How the Evolution Debate Can Be Won

^ a b "...intelligent design does not address metaphysical and religious questions such as the nature or identity of the designer," and "...the nature, moral character and purposes of this intelligence lie beyond the competence of science and must be left to religion and philosophy". In: Discovery Institute. Truth Sheet # 09-05 Does intelligent design postulate a "supernatural creator? [cited 2007-07-19].

^ Phillip Johnson. 'Keeping the Darwinists Honest' an interview with Phillip Johnson. 1999. "Intelligent Design is an intellectual movement, and the Wedge strategy stops working when we are seen as just another way of packaging the Christian evangelical message. [...] The evangelists do what they do very well, and I hope our work opens up for them some doors that have been closed".

^ a b Phillip Johnson. Touchstone: A Journal of Mere Christianity. 1999. "...the first thing that has to be done is to get the Bible out of the discussion.... This is not to say that the biblical issues are unimportant; the point is rather that the time to address them will be after we have separated materialist prejudice from scientific fact". The Wedge

^ Barbara Forrest. Expert Testimony. Kitzmiller v. Dover Area School District trial transcript, Day 6 (October 5) "What I am talking about is the essence of intelligent design, and the essence of it is theistic realism as defined by Professor Johnson. Now that stands on its own quite apart from what their motives are. I'm also talking about the definition of intelligent design by Dr. Dembski as the Logos theology of John's Gospel. That stands on its own. [...] Intelligent design, as it is understood by the proponents that we are discussing today, does involve a supernatural creator, and that is my objection. And I am objecting to it as they have defined it, as Professor Johnson has defined intelligent design, and as Dr. Dembski has defined intelligent design. And both of those are basically religious. They involve the supernatural".

^ Scientific Method in Practice. Cambridge UP; 2003. ISBN 0-521-01708-4. Chapters 5â ^8. Discusses principles of induction, deduction and probability related to the expectation of consistency, testability, and multiple observations. Chapter 8 discusses parsimony (Occam's razor)

^ Kitzmiller v. Dover Area School District, cv 2688 (December 20, 2005). , 4: whether ID is science. The ruling discusses central aspects of expectations in the scientific community that a scientific theory be testable, dynamic, correctible, progressive, based upon multiple observations, and provisional,

^ Intelligent design fails to pass Occam's razor. Adding entities (an intelligent agent, a designer) to the equation is not strictly necessary to explain events. See, e.g., Branden Fitelson, et al.. How Not to Detect Designâ ^Critical Notice: William A. Dembski The Design Inference. In: Robert T. Pennock. Intelligent Design Creationism and Its Critics: Philosophical, Theological, and Scientific Perspectives. MIT Press; 2001. p. 597â ^616.

^ See, e.g., Department of Biological Sciences, Lehigh University. Thoughts on Evolution and Intelligent Design; 2005. "Q: Why couldn't intelligent design also be a scientific theory? A: The idea of intelligent design might or might not be true, but when presented as a scientific hypothesis, it is not useful because it is based on weak assumptions, lacks supporting data and terminates further thought."

^ The designer is not falsifiable, since its existence is typically asserted without sufficient conditions to allow a falsifying observation. The designer being beyond the realm of the observable, claims about its existence can be neither supported nor undermined by observation, making intelligent design and the argument from design analytic a posteriori arguments. See, e.g., Kitzmiller

v. Dover Area School District, cv 2688 (December 20, 2005). Ruling, p. 22 and p. 77.

^ That intelligent design is not empirically testable stems from the fact that it violates a basic premise of science, naturalism. See, e.g., *Kitzmiller v. Dover Area School District*, cv 2688 (December 20, 2005). Ruling, p. 22 and p. 66.

^ Intelligent design professes to offer an answer that does not need to be defined or explained, the intelligent agent, designer. By asserting a conclusion that cannot be accounted for scientifically, the designer, intelligent design cannot be sustained by any further explanation, and objections raised to those who accept intelligent design make little headway. Thus intelligent design is not a provisional assessment of data, which can change when new information is discovered. Once it is claimed that a conclusion that need not be accounted for has been established, there is simply no possibility of future correction. The idea of the progressive growth of scientific ideas is required to explain previous data and any previously unexplainable data. See, e.g., the brief explanation in *Kitzmiller v. Dover Area School District*, 04 cv 2688 (December 20, 2005). p. 66.

^ "Nobel Laureates Initiative" (PDF). The Elie Wiesel Foundation for Humanity. September 9, 2005. [http://media.ljworld.com/pdf/2005/09/15/nobel\\_letter.pdf](http://media.ljworld.com/pdf/2005/09/15/nobel_letter.pdf). Retrieved 2007-07-19. The September 2005 statement by 38 Nobel laureates stated that: "Intelligent design is fundamentally unscientific; it cannot be tested as scientific theory because its central conclusion is based on belief in the intervention of a supernatural agent".

^ Intelligent Design is not Science: Scientists and teachers speak out. 2005 October [archived 2006-06-14; cited 2009-01-09]. University of New South Wales. The October 2005 statement, by a coalition representing more than 70,000 Australian scientists and science teachers said: "intelligent design is not science" and called on "all schools not to teach Intelligent Design (ID) as science, because it fails to qualify on every count as a scientific theory".

^ Phillip E. Johnson. Access Research Network. Starting a Conversation about Evolution: Johnson, Phillip; August 31, 1996 [cited 2012-06-16]. "My colleagues and I speak of 'theistic realism'â ~or sometimes, 'mere creation'â ~as the defining concept of our [the ID] movement. This means that we affirm that God is objectively real as Creator, and that the reality of God is tangibly recorded in evidence accessible to science, particularly in biology."

^ Enlisting Science to Find the Fingerprints of a Creator; March 25, 2001 [cited 2012-06-16]. "[Phillip E. Johnson quoted]: We are taking an intuition most people have and making it a scientific and academic enterprise.... We are removing the most important cultural roadblock to accepting the role of God as creator."

^ Is It Science Yet?: Intelligent Design Creationism and the Constitution [PDF]. Washington University Law Quarterly. 2005 [cited 2007-07-18];83(1). "ID leaders know the benefits of submitting their work to independent review and have established at least two purportedly "peer-reviewed" journals for ID articles. However, one has languished for want of material and quietly ceased publication, while the other has a more overtly philosophical orientation. Both journals employ a weak standard of "peer review" that amounts to no more than vetting by the editorial board or society fellows."

^ TalkOrigins Archive. Index to Creationist Claims; 2006. "With some of the claims for peer review, notably Campbell and Meyer (2003) and the e-journal PCID, the reviewers are themselves ardent supporters of intelligent design. The purpose of peer review is to expose errors, weaknesses, and significant omissions in fact and argument. That purpose is not served if the reviewers are uncritical"

^ "For human artifacts, we know the designer's identity, human, and the mechanism of design, as we have experience based upon empirical evidence that humans can make such things, as well as many other attributes including the designer's abilities, needs, and desires. With ID, proponents assert that they refuse to propose hypotheses on the designer's identity, do not propose a

mechanism, and the designer, he/she/it/they, has never been seen. In that vein, defense expert Professor Minnich agreed that in the case of human artifacts and objects, we know the identity and capacities of the human designer, but we do not know any of those attributes for the designer of biological life. In addition, Professor Behe agreed that for the design of human artifacts, we know the designer and its attributes and we have a baseline for human design that does not exist for design of biological systems. Professor Behe's only response to these seemingly insurmountable points of disanalogy was that the inference still works in science fiction movies".<sup>^</sup> *Kitzmiller v. Dover Area School District*, cv 2688 (December 20, 2005). , p. 81

<sup>^</sup> Illustra Media. WIRED Magazine response [archived 2008-12-20; cited 2007-07-13]. "It's also important that you read a well developed rebuttal to Wired's misleading accusations. Links to both the article and a response by the Discovery Institute (our partners in the production of *Unlocking the Mystery of Life and The Privileged Planet*)"

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<sup>^</sup> "Science and Policy: Intelligent Design and Peer Review". American Association for the Advancement of Science. 2007. [http://www.aaas.org/spp/dser/03\\_Areas/evolution/issues/peerreview.shtml](http://www.aaas.org/spp/dser/03_Areas/evolution/issues/peerreview.shtml). Retrieved 2012-06-16.

<sup>^</sup> Stephen C. Meyer and Paul A. Nelson (May 1, 1996). "CSC <sup>^</sup> Getting Rid of the Unfair Rules, A book review, *Origins & Design*". <http://www.discovery.org/scripts/viewDB/index.php?command=view&id=1685>. Retrieved 2007-05-20.

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<sup>^</sup> Nature Methods Editorial. An intelligently designed response. *Nat. Methods*. 2007;4(12):983. doi:10.1038/nmeth1207-983.

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<sup>^</sup> a b John H. McDonald's "reducibly complex mousetrap"

<sup>^</sup> a b *Kitzmiller v. Dover Area School District*, 04 cv 2688 (December 20, 2005). , p. 64.

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^ a b Kitzmiller v. Dover Area School District, 04 cv 2688 (December 20, 2005). , pp. 31â ^33.

^ Discovery Institute. Media Backgrounder: Intelligent Design Article Sparks Controversy; September 7, 2004.

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List of scientific societies rejecting intelligent design

Kitzmiller v. Dover page 83

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The AAAS, the largest association of scientists in the U.S., has 120,000 members, and firmly rejects ID

70,000 Australian scientists and educators call on schools not to teach intelligent design in school science classes. [3]

List of statements from scientific professional organizations on the status intelligent design and other forms of creationism in the sciences.[4]

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[edit] Further reading

ID perspectives  
Non-ID perspectives  
Media articles

The Bal des Ardents (Ball of the Burning Men[1]) or Bal des Sauvages[2] was a masquerade ball[note 1] held on 28Â January 1393 in Paris at which Charles VI of France performed in a dance with five members of the French nobility. Four of the dancers were killed in a fire caused by a torch brought in by a spectator, Charles' brother Louis, Duke of OrlÃ©ans. Charles and another of the dancers survived. The ball was one of a number of events intended to entertain the young king, who in the previous summer had suffered an attack of insanity. The event undermined confidence in Charles' capacity to rule; Parisians considered it proof of courtly decadence and threatened to rebel against the more powerful members of the nobility. The public's outrage forced the king and his brother OrlÃ©ans, whom a contemporary chronicler accused of attempted regicide and sorcery, into offering penance for the event.

Charles' wife Queen Isabeau held the ball to honor the remarriage of a lady-in-waiting. Scholars believe it may have been a traditional charivari, with the dancers disguised as wild men, mythical beings often associated with demonology, that were commonly represented in medieval Europe and documented in revels of Tudor England. The event was chronicled by contemporary writers such as the Monk of St Denis and Jean Froissart, and illustrated in a number of 15th-century illuminated manuscripts by painters such as the Master of Anthony of Burgundy.

[edit] Background

In 1380, after the death of his father Charles V of France, the 12-year-old Charles VI was crowned king, beginning his minority with his four uncles acting as regents.[note 2][3] Within two years one of them, Philip of Burgundy, described by historian Robert Knecht as "one of the most powerful princes in Europe",[4] became sole regent to the young king after Louis of Anjou pillaged the royal treasury and departed to campaign in Italy; Charles' other two uncles, John of Berry and Louis of Bourbon, showed little interest in governing.[3] In 1387, the 20-year-old Charles assumed sole control of the monarchy and immediately dismissed his uncles and reinstated the Marmousets, his father's traditional councilors. Unlike his uncles, the Marmousets wanted peace with England, less taxation, and a strong, responsible central governmentâpolicies that resulted in a negotiated three-year truce with England and the Duke of Berry being stripped of his post as governor of Languedoc because of his excessive taxation.[5]

In 1392 Charles suffered the first in a lifelong series of attacks of insanity, manifested by an "insatiable fury" at the attempted assassination of the Constable of France and leader of the Marmousets, Olivier de Clissonâcarried out by Pierre de Craon but orchestrated by John V, Duke of Brittany. Convinced that the attempt on Clisson's life was also an act of violence against himself and the monarchy, Charles quickly planned a retaliatory invasion of Brittany with the approval of the Marmousets, and within months departed Paris with a force of knights.[5][6]

On a hot August day outside Le Mans, accompanying his forces on the way to Brittany, without warning Charles drew his weapons and charged his own household knights including his brother Louis I, Duke of OrlÃ©ansâwith whom he had a close relationshipâcrying "Forward against the traitors! They wish to deliver me to the enemy!"[7] He killed four men[8] before his chamberlain grabbed him by the waist and subdued him, after which he fell into a coma that lasted for four days. Few believed he would recover; his uncles, the dukes of Burgundy and Berry, took advantage of the king's illness and quickly seized power, re-established themselves as regents, and dissolved the Marmouset council.[6]

The comatose king was returned to Le Mans, where Guillaume de Harsignyâa

venerated and well-educated 92-year-old physicianâ ~was summoned to treat him. After Charles regained consciousness, and his fever subsided, he was returned to Paris by Harsigny, moving slowly from castle to castle, with periods of rest in between. Late in September Charles was well enough to make a pilgrimage of thanks to Notre Dame de Liesse near Laon after which he returned again to Paris.[6]

The king's sudden onset of insanity was seen by some as a sign of divine anger and punishment and by others as the result of sorcery;[6] modern historians such as Knecht speculate that Charles may have been experiencing the onset of paranoid schizophrenia.[5] Charles continued to be mentally fragile, believing he was made of glass, and according to historian Desmond Seward, running "howling like a wolf down the corridors of the royal palaces".[9] Contemporary chronicler Jean Froissart wrote that the king's illness was so severe that he was "far out of the way; no medicine could help him".[9] During the worst of his illness Charles was unable to recognize his wife Queen Isabeau, demanding her removal when she entered his chamber, but after his recovery Charles made arrangements for her to hold guardianship of their children. She eventually became guardian to her sonâ ~the future Charles VII of Franceâ ~the Dauphin (b. 1397), granting her great political power and ensuring a place on the council of regents in event of a relapse.[10]

In *A Distant Mirror: The Calamitous 14th Century* the historian Barbara Tuchman writes that the physician Harsigny, refusing "all pleas and offers of riches to remain", [11] left Paris and ordered the courtiers to shield the king from the duties of government and leadership. He told the king's advisors to "be careful not to worry or irritate himâ .... Burden him with work as little as you can; pleasure and forgetfulness will be better for him than anything else." [1] To surround Charles with a festive atmosphere and to protect him from the rigor of governing, the court turned to elaborate amusements and extravagant fashions. Isabeau and her sister-in-law Valentina Visconti, Duchess of OrlÃ©ans, wore jewel-laden dresses and elaborate braided hairstyles coiled into tall shells and covered with wide double hennins that reportedly required doorways to be widened to accommodate them.[1]

The common people thought the extravagances excessive yet loved their young king, whom they called Charles le bien-aimÃ© (the well-beloved). Blame for unnecessary excess and expense was directed at the foreign queen, who was brought from Bavaria at the request of Charles' uncles.[1] Neither Isabeau nor her sister-in-law Valentinaâ ~daughter of the ruthless Duke of Milanâ ~were well liked by either the court or the people.[8] Froissart wrote in his *Chronicles* that Charles' uncles were content to allow the frivolities because "so long as the Queen and the Duc d'OrlÃ©ans danced, they were not dangerous or even annoying".[12]

[edit] Bal des Ardents and aftermath

On 28Â January 1393, Isabeau held a masquerade at the HÃtel Saint-Pol to celebrate the third marriage of her lady-in-waiting, Catherine de Fastaverin.[2][note 3] Tuchman explains that a widow's remarriage was traditionally an occasion for mockery and tomfoolery, often celebrated with masquerades or charivari characterized by "all sorts of licence, disguises, disorders, and loud blaring of discordant music and clanging of cymbals".[13] On the suggestion of Huguet de Guisay, whom Tuchman describes as well known for his "outrageous schemes" and cruelty, six high-ranking knights performed a dance in costume as wood savages. The costumes, which were sewn onto the men, were made of linen soaked with resin to which flax was attached "so that they appeared shaggy and hairy from head to foot".[1] Masks made of the same materials covered the dancers' faces and hid their identities from the audience. Some chronicles report that the dancers were bound together by chains. Most of the audience were unaware that Charles was among the dancers. Strict orders forbade the lighting of hall torches and prohibited anyone from entering the hall with a torch during the performance, to minimize the risk of the highly flammable costumes catching fire.[1]

According to historian Jan Veenstra the men capered and howled "like wolves",

spat obscenities and invited the audience to guess their identities while dancing in a "diabolical" frenzy.[14] Charles' brother Orléans arrived with Phillipe de Bar, late and drunk, and they entered the hall carrying lit torches. Accounts vary, but Orléans may have held his torch above a dancer's mask to reveal his identity when a spark fell, setting fire to the dancer's leg.[1] In the 17th century, William Prynne wrote of the incident that "the Duke of Orleance ... put one of the Torchés his servants held so neere the flax, that he set one of the Coates on fire, and so each of them set fire on to the other, and so they were all in a bright flame",[15] whereas a contemporary chronicle stated that he "threw" the torch at one of the dancers.[2]

Isabeau, knowing that her husband was one of the dancers, fainted when the men caught fire. Charles, however, was standing at a distance from the other dancers, near his 15-year-old aunt Joan, Duchess of Berry, who swiftly threw her voluminous skirt over him to protect him from the sparks.[1] Sources disagree as to whether the duchess moved into the dance and drew the king aside to speak to him, or whether the king moved away toward the audience. Froissart wrote that "The King, who proceeded ahead of [the dancers], departed from his companions ... and went to the ladies to show himself to them ... and so passed by the Queen and came near the Duchess of Berry".[16][17]

The scene soon descended into chaos; the dancers shrieked in pain as they burned in their costumes, and the audience, many of them also sustaining burns, screamed as they tried to rescue the burning men.[1] The event was chronicled in uncharacteristic vividness by the Monk of St Denis, who wrote that "four men were burned alive, their flaming genitals dropping to the floor ... releasing a stream of blood".[14] Only two dancers survived: the king, thanks to the quick reactions of the Duchess of Berry, and the Sieur de Nantouillet, who jumped into an open vat of wine and remained there until the flames were extinguished. The Count de Joigny died at the scene; Yvain de Foix and Aimery Poitiers, son of the Count of Valentinois, lingered with painful burns for two days. The instigator of the affair, Huguet de Guisay, survived a day longer, described by Tuchman as bitterly "cursing and insulting his fellow dancers, the dead and the living, until his last hour".[1]

The citizens of Paris, angered by the event and at the danger posed to their monarch, blamed Charles' advisors. A "great commotion" swept through the city as the populace threatened to depose Charles' uncles and kill dissolute and depraved courtiers. Greatly concerned at the popular outcry and worried about a repeat of the Maillotin revolt of the previous decade when Parisians armed with mallets turned against tax collectors Charles' uncles persuaded the court to do penance at Notre Dame Cathedral, preceded by an apologetic royal progress through the city in which the king rode on horseback with his uncles walking in humility. Orléans, who was blamed for the tragedy, donated funds in atonement for a chapel to be built at the Celestine monastery.[1][18]

Froissart's chronicle of the event places blame directly on Charles' brother, Orléans. He wrote: "And thus the feast and marriage celebrations ended with such great sorrow ... [Charles] and [Isabeau] could do nothing to remedy it. We must accept that it was no fault of theirs but of the duke of Orléans." [19] Orléans' reputation was severely damaged by the event, compounded by an episode a few years earlier in which he was accused of sorcery after hiring an apostate monk to imbue a ring, dagger and sword with demonic magic. The theologian Jean Petit would later testify that Orléans practiced sorcery, and that the fire at the dance represented a failed attempt at regicide made in retaliation for Charles' attack the previous summer.[20]

The Bal des Ardents added to the impression of a court steeped in extravagance, with a king in delicate health and unable to rule. Charles' attacks of illness increased in frequency such that by the end of the 1390s his role was merely ceremonial. By the early 15th century he was neglected and often forgotten, a lack of leadership that contributed to the decline and fragmentation of the Valois dynasty.[21] In 1407, Philip the Bold's son, John the Fearless, had his cousin Orléans assassinated because of "vice, corruption, sorcery, and a long list of public and private villainies"; at the same time



Isabeau was accused of having been the mistress of her husband's brother.[22] Orlean's assassination pushed the country into a civil war between the Burgundians and the Orleanists (known as the Armagnacs), which lasted for several decades. The vacuum created by the lack of central power and the general irresponsibility of the French court resulted in it gaining a reputation for lax morals and decadence that endured for more than 200 years.[23] The lover and favourite of Queen Isabeau, Louis de Bois-Bourdon, gave a deposition during his trial at which he told the court of how the Queen had confided in him before the event that she had conspired with her brother-in-law (the king's brother) to set fire to the king. Bois-Bourdon was drowned on the orders of Charles VI in 1417. Though Bois-Bourdon left a legitimate child, a daughter named Anna born in 1415 and married to Henri David, it is also possible that Charles VII is Bois-Bourdon's illegitimate son.[24]

[edit] Folkloric and Christian representations of wild men

Veenstra writes in *Magic and Divination at the Courts of Burgundy and France* that the *Bal des Ardents* reveals the tension between Christian beliefs and the latent paganism that existed in 14th-century society. According to him, the event "laid bare a great cultural struggle with the past but also became an ominous foreshadowing of the future." [14]

Wild men or savagesâ ~usually depicted carrying a staff or club, living beyond the bounds of civilization without shelter or fire, lacking feelings and a soulâ ~were then a metaphor for man without God.[25] Common superstition held that long-haired wild men, known as lutins, who danced to firelight either to conjure demons or as part of fertility rituals, lived in mountainous areas such as the Pyrenees. In some village charivaris at harvest or planting time dancers dressed as wild men, to represent demons, were ceremonially captured and then an effigy of them was symbolically burnt to appease evil spirits. The Church, however, considered these rituals pagan and demonic.[26][note 4]

Veenstra explains that it was believed that by dressing as wild men, villagers ritualistically "conjured demons by imitating them"â ~although at that period penitentials forbade a belief in wild men or an imitation of them, such as the costumed dance at Isabeau's event. In folkloric rituals the, "burning did not happen literally but in effigie", he writes, "contrary to the *Bal des Ardents* where the seasonal fertility rite had watered down to courtly entertainment, but where burning had been promoted to a dreadful reality." A 15th-century chronicle describes the *Bal des Ardents* as *una corea procurance demone* ("a dance to ward off the devil").[27]

Because remarriage was often thought to be a sacrilegeâ ~common belief was that the sacrament of marriage extended beyond deathâ ~it was censured by the community. Thus the purpose of the *Bal des Ardents* was twofold: to entertain the court and to humiliate and rebuke Isabeau's lady-in-waitingâ ~in an inherently pagan manner, which the Monk of St Denis seemed to dislike.[26] A ritual burning on the wedding night of a woman who was remarrying had Christian origins as well, according to Veenstra. The *Book of Tobit* partly concerns a woman who had seven husbands murdered by the demon Asmodeus; she is eventually freed of the demon by the burning of the heart and liver of a fish.[26][28]

The event also may have served as a symbolic exorcism of Charles' mental illness at a time when magicians and sorcerers were commonly consulted by members of the court. In the early 15th century, ritual burning of evil, demonic, or Satanic forces was not uncommon as shown by the Duke of Orleans' later persecution of the king's physician Jehan de Bar, who was burned to death after confessing, under torture, to practicing sorcery.[26]

[edit] Chronicles

The death of four members of the nobility was sufficiently important to ensure that the event was recorded in contemporary chronicles, most notably by Froissart and the Monk of St Denis, and subsequently illustrated in a number of copies of illuminated manuscripts. While the two main chroniclers agree on essential points of the eveningâ ~the dancers were dressed as wild men, the king survived, one man fell into a vat, and four of the dancers diedâ ~there are

discrepancies in the details. Froissart wrote that the dancers were chained together, which is not mentioned in the Monk's account. Furthermore, the two chroniclers are at odds regarding the purpose of the dance. According to the historian Susan Crane, the Monk describes the event as a wild charivari with the audience participating in the dance, whereas Froissart's description suggests a theatrical performance without audience participation.[29]

Froissart wrote about the event in Book IV of his Chronicles (covering the years 1389 to 1440), an account described by scholar Katerina Nara as full of "a sense of pessimism", as Froissart "did not approve of all he recorded".[30] Froissart blamed Orleanians for the tragedy,[31] and the Monk blamed the instigator, de Guisay, whose reputation for treating low-born servants like animals earned him such universal hatred that "the Nobles rejoiced at his agonizing death".[32]

The Monk wrote of the event in the *Histoire de Charles VI* (History of Charles VI), covering about 25 years of the king's reign.[33] He seemed to disapprove[<sup>note 5</sup>] on the grounds that the event broke social mores and the king's conduct was unbecoming, whereas Froissart described it as a celebratory event.[29]

Scholars are unsure whether either chronicler was present that evening. According to Crane, Froissart wrote of the event about five years later, and the Monk about ten. Veenstra speculates that the Monk may have been an eyewitness (as he was for much of Charles VI's reign) and that his account is the more accurate of the two.[29][35] The Monk's chronicle is generally accepted as essential for understanding the king's court, however his neutrality may have been affected by his pro-Burgundian and anti-Orleanist stance, causing him to depict the royal couple in a negative manner.[36] A third account was written in the mid-15th century by Jean Juvenal des Ursins in his biography of Charles, *L'Histoire de Charles VI: roy de France*, not published until 1614.[37]

The Froissart manuscript dating from between 1470 and 1472 from the Harleian Collection held at the British Library includes a miniature depicting the event, titled "Dance of the Wodewoses", attributed to an unknown painter referred to as the Master of the Harley Froissart.[34] A slightly later edition of Froissart's Chronicles, dated to around 1480, contains a miniature of the event, "Fire at a Masked Dance", also attributed to an unidentified early Netherlandish painter known as the Master of the Getty Froissart.[38] The 15th-century Gruuthuse manuscript of Froissart's Chronicles, held at the Bibliothèque nationale de France, has a miniature of the event.[39] Another edition of Froissart's Chronicles published in Paris around 1508 may have been made expressly for Maria of Cleves. The edition has 25 miniatures in the margins; the single full-page illustration is of the *Bal des Ardents*.<sup>[40]</sup>

[edit] See also

"Hop-Frog", an Edgar Allan Poe short story that may have been inspired by the *Bal des Ardents*.

[edit] Notes and references

<sup>^</sup> Sources vary whether the event was a masquerade or a masque.

<sup>^</sup> Three uncles were brothers to Charles V: Louis of Anjou, Philip of Burgundy (commonly known as Philip the Bold), and John of Berry. Louis of Bourbon married Charles V's sister. See Tuchman (1978), 367

<sup>^</sup> The Monk of St Denis claimed the woman was widowed three times, making it her fourth marriage. See Veenstra, 90

<sup>^</sup> Early medieval folk festivals in Germany and Switzerland included a ritual called the "Expulsion of Death", often performed on the fourth Sunday in Lent, also known as *Todten-Sonntag* ("Sunday of the Dead"). An effigy was "killed" by burning, with the fragments scattered on fields as a fertility ritual. As early as the 8th century in Saxony and Thuringen in Germany a ritual was performed in which a *pfungstlâ* ~a leaf- and moss-clad villager representing a wild man~ was ceremonially hunted and killed. Chambers (1996 ed.), 183~185

<sup>^</sup> The Monk described the event as "contrary to all decency". See Tuchman

(1978), 504

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^ a b c d e f g h i j k Tuchman (1979), 503â ^505  
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^ a b Tuchman (1978), 367  
^ qtd. in Knecht (2007), 42  
^ a b c Knecht (2007), 42â ^47  
^ a b c d Tuchman (1978), 496â ^499  
^ qtd. in Tuchman (1978), 498  
^ a b Henneman (1996), 173â ^175  
^ a b qtd. in Seward (1987), Chapter 5, np  
^ Gibbons (1996), 57â ^59  
^ qtd. in Tuchman (1978), 502  
^ qtd. in Tuchman (1978), 503  
^ Tuchman (1978), 503  
^ a b c Veenstra (1997), 91  
^ qtd. in MacKay (2011), 167  
^ Stock (2004) 159â ^160  
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^ Veenstra (1997), 60, 91, 95  
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^ Tuchman (1978), 516, 537â ^538  
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^ a b c d Veenstra (1997), 92â ^94  
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^ Veenstra (1997), 67  
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The Ediacara (pron.: /Ë iËdiË Ã|kÉ rÉ /; formerly Vendian) biota consisted of enigmatic tubular and frond-shaped, mostly sessile organisms which lived during the Ediacaran Period (ca. 635â ^542 Ma). Trace fossils of these organisms have been found worldwide, and represent the earliest known complex multicellular organisms.[note 1] The Ediacara biota radiated in an event called the Avalon Explosion, 575 million years ago,[1][2] after the Earth had thawed from the Cryogenian period's extensive glaciation. The biota largely disappeared contemporaneously with the rapid appearance of biodiversity known as the Cambrian explosion. Most of the currently existing body plans of animals first appeared only in the fossil record of the Cambrian rather than the Ediacaran. For macroorganisms, the Cambrian biota completely replaced the organisms that populated the Ediacaran fossil record.

The organisms of the Ediacaran Period first appeared around 600 million years ago and flourished until the cusp of the Cambrian 542 million years ago when the characteristic communities of fossils vanished. The earliest reasonably diverse Ediacaran community was discovered in 1995 in Sonora, Mexico, and is approximately 600 million years in age, pre-dating the Gaskiers glaciation about 580 million years ago.[3][4] While rare fossils that may represent survivors have been found as late as the Middle Cambrian (510 to 500Â million years ago) the earlier fossil communities disappear from the record at the end of the Ediacaran leaving only curious fragments of once-thriving ecosystems.[5] Multiple hypotheses exist to explain the disappearance of this biota, including preservation bias, a changing environment, the advent of predators and competition from other life-forms.

Determining where Ediacaran organisms fit in the tree of life has proven challenging; it is not even established that they were animals, with suggestions that they were lichens (fungus-alga symbionts), algae, protists known as foraminifera, fungi or microbial colonies, to hypothetical intermediates between plants and animals. The morphology and habit of some taxa (e.g. *Funisia dorothea*) suggest relationships to Porifera or Cnidaria.[6] *Kimberella* may show a similarity to molluscs, and other organisms have been thought to possess bilateral symmetry, although this is controversial. Most macroscopic fossils are morphologically distinct from later life-forms: they resemble discs, tubes, mud-filled bags or quilted mattresses. Due to the difficulty of deducing evolutionary relationships among these organisms some paleontologists have suggested that these represent completely extinct lineages that do not resemble any living organism. One paleontologist proposed a separate kingdom level category Vendozoa (now renamed Vendobionta)[7] in the Linnaean hierarchy for the Ediacaran biota. If these enigmatic organisms left no descendants their strange forms might be seen as a "failed experiment" in multicellular life with later multicellular life independently evolving from unrelated single-celled organisms.[8]

#### The Ediacara biota in context

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First Ediacaran megafossil

Axis scale: millions of years ago.

References: Waggoner 1998,[9] Hofmann 1990[10]

[edit] History

The first Ediacaran fossils discovered were the disc-shaped *Aspidella terranovica* in 1868. Their discoverer, Scottish geological surveyor Alexander Murray, found them useful aids for correlating the age of rocks around Newfoundland.[11] However since they lay below the "Primordial Strata", the Cambrian strata that were then thought to contain the very first signs of life, it took four years for anybody to dare propose they could be fossils. Elkanah Billings' proposal was dismissed by his peers on account of their simple form and they were instead declared gas escape structures, inorganic concretions, or even tricks played by a malicious God to promote unbelief.[11] No similar structures elsewhere in the world were then known and the one-sided debate soon fell into obscurity.[11] In 1933, Georg G  rich discovered specimens in Namibia[12] but the firm belief that life originated in the Cambrian led to them being assigned to the Cambrian Period and no link to *Aspidella* was made. In 1946 Reg Sprigg noticed "jellyfishes" in the Ediacara Hills of Australia's Flinders Ranges[13] but these rocks were believed to be Early Cambrian so, while the discovery sparked some interest, little serious attention was garnered.

It was not until the British discovery of the iconic *Charnia* in 1957 that the pre-Cambrian was seriously considered as containing life. This frond-shaped fossil was found in England's Charnwood Forest,[14] and due to the detailed geological mapping of the British Geological Survey there was no doubt that these fossils sat in Precambrian rocks. Pal  ontologist Martin Glaessner finally, in 1959, made the connection between this and the earlier finds[15][16] and with a combination of improved dating of existing specimens and an injection of vigour into the search many more instances were recognised.[17]

All specimens discovered until 1967 were in coarse-grained sandstone that prevented preservation of fine details, making interpretation difficult. S.B. Misra's discovery of fossiliferous ash-beds at the Mistaken Point assemblage in Newfoundland changed all this as the delicate detail preserved by the fine ash allowed the description of features that were previously undiscernible.[18][19]

Poor communication, combined with the difficulty in correlating globally distinct formations, led to a plethora of different names for the biota. In 1960 the French name "Ediacarien"      after the Ediacaran Hills in South Australia, which take their name from aborigine Idiyakra, "water is present"      was added to the competing terms "Sinian" and "Vendian"[20] for terminal-Precambrian rocks, and these names were also applied to the life-forms. "Ediacaran" and "Ediacarian" were subsequently applied to the epoch or period of geological time and its corresponding rocks. In March 2004, the International Union of Geological Sciences ended the inconsistency by formally naming the terminal period of the Neoproterozoic after the Australian locality.[21]

[edit] Preservation

The majority of the fossil record consists of the robust matter of decayed corpses.[citation needed] The Ediacaran biota had soft bodies and no skeletons,

making their abundant preservation surprising. The absence of burrowing creatures living in the sediments undoubtedly helped.[22] After the evolution of these organisms in the Cambrian, soft-bodied impressions were usually disturbed before they could fossilize.[citation needed]

[edit] Microbial mats

Microbial mats are areas of sediment stabilised by the presence of colonies of microbes which secrete sticky fluids or otherwise bind the sediment particles. They appear to migrate upwards when covered by a thin layer of sediment but this is an illusion caused by the colony's growth; individuals do not, themselves, move. If too thick a layer of sediment is deposited before they can grow or reproduce through it parts of the colony will die leaving behind fossils with a characteristically wrinkled ("elephant skin") and tubercular texture.[23]

Some Ediacaran strata with the texture characteristics of microbial mats contain fossils, and Ediacaran fossils are almost always found in beds that contain these microbial mats. Although microbial mats were once widespread, the evolution of grazing organisms in the Cambrian vastly reduced their numbers.[24] These communities are now limited to inhospitable refugia where predators cannot survive long enough to eat them, such as the stromatolites found in Hamelin Pool Marine Nature Reserve in Shark Bay, Western Australia where the salt levels can be as high as 1.5 or 2 times the normal level of the surrounding sea.[citation needed]

[edit] Fossilisation

The preservation of these fossils is one of their great fascinations to science. As soft-bodied organisms they would normally not fossilise and, unlike later soft-bodied fossil biota such as the Burgess Shale or Solnhofen Limestone, the Ediacara biota is not found in a restricted environment subject to unusual local conditions: they were a global phenomenon. The processes that were operating must have been systemic and worldwide. There was something very different about the Ediacaran Period that permitted these delicate creatures to be left behind and it is thought that the fossils were preserved by virtue of rapid covering by ash or sand, trapping them against the mud or microbial mats on which they lived.[25] Ash beds provide more detail and can readily be precisely dated to the nearest million years or better by means of radiometric dating.[26] However it is more common to find Ediacaran fossils under sandy beds deposited by storms or high-energy bottom-scraping ocean currents known as turbidites.[25] Soft-bodied organisms today almost never fossilise during such events but the presence of widespread microbial mats probably aided preservation by stabilising their impressions in the sediment below.[27]

[edit] Scale of preservation

The rate of cementation of the overlying substrate relative to the rate of decomposition of the organism determines whether the top or bottom surface of an organism is preserved. Most disc-shaped fossils decomposed before the overlying sediment was cemented, the ash or sand then slumped in to fill the void, leaving a cast of the underside of the organism.

Conversely, quilted fossils tended to decompose after the cementation of the overlying sediment; hence their upper surfaces are preserved. Their more resistant nature is reflected in the fact that in rare occasions quilted fossils are found within storm beds as the high-energy sedimentation did not destroy them as it would have the less-resistant discs. Further, in some cases, the bacterial precipitation of minerals formed a "death mask" creating a mould of the organism.[28]

[edit] Morphology

The Ediacaran biota exhibited a vast range of morphological characteristics. Size ranged from millimetres to metres; complexity from "blob-like" to intricate; rigidity from sturdy and resistant to jelly-soft. Almost all forms of symmetry were present.[25] These organisms differed from earlier fossils by displaying an organised, differentiated multicellular construction and centimetre-plus sizes.

These disparate morphologies can be broadly grouped into form taxa:

## "Embryos"

Recent discoveries of Precambrian multicellular life have been dominated by reports of embryos, particularly from the Doushantuo Formation in China. Some finds[29] generated intense media excitement[30] though some have claimed they are instead inorganic structures formed by the precipitation of minerals on the inside of a hole.[31] Other "embryos" have been interpreted as the remains of the giant sulfur-reducing bacteria akin to *Thiomargarita*,[32] a view which is highly contested yet gradually gaining supporters.[33][34] Microfossils dating from 632.5 million years ago<sup>^</sup> just 3<sup>^</sup> million years after the end of the Cryogenian glaciations<sup>^</sup> may represent embryonic 'resting stages' in the life cycle of the earliest known animals.[35] An alternative proposal is that these structures represent adult stages of the multicellular organisms of this period.[36]

## Discs

Circular fossils, such as *Ediacaria*, *Cyclomedusa* and *Rugoconites* led to the initial identification of *Ediacaran* fossils as cnidaria which include jellyfish and corals.[13] Further examination has provided alternative interpretations of all disc-shaped fossils: not one is now confidently recognised as a jellyfish. Alternate explanations include holdfasts and protists;[37] the patterns displayed where two meet have led to many 'individuals' being identified as microbial colonies,[38][39] and yet others may represent scratch marks formed as stalked organisms spun around their holdfasts.[40] Useful diagnostic characters are often lacking because only the underside of the organism is preserved by fossilization.

## Bags

Fossils such as *Pteridinium* preserved within sediment layers resemble "mud-filled bags". The scientific community is a long way from reaching a consensus on their interpretation.[41]

## Toroids

The fossil *Vendoglossa tuberculata* from the Nama Group, Namibia, has been interpreted as a dorso-ventrally compressed stem-group metazoan, with a large gut cavity and a transversely ridged ectoderm. The organism is in the shape of a flattened torus, with the long axis of its toroidal body running through the approximate center of the presumed gut cavity.[42]

## Quilted organisms

The organisms considered in Seilacher's revised definition of the *Vendobionta*[7] share a "quilted" appearance and resembled an inflatable mattress. Sometimes these quilts would be torn or ruptured prior to preservation: such damaged specimens provide valuable clues in the reconstruction process. For example the three (or more) petaloid fronds of *Swartpuntia germsi* could only be recognised in a posthumously damaged specimen<sup>^</sup> usually multiple fronds were hidden as burial squashed the organisms flat.[43]

These organisms appear to form two groups: the fractal rangeomorphs and the simpler erniettomorphs.[44] Including such fossils as the iconic *Charnia* and *Swartpuntia*, the group is both the most iconic of the *Ediacaran* biota and the most difficult to place within the existing tree of life. Lacking any mouth, gut, reproductive organs, or indeed any evidence of internal anatomy, their lifestyle was somewhat peculiar by modern standards; the most widely accepted hypothesis holds that they sucked nutrients out of the surrounding seawater by osmotrophy [45] or osmosis.[46]

## Non-Ediacaran Ediacarans

Some *Ediacaran* organisms have more complex details preserved which has allowed them to be interpreted as possible early forms of living phyla excluding them from some definitions of the *Ediacaran* biota.

The earliest such fossil is the reputed bilaterian *Vernanimalcula* claimed by some, however, to represent the infilling of an egg-sac or acritarch.[31][47] Later examples are almost universally accepted as bilaterians and include the mollusc-like *Kimberella*,[48] *Spriggina* (pictured)[49] and the shield-shaped *Parvancorina*[50] whose affinities are currently debated.[51]

A suite of fossils known as the Small shelly fossils are represented in the



Ediacaran, most famously by Cloudina[52] a shelly tube-like fossil that often shows evidence of predatory boring, suggesting that whilst predation may not have been common in the Ediacaran Period it was at least present. Representatives of modern taxa existed in the Ediacaran, some of which are recognisable today. Sponges, red and green algae, protists and bacteria are all easily recognisable with some pre-dating the Ediacaran by thousands of millions of years. Possible arthropods have also been described.[53]

#### Trace fossils

With the exception of some very simple vertical burrows[54](p186)[55] the only Ediacaran burrows are horizontal, lying on or just below the surface. Such burrows have been taken to imply the presence of motile organisms with heads which would probably have had a bilateral symmetry. This could place them in the bilateral clade of animals[54] but they could also have been made by simpler organisms feeding as they slowly rolled along the sea floor.[56] Putative "burrows" dating as far back as 1,100 million years may have been made by animals which fed on the undersides of microbial mats which would have shielded them from a chemically unpleasant ocean;[57] however their uneven width and tapering ends make a biological origin so difficult to defend[58] that even the original proponent no longer believes they are authentic.[59] The burrows observed imply simple behaviour, and the complex efficient feeding traces common from the start of the Cambrian are absent. Some Ediacaran fossils, especially discs, have been interpreted tentatively as trace fossils but this hypothesis has not gained widespread acceptance. As well as burrows, some trace fossils have been found directly associated with an Ediacaran fossil. Yorgia and Dickinsonia are often found at the end of long pathways of trace fossils matching their shape;[60] these fossils are thought to be associated with ciliary feeding but the precise method of formation of these disconnected and overlapping fossils largely remains a mystery.[61] The potential mollusc Kimberella is associated with scratch marks, perhaps formed by a radula.[62]

#### [edit] Classification and interpretation

Classification of the Ediacarans is difficult, and hence a variety of theories exist as to their placement on the tree of life.

#### [edit] Cnidarians

Since the most primitive eumetazoans are multi-cellular animals with tissues are cnidarians, the first attempt to categorise these fossils designated them as jellyfish and sea pens.[63] However, more recent discoveries have established that many of the circular forms formerly considered "cnidarian medusa" are actually holdfasts and sand-filled vesicles occurring at the base of the stem of upright frond-like Ediacarans. A notable example is the form known as Charniodiscus, a circular impression later found to be attached to the long 'stem' of a frond-like organism that now bears the name.[64][65]

The link between certain frond-like Ediacarans and sea pens has been thrown into doubt by multiple lines of evidence; chiefly the derived nature of the most frond-like pennatulacean octocorals, their absence from the fossil record before the Tertiary, and the apparent cohesion between segments in Ediacaran frond-like organisms.[66] Some researchers have suggested that an analysis of "growth poles" discredits the pennatulacean nature of Ediacaran fronds.[67][68]

#### [edit] The Dawn of Animal Life

Martin Glaessner proposed in The Dawn of Animal Life (1984) that the Ediacara biota were recognisable crown group members of modern phyla, but were unfamiliar because they had yet to evolve the characteristic features we use in modern classification.[69]

Adolf Seilacher responded by suggesting that the Ediacaran sees animals usurping giant protists as the dominant life form.[70] The modern xenophyophores are giant single-celled protozoans found throughout the world's oceans, largely on the abyssal plain. A recent genetic study suggested that the xenophyophores are a specialized group of Foraminifera. There are approximately 42 recognized species in 13 genera and 2 orders; one of which, Syringammina fragilissima, is among the largest known protozoans at up to 20 centimeters in

diameter.

In 1998 Mark McMenamin claimed that Ediacarans did not possess an embryonic stage, and thus could not be animals. He believed that they independently evolved a nervous system and brains, meaning that "the path toward intelligent life was embarked upon more than once on this planet", though this idea has not been widely accepted.[37]

[edit] New phylum

Seilacher most famously suggested that the Ediacaran organisms represented a unique and extinct grouping of related forms descended from a common ancestor (clade) and created the kingdom Vendozoa,[71][72] named after the now-obsolete Vendian era. He later excluded fossils identified as metazoans and relaunched the phylum "Vendobionta".

He described the Vendobionta as quilted cnidarians lacking stinging cells. This absence precludes the current cnidarian method of feeding, so Seilacher suggested that the organisms may have survived by symbiosis with photosynthetic or chemoautotrophic organisms.[73] Mark McMenamin saw such feeding strategies as characteristic for the entire biota, and referred to the marine biota of this period as a "Garden of Ediacara".[74]

[edit] Lichens

Gregory Retallack's hypothesis that Ediacaran organisms were lichens[75][76] is not widely accepted by the scientific community.[77][78] He argues that the fossils are not as squashed as known fossil jellyfish, and their relief is closer to compressed woody branches whose compaction can be estimated as compressed cylinders. He points out the chitinous walls of lichen colonies would provide a similar resistance to compaction, and claims the large size of the organisms (up to 1.5 metres long, far larger than any of the preserved burrows) also hints against classification with animals. Finally, Ediacaran fossils from classic localities of the Flinders Ranges have been found in growth position within red calcareous and gypsiferous paleosols, interpreted as soils of well drained temperate desert soils.[76][79] Such habitats limit interpretive options for fractal Ediacaran fossils such as Dickinsonia to lichenized or unlichenized fungi, but other Ediacaran fossils could have been slime molds or microbial colonies.

[edit] Other interpretations

Almost every possible phylum has been used to accommodate the Ediacaran biota at some point,[80] from algae,[81] to protists known as foraminifera,[82] to fungi[83] to bacterial or microbial colonies,[38] to hypothetical intermediates between plants and animals.[84]

[edit] Origin

It took almost 4 billion years from the formation of the Earth for the Ediacaran fossils to first appear, 655 million years ago. Whilst putative fossils are reported from 3,460 million years ago,[85][86] the first uncontroversial evidence for life is found 2,700 million years ago,[87] and cells with nuclei certainly existed by 1,200 million years ago:[88] The reason why it took so long for forms with an Ediacaran grade of organisation to appear is uncertain.

It could be that no special explanation is required: the slow process of evolution simply required 4 billion years to accumulate the necessary adaptations. Indeed, there does seem to be a slow increase in the maximum level of complexity seen over this time, with more and more complex forms of life evolving as time progresses, with traces of earlier semi-complex life such as Nimbia, found in the 610 million year old Twitya formation,[89] (and possibly older rocks dating to 770 million years ago[90]) possibly displaying the most complex morphology of the time.

The alternative train of thought is that it was simply not advantageous to be large until the appearance of the Ediacarans: the environment favoured the small over the large. Examples of such scenarios today include plankton, whose small size allows them to reproduce rapidly to take advantage of ephemerally abundant nutrients in algal blooms. But for large size never to be favourable, the environment would have to be very different indeed.

A primary size-limiting factor is the amount of atmospheric oxygen. Without a complex circulatory system, low concentrations of oxygen cannot reach the centre of an organism quickly enough to supply its metabolic demand.

On the early Earth, reactive elements such as iron and uranium existed in a reduced form, which would react with any free oxygen produced by photosynthesising organisms. Oxygen would not be able to build up in the atmosphere until all the iron had rusted (producing banded iron formations), and other reactive elements had also been oxidised. Donald Canfield detected records of the first significant quantities of atmospheric oxygen just before the first Ediacaran fossils appeared[91] and the presence of atmospheric oxygen was soon heralded as a possible trigger for the Ediacaran radiation.[92] Oxygen seems to have accumulated in two pulses; the rise of small, sessile (stationary) organisms seems to correlate with an early oxygenation event, with larger and mobile organisms appearing around the second pulse of oxygenation.[93] However, the assumptions underlying the reconstruction of atmospheric composition have attracted some criticism, with widespread anoxia having little effect on life where it occurs in the Early Cambrian and the Cretaceous.[94]

Periods of intense cold have also been suggested as a barrier to the evolution of multicellular life. The earliest known embryos, from China's Doushantuo Formation, appear just a million years after the Earth emerged from a global glaciation, suggesting that ice cover and cold oceans may have prevented the emergence of multicellular life.[95] Potentially, complex life may have evolved before these glaciations, and been wiped out. However, the diversity of life in modern Antarctica has sparked disagreement over whether cold temperatures increase or decrease the rate of evolution.

In early 2008 a team analysed the range of basic body structures ("disparity") of Ediacaran organisms from three different fossil beds: Avalon in Canada, 575 to 565 million years ago; White Sea in Russia, 560 to 550 million years ago; and Nama in Namibia, 550 to 542 million years ago, immediately before the start of the Cambrian. They found that, while the White Sea assemblage had the most species, there was no significant difference in disparity between the three groups, and concluded that before the beginning of the Avalon timespan these organisms must have gone through their own evolutionary "explosion", which may have been similar to the famous Cambrian explosion .[96]

[edit] Preservation bias

The paucity of Ediacaran fossils after Cambrian could simply be because conditions no longer favoured the fossilisation of Ediacaran organisms, which may have continued to thrive unpreserved.[23] However, if they were common, more than the occasional specimen[5][97] might be expected in exceptionally preserved fossil assemblages (Konservat-Lagerstätten) such as the Burgess Shale and Chengjiang.[98] However, Vendobionta remain locally common in paleosols throughout the Cambrian[99] and into the Ordovician,[100] and may always have been rare in marine environments.[76]

[edit] Predation and grazing

It is suggested that by the Early Cambrian, organisms higher in the food chain caused the microbial mats to largely disappear. If these grazers first appeared as the Ediacaran biota started to decline, then it may suggest that they destabilised the microbial substrate, leading to displacement or detachment of the biota; or that the destruction of the mat destabilised the ecosystem, causing extinctions.

Alternatively, skeletonised animals could have fed directly on the relatively undefended Ediacaran biota.[37] However, if the interpretation of the Ediacaran age *Kimberella* as a grazer is correct then this suggests that the biota had already had limited exposure to "predation".[48]

There is however little evidence for any trace fossils in the Ediacaran Period, which may speak against the active grazing theory. Further, the onset of the Cambrian Period is defined by the appearance of a worldwide trace fossil assemblage, quite distinct from the activity-barren Ediacaran Period.

[edit] Competition

It is possible that increased competition due to the evolution of key innovations amongst other groups, perhaps as a response to predation,[22] drove the Ediacaran biota from their niches. However, this argument has not successfully explained similar phenomena. For instance, the bivalve molluscs' "competitive exclusion" of brachiopods was eventually deemed to be a coincidental result of two unrelated trends.[101]

[edit] Change in environmental conditions

While it is difficult to infer the effect of changing planetary conditions on organisms, communities and ecosystems, great changes were happening at the end of the Precambrian and the start of the Early Cambrian. The breakup of the supercontinents,[102] rising sea levels (creating shallow, "life-friendly" seas),[103] a nutrient crisis,[104] fluctuations in atmospheric composition, including oxygen and carbon dioxide levels,[105] and changes in ocean chemistry[106] (promoting biomineralisation)[107] could all have played a part.

[edit] Assemblages

Ediacaran-type fossils are recognised globally in 25 localities[21] and a variety of depositional conditions, and are commonly grouped into three main types, named after typical localities. Each assemblage tends to occupy its own region of morphospace, and after an initial burst of diversification changes little for the rest of its existence.[108]

[edit] Avalon-type assemblage

The Avalon-type assemblage is defined at Mistaken Point in Canada, the oldest locality with a large quantity of Ediacaran fossils.[109] The assemblage is easily dated because it contains many fine ash-beds, which are a good source of zircons used in the uranium-lead method of radiometric dating. These fine-grained ash beds also preserve exquisite detail. Constituents of this biota appear to survive through until the extinction of all Ediacarans at the base of the Cambrian.[108]

The biota comprises deep sea dwelling rangeomorphs[110] such as *Charnia*, all of which share a fractal growth pattern. They were probably preserved in situ (without post-mortem transportation), although this point is not universally accepted. The assemblage, while less diverse than the Ediacara- or Nama-types, resembles Carboniferous suspension-feeding communities, which may suggest filter feeding[111]—by most interpretations, the assemblage is found in water too deep for photosynthesis. The low diversity may reflect the depth of water— which would restrict speciation opportunities— or it may just be too young for a rich biota to have evolved. Opinion is currently divided between these conflicting hypotheses.[112]

[edit] Ediacara-type assemblage

The Ediacara-type assemblage is named after Australia's Ediacara Hills, and consists of fossils preserved in facies of coastal lagoons and rivers. They are typically found in red gypsiferous and calcareous paleosols formed on loess and flood deposits in an arid cool temperate paleoclimate.[76] Most fossils are preserved as imprints in microbial earths,[113] but a few are preserved within sandy units.[112][108]

[edit] Nama-type assemblage

The Nama assemblage is best represented in Namibia. Three-dimensional preservation is most common, with organisms preserved in sandy beds containing internal bedding. Dima Grazhdankin believes that these organisms represent burrowing organisms,[41] while Guy Narbonne maintains they were surface dwellers.[114] These beds are sandwiched between units comprising interbedded sandstones, siltstones and shales— with microbial mats, where present, usually containing the fossils. The environment is interpreted as sand bars formed at the mouth of a delta's distributaries.[112]

[edit] Significance of assemblages

In the White Sea region of Russia, all three assemblage types have been found in close proximity. This, and the faunas' considerable temporal overlap, makes it unlikely that they represent evolutionary stages or temporally distinct communities. Since they are globally distributed— described on all continents except Antarctica— geographical boundaries do not appear to be a factor;[115]

the same fossils are found at all palaeolatitudes (the latitude where the fossil was created, accounting for continental drift) and in separate sedimentary basins.[112]

It is most likely that the three assemblages mark organisms adapted to survival in different environments, and that any apparent patterns in diversity or age are in fact an artefact of the few samples that have been discovered. The timeline (right) demonstrates the paucity of Ediacaran fossil-bearing assemblages. An analysis of one of the White Sea fossil beds, where the layers cycle from continental seabed to inter-tidal to estuarine and back again a few times, found that a specific set of Ediacaran organisms was associated with each environment.[112]

As the Ediacaran biota represent an early stage in multicellular life's history, it is unsurprising that not all possible modes of life are occupied. It has been estimated that of 92 potentially possible modes of life – combinations of feeding style, tiering and motility – no more than a dozen are occupied by the end of the Ediacaran. Just four are represented in the Avalon assemblage.[116] The lack of large-scale predation and vertical burrowing are perhaps the most significant factors limiting the ecological diversity; the emergence of these during the Early Cambrian allowed the number of lifestyles occupied to rise to 30.

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#### [edit] Further reading

Mark McMenamin (1998). *The Garden of Ediacara: Discovering the First Complex Life*. New York: Columbia University Press. pp.Â 368pp. ISBNÂ 0-231-10558-4. OCLCÂ 60159576 37588521 60159576. A popular science account of these fossils, with a particular focus on the Namibian fossils.

Derek Briggs & Peter Crowther (Editors) (2001). *Pal obiology II: A synthesis*. Malden, MA: Blackwell Science. pp.Â Chapter 1. ISBNÂ 0-632-05147-7. OCLCÂ 51682981 43945263 51682981. Excellent further reading for the keenâ â ^

includes many interesting chapters with macroevolutionary theme.

[edit] External links

An extrasolar planet, or exoplanet, is a planet outside the Solar System. A total of 862 such planets (in 678 planetary systems, including 129 multiple planetary systems) have been identified as of February 12, 2013.[5] The Kepler mission has detected over 18,000 additional candidates, including potentially 262 habitable ones.[6][7] In the Milky Way galaxy, it is expected that there are many billions of planets (at least one planet, on average, orbiting around each star, resulting in 100-400 billion exoplanets)[1][2][3][8], with many more free-floating planetary-mass bodies orbiting the galaxy directly.[9] The nearest known exoplanet is Alpha Centauri Bb. Almost all of the planets detected so far are within our home galaxy the Milky Way; however, there have been a small number of possible detections of extragalactic planets. Astronomers at the Harvard-Smithsonian Center for Astrophysics (CfA) reported in January 2013, that "at least 17 billion" Earth-sized exoplanets are estimated to reside in the Milky Way Galaxy.[10]

For centuries, many philosophers and scientists supposed that extrasolar planets existed, but there was no way of knowing how common they were or how similar they might be to the planets of the Solar System. Various detection claims, starting in the nineteenth century, were all eventually rejected by astronomers. The first confirmed detection came in 1992, with the discovery of several terrestrial-mass planets orbiting the pulsar PSR B1525-12.[11] The first confirmed detection of an exoplanet orbiting a main-sequence star was made in 1995, when a giant planet was found in a four-day orbit around the nearby star 51 Pegasi. Due to improved observational techniques, the rate of detections has increased rapidly since then.[5] Some exoplanets have been directly imaged by telescopes, but the vast majority have been detected through indirect methods such as radial velocity measurements.[5] Besides exoplanets, "exocomets", comets beyond our solar system, have also been detected and may be common in the Milky Way Galaxy.[10]

Most known exoplanets are giant planets believed to resemble Jupiter or Neptune, but this reflects a sampling bias, as massive planets are more easily observed.[12] Some relatively lightweight exoplanets, only a few times more massive than Earth (now known by the term Super-Earth), are known as well; statistical studies now indicate that they actually outnumber giant planets[13] while recent discoveries have included Earth-sized and smaller planets and a handful that appear to exhibit other Earth-like properties.[14][15][16] There also exist planetary-mass objects that orbit brown dwarfs and other bodies that "float free" in space not bound to any star; however, the term "planet" is not always applied to these objects.

The discovery of extrasolar planets, particularly those that orbit in the habitable zone where it is possible for liquid water to exist on the surface (and therefore also life), has intensified interest in the search for extraterrestrial life.[17] Thus, the search for extrasolar planets also includes the study of planetary habitability, which considers a wide range of factors in determining an extrasolar planet's suitability for hosting life.

On January 7, 2013, astronomers from the Kepler Mission space observatory announced the discovery of KOI-172.02, an Earth-like exoplanet candidate orbiting a star similar to our Sun in the habitable zone and possibly a "prime candidate to host alien life".[18]

[edit] History of detection

[edit] Early speculations

â

This space we declare to be infinite... In it are an infinity of worlds of the same kind as our own.

â "

â ~Giordano Bruno[19]

In the sixteenth century the Italian philosopher Giordano Bruno, an early supporter of the Copernican theory that the Earth and other planets orbit the

Sun (heliocentrism), put forward the view that the fixed stars are similar to the Sun and are likewise accompanied by planets. He was burned at the stake by the Roman Inquisition in 1600, though his views on astronomy were not the main reason for his condemnation.[20]

In the eighteenth century the same possibility was mentioned by Isaac Newton in the "General Scholium" that concludes his Principia. Making a comparison to the Sun's planets, he wrote "And if the fixed stars are the centers of similar systems, they will all be constructed according to a similar design and subject to the dominion of One." [21]

In the nineteenth century Bahá'í, the prophet-founder of the Bahá'í Faith, who spent much of his life in prison or exile for his teachings, stated "Every fixed star hath its own planets, and every planet its own creatures, whose number no man can compute." [22][1]

[edit] Discredited claims

Claims of exoplanet detections have been made since the nineteenth century. Some of the earliest involve the binary star 70 Ophiuchi. In 1855 Capt. W. S. Jacob at the East India Company's Madras Observatory reported that orbital anomalies made it "highly probable" that there was a "planetary body" in this system.[23] In the 1890s, Thomas J. J. See of the University of Chicago and the United States Naval Observatory stated that the orbital anomalies proved the existence of a dark body in the 70 Ophiuchi system with a 36-year period around one of the stars.[24] However, Forest Ray Moulton published a paper proving that a three-body system with those orbital parameters would be highly unstable.[25] During the 1950s and 1960s, Peter van de Kamp of Swarthmore College made another prominent series of detection claims, this time for planets orbiting Barnard's Star.[26] Astronomers now generally regard all the early reports of detection as erroneous.[27]

In 1991 Andrew Lyne, M. Bailes and S.L. Shemar claimed to have discovered a pulsar planet in orbit around PSR 1829-10, using pulsar timing variations.[28] The claim briefly received intense attention, but Lyne and his team soon retracted it.[29]

[edit] Confirmed discoveries

The first published discovery to receive subsequent confirmation was made in 1988 by the Canadian astronomers Bruce Campbell, G. A. H. Walker, and Stephenson Yang of University of Victoria and University of British Columbia.[30] Although they were cautious about claiming a planetary detection, their radial-velocity observations suggested that a planet orbits the star Gamma Cephei. Partly because the observations were at the very limits of instrumental capabilities at the time, astronomers remained skeptical for several years about this and other similar observations. It was thought some of the apparent planets might instead have been brown dwarfs, objects intermediate in mass between planets and stars. In 1990 additional observations were published that supported the existence of the planet orbiting Gamma Cephei,[31] but subsequent work in 1992 again raised serious doubts.[32] Finally, in 2003, improved techniques allowed the planet's existence to be confirmed.[33]

On 21 April 1992,[34] radio astronomers Aleksander Wolszczan and Dale Frail announced the discovery of two planets orbiting the pulsar PSR 1257+12.[11] This discovery was confirmed, and is generally considered to be the first definitive detection of exoplanets. These pulsar planets are believed to have formed from the unusual remnants of the supernova that produced the pulsar, in a second round of planet formation, or else to be the remaining rocky cores of gas giants that somehow survived the supernova and then decayed into their current orbits.

On 6 October 1995, Michel Mayor and Didier Queloz of the University of Geneva announced the first definitive detection of an exoplanet orbiting a main-sequence star, namely the nearby G-type star 51 Pegasi.[35] This discovery, made at the Observatoire de Haute-Provence, ushered in the modern era of exoplanetary discovery. Technological advances, most notably in high-resolution spectroscopy, led to the rapid detection of many new exoplanets: astronomers could detect exoplanets indirectly by measuring their

gravitational influence on the motion of their parent stars. More extrasolar planets were later detected by observing the variation in a star's apparent luminosity as an orbiting planet passed in front of it.

Initially, most known exoplanets were massive planets that orbited very close to their parent stars. Astronomers were surprised by these "hot Jupiters", since theories of planetary formation had indicated that giant planets should only form at large distances from stars. But eventually more planets of other sorts were found, and it is now clear that hot Jupiters are a minority of exoplanets. In 1999, Upsilon Andromedae became the first main-sequence star known to have multiple planets.[36] Other multiple planetary systems were found subsequently.

As of February 12, 2013, a total of 862 confirmed exoplanets are listed in the Extrasolar Planets Encyclopaedia, including a few that were confirmations of controversial claims from the late 1980s.[5] That count includes 678 planetary systems, of which 129 are multiple planetary systems. Kepler-16 contains the first discovered planet that orbits around a binary star system.[37]

As of February 2012, NASA's Kepler mission had identified 2,321 planetary candidates associated with 1,790 host stars, based on the first sixteen months of data from the space-based telescope.[38]

October 17, 2012 brought the announcement of the discovery of a planet, Alpha Centauri Bb, orbiting a star in the star system closest to Earth, Alpha Centauri. It is an Earth-size planet, but not in the habitable zone within which liquid water can exist.[39]

[edit] Detection methods

Planets are extremely faint compared to their parent stars. At visible wavelengths, they usually have less than a millionth of their parent star's brightness. It is difficult to detect such a faint light source, and furthermore the parent star causes a glare that tends to wash it out. It is necessary to block the light from the parent star in order to reduce the glare, while leaving the light from the planet detectable; doing so is a major technical challenge.[40]

All exoplanets that have been directly imaged are both large (more massive than Jupiter) and widely separated from their parent star. Most of them are also very hot, so that they emit intense infrared radiation; the images have then been made at infrared where the planet is brighter than it is at visible wavelengths.

Though direct imaging may become more important in the future, the vast majority of known extrasolar planets have only been detected through indirect methods. The following are the indirect methods that have proven useful:

As a planet orbits a star, the star also moves in its own small orbit around the system's center of mass. Variations in the star's radial velocity<sup>~</sup> that is, the speed with which it moves towards or away from Earth<sup>~</sup> can be detected from displacements in the star's spectral lines due to the Doppler effect. Extremely small radial-velocity variations can be observed, of 1 m/s or even somewhat less.[41] This has been by far the most productive method of discovering exoplanets. It has the advantage of being applicable to stars with a wide range of characteristics. One of its disadvantages is that it cannot determine a planet's true mass, but can only set a lower limit on that mass. However if the radial-velocity of the planet itself can be distinguished from the radial-velocity of the star then the true mass can be determined.[42]

If a planet crosses (or transits) in front of its parent star's disk, then the observed brightness of the star drops by a small amount. The amount by which the star dims depends on its size and on the size of the planet, among other factors. This has been the second most productive method of detection, though it suffers from a substantial rate of false positives and confirmation from another method is usually considered necessary. The transit method reveals the radius of a planet, and it has the benefit that it sometimes allows a planet's atmosphere to be investigated through spectroscopy.

When multiple planets are present, each one slightly perturbs the others'

orbits. Small variations in the times of transit for one planet can thus indicate the presence of another planet, which itself may or may not transit. For example, variations in the transits of the planet WASP-3b suggest the existence of a second planet in the system, the non-transiting WASP-3c.[43] If multiple transiting planets exist in one system, then this method can be used to confirm their existence.[44] In another form of the method, timing the eclipses in an eclipsing binary star can reveal an outer planet that orbits both stars; as of November 2011, five planets have been found in that way.

Microlensing occurs when the gravitational field of a star acts like a lens, magnifying the light of a distant background star. Planets orbiting the lensing star can cause detectable anomalies in the magnification as it varies over time. This method has resulted in only 13 detections as of June 2011, but it has the advantage of being especially sensitive to planets at large separations from their parent stars.

Astrometry consists of precisely measuring a star's position in the sky and observing the changes in that position over time. The motion of a star due to the gravitational influence of a planet may be observable. Because the motion is so small, however, this method has not yet been very productive. It has produced only a few disputed detections, though it has been successfully used to investigate the properties of planets found in other ways.

A pulsar (the small, ultradense remnant of a star that has exploded as a supernova) emits radio waves extremely regularly as it rotates. If planets orbit the pulsar, they will cause slight anomalies in the timing of its observed radio pulses. The first confirmed discovery of an extrasolar planet was made using this method. But as of 2011, it has not been very productive; five planets have been detected in this way, around three different pulsars.

Disks of space dust surround many stars, believed to originate from collisions among asteroids and comets. The dust can be detected because it absorbs starlight and re-emits it as infrared radiation. Features in the disks may suggest the presence of planets, though this is not considered a definitive detection method.

Most confirmed extrasolar planets have been found using ground-based telescopes. However, many of the methods can work more effectively with space-based telescopes that avoid atmospheric haze and turbulence. COROT (launched December 2006) and Kepler (launched March 2009) are the two currently active space missions dedicated to searching for extrasolar planets. Hubble Space Telescope and MOST have also found or confirmed a few planets. The Gaia mission, to be launched in March 2013, will use astrometry to determine the true masses of 1000 nearby exoplanets.

[edit] Definition

The official definition of "planet" used by the International Astronomical Union (IAU) only covers the Solar System and thus does not apply to exoplanets.[45][46] As of April 2011, the only definitional statement issued by the IAU that pertains to exoplanets is a working definition issued in 2001 and modified in 2003.[47] That definition contains the following criteria:

Objects with true masses below the limiting mass for thermonuclear fusion of deuterium (currently calculated to be 13 Jupiter masses for objects of solar metallicity) that orbit stars or stellar remnants are "planets" (no matter how they formed). The minimum mass/size required for an extrasolar object to be considered a planet should be the same as that used in our solar system. Substellar objects with true masses above the limiting mass for thermonuclear fusion of deuterium are "brown dwarfs", no matter how they formed or where they are located.

Free-floating objects in young star clusters with masses below the limiting mass for thermonuclear fusion of deuterium are not "planets", but are "sub-brown dwarfs" (or whatever name is most appropriate).

This article follows the above working definition. Therefore it only discusses planets that orbit stars or brown dwarfs. (There have also been several



reported detections of planetary-mass objects that do not orbit any parent body.[48] Some of these may have once belonged to a star's planetary system before being ejected from it; the term "rogue planet" is sometimes applied to such objects.)

However, the IAU's working definition is not universally accepted. One alternate suggestion is that planets should be distinguished from brown dwarfs on the basis of formation. It is widely believed that giant planets form through core accretion, and that process may sometimes produce planets with masses above the deuterium fusion threshold;[49][50] massive planets of that sort may have already been observed.[51] This viewpoint also admits the possibility of sub-brown dwarfs, which have planetary masses but form like stars from the direct collapse of clouds of gas.

Also, the 13 Jupiter-mass cutoff does not have precise physical significance. Deuterium fusion can occur in some objects with mass below that cutoff. The amount of deuterium fused depends to some extent on the composition of the object.[52] The Extrasolar Planets Encyclopaedia includes objects up to 25 MJup in the observed mass spectrum reinforces the choice to forget this mass limit,"[53] and the Exoplanet Data Explorer includes objects up to 24 Jupiter masses with the advisory: "The 13 Jupiter-mass distinction by the IAU Working Group is physically unmotivated for planets with rocky cores, and observationally problematic due to the sin i ambiguity."[54]

[edit] Nomenclature

[edit] Multiple-star standard

The standard for naming exoplanets is an extension of the one used by the Washington Multiplicity Catalog (WMC) for multiple-star systems.[55] This section will therefore start by briefly discussing the WMC standard, which has been adopted by the International Astronomical Union.[55]

Under that standard, the brightest member of a system receives the letter "A." Distinct components not contained within "A" are labeled "B", "C", etc. Sub-components are designated by one or more suffixes with the primary label, starting with lowercase letters for the 2nd hierarchical level and then numbers for the 3rd.[56] For example, if there is a triple star system in which two stars orbit each other closely while a third star is in a more distant orbit, the two closely orbiting stars would be considered a component with two subcomponents. They would receive the designations Aa and Ab, while the third star would receive the designation B. (Note that, for historical reasons, this standard is not always strictly followed. For example, the three members of the Alpha Centauri triple star system are conventionally referred to as Alpha Centauri A, B and C while the formal standard would give their designations as Alpha Centauri Aa, Ab and B respectively.)

[edit] Extrasolar planet standard

Following an extension of the above standard, an exoplanet's name is normally formed by taking the name of its parent star and adding a lowercase letter. The first planet discovered in a system is given the designation "b" and later planets are given subsequent letters. If several planets in the same system are discovered at the same time, the closest one to the star gets the next letter, followed by the other planets in order of orbital size.

For instance, in the 55 Cancri system the first planet<sup>55 Cancri b</sup> was discovered in 1996; two additional farther planets were simultaneously discovered in 2002 with the nearest to the star being named 55 Cancri c and the other 55 Cancri d; a fourth planet was claimed (its existence was later disputed) in 2004 and named 55 Cancri e despite lying closer to the star than 55 Cancri b; and the most recently discovered planet, in 2007, was named 55 Cancri f despite lying between 55 Cancri c and 55 Cancri d.[57] As of April 2012 the highest letter in use is "j", for the unconfirmed planet HD 10180 j (HD 10180 h is the confirmed planet with the highest letter).[5]

If a planet orbits one member of a binary star system, then an uppercase letter for the star will be followed by a lowercase letter for the planet. Examples are 16 Cygni Bb[58] and HD 178911 Bb.[59] Planets orbiting the primary

or "A" star should have 'Ab' after the name of the system, as in HD 41004 Ab.[60] However, the "A" is sometimes omitted; for example the first planet discovered around the primary star of the Tau Boötis binary system is usually called simply Tau Boötis b.[61]

If the parent star is a single star, then it may still be regarded as having an "A" designation, though the "A" is not normally written. The first exoplanet found to be orbiting such a star could then be regarded as a secondary sub-component that should be given the suffix "Ab." For example, 51 Peg Aa is the host star in the system 51 Peg; and the first exoplanet is then 51 Peg Ab. Since most exoplanets are in single star systems, the implicit "A" designation was simply dropped, leaving the exoplanet name with the lower-case letter only: 51 Peg b.

A few exoplanets have been given names that do not conform to the above standard. For example, the planets that orbit the pulsar PSR 1257 are often referred to with capital rather than lowercase letters. Also, the underlying name of the star system itself can follow several different systems. In fact, some stars (such as Kepler-11) have only received their names due to their inclusion in planet-search programs, previously only being referred to by their celestial coordinates.

[edit] Circumbinary planets and 2010 proposal

Hessman et al. state that the implicit system for exoplanet names utterly failed with the discovery of circumbinary planets.[55] They note that the discoverers of the two planets around HW Virginis tried to circumvent the naming problem by calling them "HW Vir 3" and "HW Vir 4", i.e. the latter is the 4th object<sup>^</sup> stellar or planetary<sup>^</sup> discovered in the system. They also note that the discoverers of the two planets around NN Serpentis were confronted with multiple suggestions from various official sources and finally chose to use the designations "NN Ser c" and "NN Ser d."

The proposal of Hessman et al. starts with the following two rules:

Rule 1. The formal name of an exoplanet is obtained by appending the appropriate suffixes to the formal name of the host star or stellar system. The upper hierarchy is defined by upper-case letters, followed by lower-case letters, followed by numbers, etc. The naming order within a hierarchical level is for the order of discovery only. (This rule corresponds to the present provisional WMC naming convention.)

Rule 2. Whenever the leading capital letter designation is missing, this is interpreted as being an informal form with an implicit "A" unless otherwise explicitly stated. (This rule corresponds to the present exoplanet community usage for planets around single stars.)

They note that under these two proposed rules all of the present names for 99% of the planets around single stars are preserved as informal forms of the IAU sanctioned provisional standard. They would rename Tau Boötis b formally as Tau Boötis Ab, retaining the prior form as an informal usage (using Rule 2, above).

To deal with the difficulties relating to circumbinary planets, the proposal contains two further rules:

Rule 3. As an alternative to the nomenclature standard in Rule 1, a hierarchical relationship can be expressed by concatenating the names of the higher order system and placing them in parentheses, after which the suffix for a lower order system is added.

Rule 4. When in doubt (i.e. if a different name has not been clearly set in the literature), the hierarchy expressed by the nomenclature should correspond to dynamically distinct (sub-)systems in order of their dynamical relevance. The choice of hierarchical levels should be made to emphasize dynamical relationships, if known.

They submit that the new form using parentheses is the best for known circumbinary planets and has the desirable effect of giving these planets identical sub-level hierarchical labels and stellar component names which conform to the usage for binary stars. They say that it requires the complete renaming of only two exoplanetary systems: The planets around HW Virginis would

be renamed HW Vir (AB) b & (AB) c, while those around NN Serpentis would be renamed NN Ser (AB) b & (AB) c. In addition the previously known single circumbinary planets around PSR B1620-26 and DP Leonis) can almost retain their names (PSR B1620-26 b and DP Leonis b) as unofficial informal forms of the "(AB)b" designation where the "(AB)" is left out.

The discoverers of the circumbinary planet around Kepler-16 followed Hessman et al.'s proposed naming scheme when naming the body Kepler-16 (AB)-b, or simply Kepler-16b when there is no ambiguity.[62]

[edit] Other naming systems

Another nomenclature, often seen in science fiction, uses Roman numerals in the order of planets' positions from the star. (This was inspired by an old system for naming moons of the outer planets, such as "Jupiter IV" for Callisto.) But such a system is impractical for scientific use, since new planets may be found closer to the star, changing all numerals.

Finally, several planets have received unofficial "real" names: notably Osiris (HD 209458 b), Bellerophon (51 Pegasi b), Zarmina (Gliese 581 g) and Methuselah (PSR B1620-26 b). W. Lyra of the Max Planck Institute for Astronomy has suggested names mostly drawn from Roman-Greek mythology for the 403 extrasolar planet candidates known as of October 2009.[63] But the International Astronomical Union (IAU) currently has no plans to assign names of this sort to extrasolar planets, considering it impractical.[64]

[edit] General properties

[edit] Number of stars with planets

Planet-search programs have discovered planets orbiting a substantial fraction of the stars they have looked at. However the overall proportion of stars with planets is uncertain because not all planets can yet be detected. The radial-velocity method and the transit method (which between them are responsible for the vast majority of detections) are most sensitive to large planets in small orbits. Thus many known exoplanets are "hot Jupiters": planets of Jovian mass or larger in very small orbits with periods of only a few days. It is now estimated that 1% to 1.5% of sunlike stars possess such a planet, where "sunlike star" refers to any main-sequence star of spectral classes late-F, G, or early-K without a close stellar companion.[65] It is further estimated that 3% to 4.5% of sunlike stars possess a giant planet with an orbital period of 100 days or less, where "giant planet" means a planet of at least 30 Earth masses.[66]

The proportion of stars with smaller or more distant planets is less certain. It is known that small planets (of roughly Earth-like mass or somewhat larger) are more common than giant planets. It also appears that there are more planets in large orbits than in small orbits. Based on this, it is estimated that perhaps 20% of sunlike stars have at least one giant planet while at least 40% may have planets of lower mass.[66][67][68] A 2012 study of gravitational microlensing data collected between 2002 and 2007 concludes the proportion of stars with planets is much higher and estimates an average of 1.6 planets orbiting between 0.5<sup>+</sup>10 AU per star in the Milky Way Galaxy, the authors of this study conclude "that stars are orbited by planets as a rule, rather than the exception." [3]

Whatever the proportion of stars with planets, the total number of exoplanets must be very large. Since our own Milky Way Galaxy has at least 200 billion stars, it must also contain tens or hundreds of billions of planets.

[edit] Characteristics of planet-hosting stars

[edit] Spectral classification

Most known exoplanets orbit stars roughly similar to the Sun, that is, main-sequence stars of spectral categories F, G, or K. One reason is that planet search programs have tended to concentrate on such stars. But in addition, statistical analysis indicates that lower-mass stars (red dwarfs, of spectral category M) are less likely to have planets massive enough to detect.[66][69] Stars of spectral category A typically rotate very quickly, which makes it very difficult to measure the small Doppler shifts induced by orbiting planets since the spectral lines are very broad. However, this type of

massive star eventually evolves into a cooler red giant which rotates more slowly and thus can be measured using the radial velocity method. As of early 2011 about 30 Jupiter class planets had been found around K-giant stars including Pollux, Gamma Cephei and Iota Draconis. Doppler surveys around a wide variety of stars indicate about 1 in 6 stars having twice the mass of the Sun are orbited by one or more Jupiter-sized planets, vs. 1 in 16 for Sun-like stars and only 1 in 50 for class M red dwarfs. On the other hand, microlensing surveys indicate that long-period Neptune-mass planets are found around 1 in 3 M dwarfs. [70] Observations using the Spitzer Space Telescope indicate that extremely massive stars of spectral category O, which are much hotter than our Sun, produce a photo-evaporation effect that inhibits planetary formation.[71]

[edit] Metallicity

Ordinary stars are composed mainly of the light elements hydrogen and helium. They also contain a small proportion of heavier elements, and this fraction is referred to as a star's metallicity (even if the elements are not metals in the traditional sense, such as iron). Giant planets are more likely to be found the higher the star's metallicity;[65] however, smaller planets are present around stars with a wide range of metallicities.[72] It has also been shown that stars with planets are more likely to be deficient in lithium.[73]

[edit] Orbital parameters

Many planetary systems are not as placid as the Solar System, and have extreme orbital parameters and strongly interacting orbits, so that Kepler's laws do not hold in such systems.[74]

Most known extrasolar planet candidates have been discovered using indirect methods and therefore only some of their physical and orbital parameters can be determined. For example, out of the six independent parameters that define an orbit, the radial-velocity method can determine four: semi-major axis, eccentricity, longitude of periastron, and time of periastron. Two parameters remain unknown: inclination and longitude of the ascending node.

[edit] Semi-major axis

Many exoplanets have orbits with very small semi-major axes, and are thus much closer to their parent star than any planet in the Solar System is to the Sun. This is mainly due to observational selection: the radial-velocity method is most sensitive to planets with small orbits. Astronomers were initially very surprised by these "hot Jupiters", but it is now clear that most exoplanets have much larger orbits, some located in habitable zones with temperature potentially suitable for liquid water and life.[66] It appears plausible that in most exoplanetary systems, there are one or two giant planets with orbits comparable in size to those of Jupiter and Saturn in the Solar System. Giant planets with substantially larger orbits are now known to be rare, at least around Sun-like stars.[75]

[edit] Eccentricity

The eccentricity of an orbit is a measure of how elliptical (elongated) it is. Most exoplanets with orbital periods of 20 days or less have near-circular orbits, i.e. very low eccentricity. That is believed to be due to tidal circularization: reduction of eccentricity over time due to gravitational interaction between two bodies. By contrast, most known exoplanets with longer orbital periods have quite eccentric orbits. (As of July 2010, 55% of such exoplanets have eccentricities greater than 0.2 while 17% have eccentricities greater than 0.5.[5]) This is not an observational selection effect, since a planet can be detected about equally well regardless of the eccentricity of its orbit. The prevalence of elliptical orbits is a major puzzle, since current theories of planetary formation strongly suggest planets should form with circular (that is, non-eccentric) orbits.[27] The prevalence of eccentric orbits may also indicate that the Solar System is unusual, since all of its planets except for Mercury have near-circular orbits.[65]

However, it is suggested that some of the high eccentricity values reported for exoplanets may be overestimates, since simulations show that many observations are also consistent with two planets on circular orbits. Reported observations of single planets in moderately eccentric orbits have about a 15%

chance of being a pair of planets.[76] This misinterpretation is especially likely if the two planets orbit with a 2:1 resonance. One group of astronomers has concluded that "(1) around 35% of the published eccentric one-planet solutions are statistically indistinguishable from planetary systems in 2:1 orbital resonance, (2) another 40% cannot be statistically distinguished from a circular orbital solution" and "(3) planets with masses comparable to Earth could be hidden in known orbital solutions of eccentric super-Earths and Neptune mass planets." [77]

[edit] Inclination

A combination of astrometric and radial velocity measurements has shown that some planetary systems contain planets whose orbital planes are significantly tilted relative to each other, unlike the Solar System.[78] Research has now also shown that more than half of hot Jupiters have orbital planes substantially misaligned with their parent star's rotation. A substantial fraction even have retrograde orbits, meaning that they orbit in the opposite direction from the star's rotation.[79] Andrew Cameron of the University of St Andrews stated, "The new results really challenge the conventional wisdom that planets should always orbit in the same direction as their star's spin." [80] Rather than a planet's orbit having been disturbed, it may be that the star itself flipped early in their system's formation due to interactions between the star's magnetic field and the planet-forming disc.[81]

[edit] Resonance

Extrasolar planets with notable orbital parameters include KOI-730, which contains four planets in a 8:6:4:3 orbital resonance.[82] This was originally thought to be 6:4:4:3, where one of the center planets was trapped in the other's L4 or L5 Lagrange point.[83] Such co-orbital planets are thought to be the origin of the impact that produced the Earth-Moon system because models suggest the collision was low-speed.[84]

[edit] Circumbinary orbit

Kepler-16 contains a planet orbiting around two suns, which orbit around each other. The planet is comparable to Saturn in mass and size and is on a nearly circular 229-day orbit around its two stars. The stars have an eccentric 41-day orbit.[37]

[edit] Mass distribution

When a planet is found by the radial-velocity method, its orbital inclination  $i$  is unknown and can range from 0 to 90 degrees. The method is unable to determine the true mass ( $M$ ) of the planet, but rather gives a lower limit for its mass  $M \sin i$ . In a few cases an apparent exoplanet may be a more massive object such as a brown dwarf or red dwarf. However the probability of a small value of  $i$  (say less than 30 degrees, which would give a true mass at least double the observed lower limit) is relatively low ( $1 - (\sin^3 30^\circ)/2 \approx 13\%$ ) and hence most planets will have true masses fairly close to the observed lower limit.[66] Furthermore, if the planet's orbit is nearly perpendicular to the line of vision (i.e.  $i$  close to  $90^\circ$ ), the planet can also be detected through the transit method. The inclination will then be known, and the planet's true mass can be found. Also, astrometric observations and dynamical considerations in multiple-planet systems can sometimes provide an upper limit to the planet's true mass.

As of September 2011, all but 50 of the many known exoplanets have more than ten times the mass of Earth.[5] Many are considerably more massive than Jupiter, the most massive planet in the Solar System. However, these high masses are in large part due to an observational selection effect: all detection methods are more likely to discover massive planets. This bias makes statistical analysis difficult, but it appears that lower-mass planets are actually more common than higher-mass ones, at least within a broad mass range that includes all giant planets. In addition, the discovery of several planets only a few times more massive than Earth, despite the great difficulty of detecting them, indicates that such planets are fairly common.[65]

The results from the first 43 days of the Kepler mission "imply that small candidate planets with periods less than 30 days are much more common than

large candidate planets with periods less than 30 days and that the ground-based discoveries are sampling the large-size tail of the size distribution".[13]

[edit] Density and bulk composition

If a planet is detectable by both the radial-velocity and the transit methods, then both its true mass and its radius can be found. The planet's density can then be calculated. Planets with low density are inferred to be composed mainly of hydrogen and helium, while planets of intermediate density are inferred to have water as a major constituent. A planet of high density is believed to be rocky, like Earth and the other terrestrial planets of the Solar System.

Many transiting exoplanets are much larger than expected given their mass, meaning that they have surprisingly low density. Several theories have been proposed to explain this observation, but none have yet been widely accepted among astronomers.[85]

[edit] Atmosphere

Spectroscopic measurements can be used to study a transiting planet's atmospheric composition.[86] Water vapor, sodium vapor, methane, and carbon dioxide have been detected in the atmospheres of various exoplanets in this way.[87][88] The technique might conceivably discover atmospheric characteristics that suggest the presence of life on an exoplanet, but no such discovery has yet been made.

Another line of information about exoplanetary atmospheres comes from observations of orbital phase functions. Extrasolar planets have phases similar to the phases of the Moon. By observing the exact variation of brightness with phase, astronomers can calculate particle sizes in the atmospheres of planets.

Stellar light is polarized by atmospheric molecules; this could be detected with a polarimeter. So far, one planet has been studied by polarimetry.

[edit] Temperature

One can estimate the temperature of an exoplanet based on the intensity of the light it receives from its parent star. For example, the planet OGLE-2005-BLG-390Lb is estimated to have a surface temperature of roughly  $\hat{\sim} 220^{\circ}\text{C}$  (50 K). However, such estimates may be substantially in error because they depend on the planet's usually unknown albedo, and because factors such as the greenhouse effect may introduce unknown complications. A few planets have had their temperature measured by observing the variation in infrared radiation as the planet moves around in its orbit and is eclipsed by its parent star. For example, the planet HD 189733b has been found to have an average temperature of  $1205^{\circ}\pm 9^{\circ}\text{K}$  ( $932^{\circ}\pm 9^{\circ}\text{C}$ ) on its dayside and  $973^{\circ}\pm 33^{\circ}\text{K}$  ( $700^{\circ}\pm 33^{\circ}\text{C}$ ) on its nightside.[89]

[edit] Other properties

On Earth-sized planets, plate tectonics is more likely if there are oceans of water, however in 2007 two independent teams of researchers came to opposing conclusions about the likelihood of plate tectonics on larger super-earths[90][91] with one team saying that plate tectonics would be episodic or stagnant[92] and the other team saying that plate tectonics is very likely on super-earths even if the planet is dry.[93]

Other questions are how likely exoplanets are to possess moons and magnetospheres. No such moons and magnetospheres have yet been detected, but they may be fairly common.

[edit] Habitability

Several planets have orbits in their parent star's habitable zone, where it should be possible for liquid water to exist and for Earth-like conditions to prevail. Most of those planets are giant planets more similar to Jupiter than to Earth; if any of them have large moons, the moons might be a more plausible abode of life. Discovery of Gliese 581 g, thought to be a rocky planet orbiting in the middle of its star's habitable zone, was claimed in September 2010 and, if confirmed,[94] it could be the most "Earth-like" extrasolar planet discovered to date.[95] However, the existence of Gliese 581 g has been questioned or even discarded by other teams of astronomers; it is listed as unconfirmed at The Extrasolar Planets Encyclopaedia.[94] Subsequently, though,

the super-Earth Kepler-22b was confirmed to be in the habitable zone of its parent star, Kepler-22, the first planet of its size confirmed to be in this zone.[96] In September 2012, the discovery of two planets orbiting Gliese 163[97] was announced.[98][99] One of the planets, Gliese 163 c, about 6.9 times the mass of Earth and somewhat hotter, was considered to be within the habitable zone.[98][99]

Various estimates have been made as to how many planets might support simple or even intelligent life. However, these estimates have large uncertainties, because the complexity of cellular life may make biogenesis highly improbable. For example, Dr. Alan Boss of the Carnegie Institution of Science estimates there may be a "hundred billion" terrestrial planets in our Milky Way Galaxy, many with simple life forms. He further believes there could be thousands of civilizations in our galaxy. Recent work by Duncan Forgan of Edinburgh University has also tried to estimate the number of intelligent civilizations in our galaxy. The research suggested there could be thousands of them, although presently there is no scientific evidence for extraterrestrial life. These estimates do not account for the unknown probability of the origins of life, but if life originates, it may spread among habitable planets by natural panspermia or directed panspermia. [100]

Data from the Habitable Exoplanets Catalog (HEC) suggests that, of the 859 exoplanets which have been confirmed as of 3 January 2013, nine potentially habitable planets have been found, and the same source predicts that there may be 30 habitable extrasolar moons around confirmed planets.[101] The HEC also states, of the 15,874 transit threshold crossing events (TCE) which have recurred more than three times (thus making them more likely to be actual planets) discovered by the Kepler probe up until 3 January 2013, that 262 planets (1.65%) have the potential to be habitable, with an additional 35 "warm jovian" planets which may have habitable natural satellites.[7] Further research unveiled in February 2013 reveals that up to 6% small red dwarf stars may have planets with Earth-like properties, thus revealing that there could be up to 4.5 billion such planets within our galaxy and, statistically speaking, the closest "alien Earth" to the Solar System could be 13 light-years away.[102]

[edit] See also

[edit] Classifications

[edit] Habitability and life

[edit] Astronomers

[edit] Observing programs and instruments

[edit] Missions

[edit] Current

COROTâ€”launched in 2006

Keplerâ€”launched in 2009

MOSTâ€”launched in 2003

[edit] Under development

[edit] Proposed

[edit] Canceled

[edit] Websites

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Hurricane Gustav was a Category 2 hurricane that paralleled the East Coast of the United States in September 2002 during the 2002 Atlantic hurricane season. It was the seventh named storm and first hurricane of the season. Initially a subtropical depression north of the Bahamas, Gustav passed slightly to the east of the Outer Banks of North Carolina as a tropical storm before moving northeastward and making two landfalls in Atlantic Canada as a Categoryâ 1 hurricane. The storm was responsible for one death and \$100,000 in damage, mostly in North Carolina. The interaction between Gustav and a non-tropical system produced strong winds that caused an additional \$240,000 (2002â USD) in damage in New England, but this damage was not directly attributed to the hurricane.

Gustav spent the early part of its existence as a subtropical storm, and was the first such storm to be named from the current lists by the National

Hurricane Center. Previously, subtropical storms were not given names.[1] The cyclone was also the latest-forming first hurricane of the season since 1941.

[edit] Meteorological history

An area of disturbed weather in association with a weak surface trough and a stronger upper-level trough between the Bahamas and Bermuda developed on September 6.[2] High pressure ridging strengthened by Tropical Storm Fay caused the trough to become more organized and close off into a broad non-tropical low on September 7.[2] By September 8, the system had developed enough convection near its center of circulation to be classified Subtropical Depression Eight while located southeast of Cape Hatteras, North Carolina.[2] Later that day, data from a Hurricane Hunter reconnaissance aircraft indicated that the system had strengthened into a subtropical storm, and the depression was upgraded to Subtropical Storm Gustav.[3]

Gustav moved erratically to the west-northwest toward the North Carolina-South Carolina border over the next two days, it slowly strengthened, acquiring more tropical characteristics. On September 10, a poorly organized band of stronger winds developed around the center, and Gustav was designated a fully tropical storm[4] shortly before turning toward the north and brushing Cape Hatteras, then accelerating toward the northeast and away from the coast.[2] On September 11, while under the influence of a non-tropical system over New England, Gustav quickly strengthened into a hurricane, in a process similar to the intensification of Hurricane Michael in 2000.[2] Gustav reached its peak intensity of 100 mph (160 km/h) later that day.[2]

The hurricane began to slowly weaken and lose tropical characteristics on early September 12 as it moved over colder waters and encountered increasing wind shear. However, the storm was moving quickly enough to make landfall over Cape Breton, Nova Scotia as a Category 1 hurricane on September 12.[5] Later that morning, Gustav made a second landfall in Newfoundland and became extratropical shortly after.[6] The extratropical low continued moving slowly to the northeast before dissipating over the Labrador Sea on September 15.[2]

[edit] Preparations

On September 8, forecasters at the National Hurricane Center predicted that Gustav would approach the North Carolina coast, and issued a tropical storm watch from Cape Fear to the North Carolina ^ Virginia border. The tropical storm watch was upgraded to a tropical storm warning on September 9, and a new tropical storm watch was issued later that day for areas of southeastern Virginia, from the North Carolina ^ Virginia border to New Point Comfort. The new watch was upgraded to a tropical storm warning on September 10. As Gustav began to turn to the northeast and away from the Mid-Atlantic coast, the tropical storm warnings were gradually discontinued. The last warning was discontinued on September 11.[2]

As Gustav approached Atlantic Canada, Environment Canada and the Canadian Hurricane Centre issued heavy rain and wind warnings for southern New Brunswick, Prince Edward Island, Nova Scotia, and Newfoundland.[7]

[edit] Impact

[edit] North Carolina and Virginia

Although the center of Gustav passed just to the east of Cape Hatteras, areas of North Carolina and southeastern Virginia experienced heavy rain and tropical storm force winds. Parts of the Outer Banks received 2 ^5 inches (50 ^125 mm) of rain and winds of up to 50 mph (80 km/h), and the Coast Guard station at Cape Hatteras reported a wind gust of 78 mph (125 km/h). The storm produced storm surges of 3 ^6 feet (1.8 m) along the Outer Banks, and 1 ^3 feet (0.91 m) along the southeastern coast of Virginia. These surges, combined with strong winds and high sea swells, resulted in minor flooding, mainly in Ocracoke and Hatteras Village, North Carolina.[8] A weak waterspout also touched down on Silver Lake near Ocracoke and moved onshore, but only minor roof damage was reported.[9] Sporadic power outages were also reported.[10] One person died after suffering injuries in the high surf, and 40 other people had to be rescued from riptides and storm surges.[2] Damage in the region amounted to \$100,000 (2002 USD).[2]

[edit] New Jersey

Although the center of Gustav remained well offshore, the difference in pressure between it and a high pressure area over the central United States caused strong winds in areas of New Jersey on September 11. Wind gusts ranged from 35 to 45 mph (55 to 70 km/h), with stronger winds reported near the coast.[11] A maximum wind gust of 60 mph (100 km/h) was reported at Keansburg.[11] The strong winds downed trees and power lines throughout the eastern half of the state, damaging homes and blocking streets. At least 14,000 homes in the vicinity of Burlington and Ocean Counties were left without power.[11] In West Windsor Township, a man was killed when the upper section of a concrete wall he was working on blew over and crushed him. The other death occurred in West Amwell Township, where a tree limb fell on two elderly women, killing one and injuring the other. Elsewhere, while there were reports of trees falling on vehicles, no other serious injuries or deaths were reported.[11]

[edit] New York and New England

The interaction between Gustav and the non-tropical system caused strong winds that affected areas of coastal New England, mainly in eastern New York and Massachusetts. Some areas reported storm-force wind gusts of over 55 mph (90 km/h), and a maximum wind gust of 67 mph (108 km/h) was reported by a weather spotter in Catskill, New York.[12] Wind gusts of up to 50 mph (80 km/h) were reported in areas of Massachusetts.[13] The winds downed trees and power lines, and several homes and cars were damaged by fallen trees. Over 29,000 homes were left without power in eastern New York,[12] and 19,000 homes lost power in Massachusetts.[13] In all, the winds caused \$240,000 (2002 USD) in damage,[13] but this damage was not directly attributed to Gustav in the National Hurricane Center's analysis.[2]

In the New York City area, a peak wind gust of 60 mph (100 km/h) was reported at John F. Kennedy International Airport. The winds caused some minor roof damage to buildings, and forced officials in New York City to cordon off parts of Manhattan as debris ranging from wrapping paper to crushed soda cans was blown about. This debris injured four people, one critically,[14] and disrupted a 9/11 memorial service, though it continued as planned.[15]

Sustained winds of 25 to 35 mph (40 to 55 km/h), with gusts up to 55 mph (90 km/h), were reported throughout Long Island.[14] Damage on the island was mainly limited to downed trees and power lines, although the Long Island Power Authority reported that at least 93,000 homes lost power during the day on September 11. One person was killed when his boat capsized in the Long Island Sound.[14]

[edit] Atlantic Canada

Despite gradually losing its tropical characteristics, Gustav brought heavy rain, storm and hurricane force winds, and storm surges to areas of Atlantic Canada for several days. Strong winds knocked down trees and damaged docks in Nova Scotia,[2] and a wind gust of 75 mph (122 km/h) was reported on Sable Island. Gusts to over 60 mph (100 km/h) were reported in Newfoundland for several days after the center of Gustav moved out of the area. Rainfall amounts generally ranged from 0.3 to 2.7 inches (10 to 70 mm), with a maximum of 4 inches (102 mm) in Ashdale, Nova Scotia. Several locations set new daily rainfall records.[5] Localized flooding was reported in areas of Prince Edward Island, and 4,000 people in Halifax, Nova Scotia and Charlottetown, Prince Edward Island were left without power. Despite the heavy rain and wind, there were no reports of deaths or significant damage in Atlantic Canada.[16]

[edit] Naming and records

Gustav was the first subtropical storm to be given a name from the current name lists by the National Hurricane Center. Prior to the 2002 season, Atlantic subtropical storms were either not named or given a number from a separate numbering list than tropical cyclones.[1]

When Gustav attained hurricane status on September 11, it became the latest first hurricane to form in any season since the 1941 season, when the first hurricane developed on September 16. According to climatology, an average of three hurricanes form by September 11 of each year.[5]

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[edit] References

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[Main Page](#)

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From today's featured article

Liverpool Football Club's participation in European competitions organised by Union of European Football Associations (UEFA) began in 1964. Since then, Liverpool have won eleven European trophies, making them Britain's most successful team in UEFA competitions. They have won the UEFA Champions League (formerly known as the European Cup) five times, the UEFA Europa League (formerly known as the UEFA Cup) three times, and the UEFA Super Cup three times. Liverpool qualified for European competitions for 21 consecutive seasons until the 1985 European Cup Final, the occasion of the Heysel Stadium disaster, following which the club was banned from Europe for six seasons. Since being readmitted, they have qualified for the Champions League eight times and the UEFA Cup seven times. As a result of their victory in the 2005 UEFA Champions League Final, Liverpool won the European Champion Clubs' Cup trophy (pictured) outright. Bob Paisley is the club's most successful manager in Europe, with five trophies. Liverpool's biggest win in Europe is an 11–0 victory over Strømsgodset in the 1974–75 European Cup Winners' Cup. In European competitions, Jamie Carragher holds the club record for the most appearances, with 139, and Steven Gerrard is the club's record goalscorer, with 38 goals. (Full article...)

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In the news

On this day...

February 12: Mardi Gras and Shrove Tuesday in Western Christianity (2013); Darwin Day; Red Hand Day

1541 Spanish conquistador Pedro de Valdivia founded Santiago, today the capital of Chile, as Santiago del Nuevo Extremo.

1855 Michigan State University in East Lansing, Michigan, was founded as the Agricultural College of the State of Michigan, the United States' first agricultural college.

1912 Xinhai Revolution: Puyi, the last Emperor of China, abdicated under a deal brokered by military official and politician Yuan Shikai, formally

replacing the Qing Dynasty with a new republic in China.

1974 â ^ Russian author Aleksandr Solzhenitsyn was arrested and subsequently deported from the Soviet Union for writing The Gulag Archipelago, an exposÃ© of the Soviet forced labour camp system.

2001 â ^ NASA's robotic space probe NEAR Shoemaker touched down on Eros (pictured), becoming the first spacecraft to land on an asteroid.

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#### Hurricane Wilma

Category 5 hurricane (SSHS)

Hurricane Wilma track map

Formed

October 15, 2005

Dissipated

October 26, 2005

Highest winds

1-minute sustained:

185 mph (295 km/h)

Lowest pressure

882 mbar (hPa); 26.05 inHg(Record low in Atlantic)

Areas affected

Hispaniola, Jamaica, Cuba, Cayman Islands, Nicaragua, Honduras, Belize,

Cozumel, YucatÃ¡n Peninsula, Florida, Bahamas, East Coast of the United States,

Atlantic Canada, Europe

Part of the 2005 Atlantic hurricane season

The meteorological history of Hurricane Wilma, the most intense known tropical cyclone in the Western Hemisphere, began in the second week of October 2005. A large area of disturbed weather developed across much of the Caribbean Sea and gradually organized to the southeast of Jamaica. By late on October 15, the system was sufficiently organized for the National Hurricane Center to designate it as Tropical Depression Twenty-Four.

The depression drifted southwestward, and under favorable conditions, it strengthened into Tropical Storm Wilma on October 17. Initially, development was slow due to its large size, though convection steadily organized. From October 18, and through the following day, Wilma underwent explosive deepening over the open waters of the Caribbean; in a 30-hour period, the system's central atmospheric pressure dropped from 982 mbar (29.00 inHg) to the record-low value of 882 mbar (26.05 inHg), while the winds increased to 185 mph (298 km/h). At its peak intensity, the eye of Wilma was about 3 miles (4.8 km) in diameter, the smallest known eye in an Atlantic hurricane. After the inner eye dissipated due to an eyewall replacement cycle, Hurricane Wilma weakened to Category 4 status, and on October 21, it made landfall on Cozumel and on the Mexican mainland with winds of about 150 mph (240 km/h).

Wilma weakened over the Yucatán Peninsula, and reached the southern Gulf of Mexico before accelerating northeastward. Despite increasing amounts of vertical wind shear, the hurricane re-strengthened to hit Cape Romano, Florida, as a major hurricane. Wilma weakened as it quickly crossed the state, and entered the Atlantic Ocean near Jupiter, Florida. The hurricane again re-intensified before cold air and wind shear penetrated the inner core of convection. By October 26, it transitioned into an extratropical cyclone, and the next day, the remnants of Wilma were absorbed by another extratropical storm over Atlantic Canada.

[edit] Formation

During the second week of October, an unusually large, monsoon-like lower-level circulation and a broad area of disturbed weather developed over much of the Caribbean Sea. The system was enhanced by diffluence from an upper-level low across the southwestern Atlantic.[1] By October 13, a broad area of low pressure developed and persisted about 150 miles (240 km) southeast of Jamaica,[2] possibly aided by the passage of tropical waves through the area at the time.[1] Convection increased and became slightly better organized, though upper-level wind shear initially prevented development. The system drifted westward, and early on October 14 the convection became more concentrated and a little better organized as upper-level wind shear lessened slightly.[2][3]

Later on October 14, the system became much better defined, with increasingly organized shower and thunderstorm activity, as conditions in the upper levels of the atmosphere became significantly more favorable. It was then that the National Hurricane Center first indicated that it was possible for a tropical depression to develop in the area.[4] Dvorak classifications were initiated on October 15.[1] The system continued to organize, with the National Hurricane Center remarking the system could ultimately become a hurricane.[5] By late on October 15, the surface circulation became defined well enough, with sufficiently organized deep convection, for the National Hurricane Center to designate the system as Tropical Depression Twenty-Four while it was located about 220 miles (350 km) east-southeast of Grand Cayman.[1]

The depression tracked slowly westward, a motion due to weak steering currents caused by a high pressure area to its north across the Gulf of Mexico. Initially, the center of circulation was broad without a defined inner core; forecaster Lixion Avila remarked, "The area of minimum pressure could [have been] anywhere within 60 miles (97 km) of its [initial advisory position]." Initially, the tropical depression was forecast to drift west-southwestward before turning to the north; within five days of the forecast's issuance, the system was predicted to be located about 80 miles (130 km) south of the Isle of

Youth as a 105Â mph (169Â km/h) hurricane. However, the National Hurricane Center noted in the first advisory on the depression that there were "all indications that there could a dangerous hurricane in the northwestern Caribbean Sea in 3 to 5Â days." This was due to the depression being located within an environment very conducive for development, specifically low amounts of wind shear and very warm water temperatures.[6]

As Tropical Depression Twenty-Four drifted southwestward, it steadily organized; by early on October 16, rainbands began to gradually consolidate with well-established outflow, and a large upper-level anticyclone developed over the depression.[7] Although deep convection and banding features increased, mid-level dry air from the north prevented significant organization, and the convection was split into two primary areas. Surface buoy reports indicated that, due to its large size, the system failed to strengthen beyond tropical depression status, even though it received tropical storm strength Dvorak classifications from The National Hurricane Center's Tropical Analysis and Forecast Branch and the National Oceanic and Atmospheric Administration's Satellite Analysis Branch.[8] Continued reconnaissance flights reported peak winds of about 30Â mph (48Â km/h).[9]

[edit] Peak strength

By early on October 17, the outer rainbands, which had previously dominated the structure of the cyclone, dissipated, while deep convection developed near and to the south of the center. Computer models predicted steady strengthening as the depression tracked westward before turning to the north. Of the intensity models, the Geophysical Fluid Dynamics Laboratory predicted an intensity of 135Â mph (217Â km/h) within 36Â hours, with other forecasts being more conservative in their predictions.[10] Deep convection continued to develop to the south of the center, and the depression intensified into Tropical Storm Wilma at 0600Â UTC on October 17, while located about 200 miles (320Â km) southeast of Grand Cayman. Upon becoming a tropical storm, the National Hurricane Center predicted Wilma to track west-northwestward, reaching winds of 105Â mph (169Â km/h) before striking the northeastern portion of the YucatÃ¡n Peninsula.[11]

The storm continued to the southwest while deep convection persisted near the center. National Hurricane Center forecaster James Franklin remarked, "Confidence at the later ranges [of the forecast track] was unusually low", due to wide divergences between computer models.[12] Late on October 17, a Hurricane Hunters flight into Wilma recorded winds of 50Â mph (80Â km/h), but an unusually low pressure of 989Â mbar (29.21Â inHg), which would be more typical of a minimal hurricane. This was due to unusually low pressures across the region, which resulted in a lesser pressure gradient and thus lighter winds. Convection continued to develop near the center and became much more symmetrical.[13]

Tropical Storm Wilma began to turn to the west-northwest on October 18,[1] during which the storm developed a small, intermittent and ragged eye feature.[14] It continued to intensify, and at 1200Â UTC on October 18, Wilma attained hurricane status while located about 225 miles (362Â km) south-southeast of Grand Cayman.[1] Shortly after reaching hurricane strength, the hurricane began undergoing explosive deepening, subsequent to the development of a "pinhole" eye 9 miles (14Â km) in diameter. This small eye was surrounded by a ring of deep convection, with cloud-top temperatures of about â 125 Â°F (â 87Â Â°C).[15]

Early on October 19, Wilma attained major hurricane status while continuing to rapidly intensify, and by 0600 UTC, the storm's maximum sustained winds increased to 165Â mph (266Â km/h), making Wilma a dangerous Category 5 storm on the Saffir-Simpson Hurricane Scale.[1] In the span of just 24Â hours, Wilma had intensified from a 70Â mph (110Â km/h) tropical storm to a 175Â mph (282Â km/h) Category 5 hurricane, an unprecedented event for an Atlantic hurricane.[1] The eye continued to contract to a diameter of about 3 miles (4.8Â km), the smallest known eye in an Atlantic hurricane, and at 1200Â UTC on October 19, Wilma attained peak winds of 185Â mph (298Â km/h). The central pressure rapidly dropped 54Â mbar (1.65Â inHg) from 0000 to 0600Â UTC, and at 0800Â UTC, a Hurricane Hunters

flight recorded a minimum central pressure of 884 mbar (26.10 inHg) in a dropsonde near the center of the extremely small eye. As the dropsonde did not reach the calm winds in the center, the pressure was estimated at 882 mbar (26.05 inHg), the lowest pressure in an Atlantic hurricane on record. The pressure continued to fall as the Hurricane Hunters left the hurricane, and it is possible the pressure was slightly lower.[1] Operationally, the peak intensity was estimated at 175 mph (282 km/h).[16] At the time of its peak intensity, hurricane force winds extended only 50 miles (80 km) from the small center of Wilma, with tropical storm force winds extending only about 160 miles (260 km).[17]

[edit] First landfall

Shortly after peaking in intensity, the coldest cloud tops surrounding the eye warmed slightly and an outer eyewall began to develop, signifying an eyewall replacement cycle was occurring.[16] By late on October 19, the winds in Hurricane Wilma decreased to 160 mph (260 km/h) as the inner 5-mile (8 km) wide eye weakened and the wind field expanded.[18] Early on October 20 the hurricane weakened to Category 4 status after the small, inner eye dissipated and the 45-mile (72 km) wide outer eyewall became the dominant eye.[1] At the time, the pressure measured 892 mbar (26.34 inHg), the second-lowest known pressure for a Category 4 hurricane (Super Typhoon Judy had a 887 mb pressure at peak intensity), and Wilma retained the large eyewall as it turned northwestward.[1][19] Initially, the hurricane was forecast to re-intensify into a Category 5 hurricane,[20] with one forecast predicting it to make landfall on the Yucatán Peninsula with winds of 165 mph (266 km/h),[21] though Wilma remained a strong Category 4 hurricane as it tracked northwestward.[1]

Steering currents remained weak, though a series of troughs eroded the high pressure system across the Gulf of Mexico, resulting in a turn towards the north-northwest. Environmental conditions remained favorable,[1] with the eye becoming more distinct early on October 21.[22] At about 2145 UTC on October 21, Wilma made landfall on the island of Cozumel with winds of 150 mph (240 km/h). It weakened slightly as it continued northwestward, and struck the Mexican mainland near Puerto Morelos, Quintana Roo, at 0330 UTC on October 22, with winds of 135 mph (217 km/h)[1] and gusts of up to 170 mph (270 km/h).[23]

[edit] Second landfall and demise

On October 22, the mid-level ridge to the north of Wilma essentially dissipated, leaving the hurricane drifting northward across the northeastern Yucatán Peninsula.[1] As the hurricane moved further inland, the eye became cloud-filled as the deepest convection began to warm, and the winds gradually weakened during its passage over land.[24] About 26 hours after making landfall on Cozumel, Wilma emerged into the southern Gulf of Mexico near Cabo Catoche with winds of about 100 mph (160 km/h).[25] Upon reaching open waters, Reconnaissance Aircraft reported the remains of an inner eyewall and an outer eyewall oscillating between 70 and 90 miles (110 and 140 km) in diameter. Convection deepened around the eyewalls,[26] and the inner core of convection, which had previously become disrupted over land, became slightly better defined.[27]

A powerful eastward-moving mid-level trough across the central United States turned the hurricane northeastward and caused it to gradually accelerate. Vertical wind shear increased as strong upper-level southwesterly flow increased, though in spite of the shear Wilma continued to intensify.[1] Early on October 24, Wilma attained major hurricane status while located about 120 miles (190 km) west-southwest of Key West, Florida. It gradually became better organized, with the large 50 miles (80 km) eye becoming very distinct on satellite and radar imagery. Wilma was able to retain its strength because large eyes in tropical cyclones are more stable and more resistant to vertical wind shear.[28] Despite wind shear values of about 30 mph (48 km/h), Wilma strengthened further to reach winds of 125 mph (201 km/h). It weakened slightly as it approached Florida, and made landfall at Cape Romano with winds of 120 mph (190 km/h) at around 1030 UTC on October 24.[1]

Hurricane Wilma crossed the Florida peninsula in about 4.5 hours while

continuing to accelerate northeastward, and emerged into the Atlantic Ocean as a weakened 110Â mph (180Â km/h) hurricane near Jupiter. A vigorous cold front associated with the mid-level trough moved across the area to the west of Wilma, yet the cooler and drier air behind the front could not fully penetrate the inner core of the hurricane to weaken it. Shortly after exiting the Florida coastline, Wilma began to re-intensify,[1] believed to be due to a reduction of friction of the eyewall and warm waters of the Gulf Stream.[29] Early on October 25, the hurricane reached a secondary peak intensity of 125Â mph (201Â km/h) while located about 340 miles (550Â km) east of Jacksonville, Florida.[1] During the time, the large circulation of Wilma absorbed the much smaller Tropical Depression Alpha over the Bahamas.[30]

Shortly after its secondary peak intensity, the wind shear, combined with its rapid forward motion of 50Â mph (80Â km/h), resulted in a steady weakening trend.[1] The overall cloud pattern began to deteriorate, with the eye becoming less distinct and the convection less symmetric.[31] By 1117Â UTC on October 25, the center was located to the northwest of the primary convection as cold air from the southwest entrained the circulation.[32] The remaining convection continued to diminish, and by late on October 25 Wilma transitioned into an extratropical cyclone while located about 230 miles (370Â km) southeast of Halifax, Nova Scotia, and still at CategoryÂ 1 intensity. The weakening extratropical remnant turned to the east-northeast before being absorbed by another extratropical storm over Atlantic Canada on October 27.[1]

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"1987 (album)" redirects here. For the Whitesnake album called '1987' in Europe, see Whitesnake (album).

1987 (What the Fuck Is Going On?) is the debut album of British band The Justified Ancients of Mu Mu (The JAMs: Bill Drummond and Jimmy Cauty), later to be known as The KLF. 1987 was produced using extensive unauthorised samples which plagiarised a wide range of musical works, continuing a theme begun in The JAMs' debut single "All You Need Is Love" (included on the album). These samples provided a deliberately provocative backdrop for beatbox rhythms and cryptic, political raps. The album was released to mixed reviews, but was a commercial success.

Shortly after independent release in June 1987, The JAMs were ordered by the Mechanical-Copyright Protection Society to destroy all unsold copies of the album, following a complaint from ABBA. In response, The JAMs disposed of many copies of 1987 in unorthodox, publicised ways. They also released a version of the album titled "1987 (The JAMs 45 Edits)", stripped of all unauthorised samples to leave periods of protracted silence and so little audible content that it was formally classed as a 12-inch single.

A limited edition release subjected to recall and a destruction order, 1987



became something of a rarity and by 2000 mint condition copies were trading for £60.

#### [edit] Background and recording

On New Year's Day 1987, Bill Drummond decided to make a hip hop record under the pseudonym "The Justified Ancients of Mu Mu".[1] Despite his small knowledge about modern music technology, he invited Jimmy Cauty, a former member of the band Brilliant, to join him. Cauty reportedly agreed, and The JAMs' debut single "All You Need Is Love" was independently released on 9 March 1987 as a limited edition one-sided white label 12-inch.[2] Cauty conceived the pseudonym "Rockman Rock", while Drummond used the nickname "King Boy D".[3]

The reaction to "All You Need Is Love" was positive, with the record being made single of the week in the British music weekly Sounds Magazine,[4] and The JAMs lauded as "the hottest, most exhilarating band this year".[5] However, "All You Need Is Love"'s unusual reliance on uncleared, often illegal samples made commercial release impossible.[6] In response, The JAMs re-edited the single, removing or doctoring the most antagonistic samples, and re-released it as "All You Need Is Love (106Â bpm)" in May 1987.[7] According to Drummond, profits from this re-release funded the recording of their first album.[8] The JAMs had completed and pressed copies of the album by early May 1987, but didn't have a distributor.[9]

Like "All You Need Is Love", the album was made using an Apple II computer, a Greengate DS3 digital sampler peripheral card, and a Roland TR-808 drum machine.[10] Using portions from existing works and pasting them into new contexts, with the duo stealing "everything" and "taking... plagiarism to its absurd conclusion," several songs were liberally plagiarised.[11] This mashup of samples was underpinned by rudimentary beatbox rhythms and overlaid with Drummond's raps of social commentary, esoteric metaphors and mockery. Drummond would later say in an interview that:

We'd just got ourselves a sampler, and we went sample-crazy. We just ... went through my whole collection of records, sampling tons of stuff and putting it all together, and it ... was a real rush of excitement, when we were doing it.... When we put that record out, we knew what we were doing was illegal, but we thought it was gonna be such an underground record, nobody would ever hear about it. So the first thing that shocked us is that British rock papers gave a big review.[12]

#### [edit] Composition

1987 is built around samples of other artists' work, "to the point where the presence of original material becomes questionable".[13] The album is raw and unpolished, the sound contrasting sharply with the meticulous production and tight house rhythms of the duo's later work as The KLF.[14][15] The beatbox rhythms are basic ("weedy", according to Q Magazine),[16] samples often cut abruptly, and distinctive plagiarised melodies are often played with a high-pitched rasping accompaniment. The plagiarised works are arranged so as to juxtapose with each other as a backdrop for The JAMs' rebellious messages and social comments.[17] Lyrics include self-referential statements of The JAMs' agenda that clash with the fictional backstory adopted from The Illuminatus! Trilogy.[11][18] Several songs (such as "The Queen and I" and "All You Need Is Love") have specific societal targets for Drummond's satirical raps.

#### [edit] Side one

The album's opening song, "Hey Hey We Are Not The Monkees", begins with simulated human sexual intercourse noises arranged as a rhythm. The album's first plagiarism is a sample "Here we come..." from The Monkees' theme. It progresses into a cryptic and bleak spoken verse from Drummond: "Here we come, crawling out of the mud, from chaos primeval to the barnyard sun, dragging our bad selves from one end of time, with nothing to declare but some half-written rhymes". A cacophony of further samples from The Monkees' theme and Drummond's voice follow - "We're not The Monkees, I don't even like The Monkees!"[11] - before it gets interrupted by an original a cappella vocal line that later

became The KLF's "Justified and Ancient"[19] - "We're justified/And we're ancient ... We don't want to upset the apple cart/And we don't wanna cause any harm".[20]

The track is followed by a long sample of a London Underground train arriving at and leaving a tube station, with its mechanised warning to passengers, "Mind the gap...". "Don't Take Five (Take What You Want)" follows, featuring The JAMs' associates Chike (rapper) and DJ Cesare (scratches). Built around The Dave Brubeck Quartet's "Take Five" and Fred Wesley's "Same Beat", [10] the lyrics are mostly unconventional, with the majority of the song containing references to food: "I was pushing my trolley from detergent to cheese when I first saw the man with antler ears. I tried to ignore but his gaze held my eyes when he told me the truth about the basket of lies". Sounds considered the message of the song (if any) to be a modern version of Robin Hood: "This is piracy in action, with the venerable music industry figure, King Boy D, setting himself up as the Robin Hood of rap as he steals from the rich vaults of recording history".[20]

The first side of the LP closes with "Rockman Rock (Parts 2 and 3)", a homage to Jimmy Cauty that plagiarises from an array of sources, including the "Bo Diddley Beat" and "Sunrise Sunset" from the Fiddler on the Roof soundtrack. Led Zeppelin's "Whole Lotta Love", "Since I've Been Loving You" and "Houses of the Holy" can be also heard in this track. Side one would not close until "Why Did You Throw Away Your Giro?", a track consisting of a question in reference to a line from "Rockman Rock" from a female adult jokingly answered by a male person, ended in 20 seconds.[10]

[edit] Side two

The second side begins with "Má<sup>01</sup> Ru Con", an emotive Vietnamese song originally titled "Ca Dao Má<sup>01</sup>", written by Trinh Cong Son performed a cappella by The JAMs' friend Duy Khiem. According to Drummond, it was a spontaneous recital by Khiem, who was in the studio contributing clarinet and tenor sax to the album.[10] Khiem's vocal performance was later sampled by The KLF on the ambient house soundtrack to their movie, The Rites of Mu.

"The Queen and I" features excessive amounts of samples from ABBA's "Dancing Queen", often overlain with a rasping detuned accompaniment. These lead into Drummond's satirical and discontent rapping, a fictional account of his march into the British House of Commons and Buckingham Palace to demand answers. The song also protests the involvement of cigarette companies in sport ("When cancer is the killer/John Player run the league") and lambasts the "tabloid mentality" ("They all keep talking about Princess Di's dress").[20] The Sex Pistols' "God Save the Queen" is briefly sampled.[11] After nearly three minutes of samples from the television show Top of the Pops, as well as other BBC programming, Drummond cries "Fuck that, let's have The JAMs!". The acerbic "All You Need Is Love (106 bpm)" follows. A "stunning audio collage" featuring an AIDS public information film, a rerecording of glamour model Samantha Fox's "Touch Me (I Want Your Body)", [21] and the nursery rhyme "Ring a Ring O'Roses", "All You Need Is Love" comments on sex and the British media's reaction to the AIDS crisis.[4]

The final track on the album is "Next", which Drummond describes as "the only angst-er on the album", with "imagery of war and sordid sex".[10] The track samples Stevie Wonder's "Superstition", Scott Walker's "Next" from Scott 2, the Fall's "Totally Wired," and Julie Andrews' "The Lonely Goatherd" from The Sound of Music,[11] alongside Khiem's original melancholy clarinet and tenor saxophone contributions ("a saxophone of stupefying tediousness", according to Danny Kelly[22]).

Bill Drummond summed up The JAMs' approach to composition in the first "KLF Information Sheet", sent out in October 1987: "We made [the album] not giving a shit for soul boy snob values or any other values, we just went in and made the noise we wanted to hear and the stuff that came out of our mouths.... Not a pleasant sound but it's the noise we had. We pressed it up and stuck it out. A celebration of sorts." [8] Jimmy Cauty defended sampling as an artistic practice: "It's not as if we're taking anything away, just borrowing and making

things bigger. If you're creative you aren't going to stop working just because there is a law against what you are doing."[5]

In 1991, Drummond admitted: "We didn't listen to 1987 What The Fuck's Going On for a long time, and when we did we were embarrassed by it because it was so badly recorded. But I still felt we were able to get a lot out of ourselves through it."[14]

[edit] Release, reception and controversy

1987 (What the Fuck Is Going On?) was released in June 1987 on The JAMs' own record label, "The Sound of Mu(sic)".[23]

1987 was met with mixed reviews in most of the major British music publications, including Melody Maker, NME, Sounds, and Q, and the album came to the attention of the management of Swedish pop group ABBA:[24] The JAMs had sampled large portions of the ABBA single "Dancing Queen" on the track "The Queen And I". A legal showdown with ABBA and the Mechanical-Copyright Protection Society (MCPS) followed, 1987 was forcibly withdrawn from sale, and The JAMs were ordered to "deliver up the master tape, mothers, stampers and any other parts commensurate with manufacture of the record".[21][25]

King Boy D and Rockman Rock travelled to ABBA's home country of Sweden, in the hope of meeting with ABBA personally,[21] taking an NME journalist and photographer with them, along with most of the remaining copies of the LP and a gold disc of the album. Failing to find ABBA in residence at Polar Studios in Stockholm, they instead presented the gold disc to a blonde prostitute they pretended was Agnetha "fallen on hard times." Of the original LP's stock, some copies were disposed overboard on the North Sea ferry trip across, and the remainder were burned in a field in Gothenburg before dawn (as shown on the cover of their next album, Who Killed The JAMs?). The JAMs also played a recording of "The Queen and I" loudly outside the offices of ABBA's record label, Polar Music. The trip was unexpectedly eventful, the JAMs accidentally hitting and killing a moose, and later being shot at by a farmer, a bullet cracking the engine of their Ford Galaxie police car.[26] They were, by their own account, towed back to England by the AA.[27]

The JAMs were not entirely sure what they would have said to ABBA if they had been able to meet them. Rockman told NME: "We were hoping to explain [our artistic justification] to them and that maybe we'd come out of it friends, you know, them producing our album and us producing theirs - the kind of thing that often happens at these meetings." King Boy: "Yeah, we'd have said, 'Look, you haven't had many hits lately, you don't really wanna bother with all this West End musical shit do you? Come and do the new JAMMS [sic] album.'"[27] In 1994, The Guardian looked back on the Swedish sojourn as "a grand, futile, attention-grabbing gesture, the kind that would come to characterise [the duo's] collaborative career... "We were being totally stupid about it" Drummond later acknowledged."[28]

The JAMs offered what they claimed were "the last five" copies of 1987 for sale at £1000 each in a full-page advertisement in the April 1988 edition of The Face.[29] Drummond argued that the offer exploited a loophole in The JAMs' agreement with the MCPS: "We were browsing around this record shop and came across these five copies of 1987.... We made it perfectly clear to the MCPS that we couldn't actually force the shops to send our LPs back.... [B]ecause we bought them in a shop, these LPs don't come into the agreement and we can do what we like with them and not break any laws."[30]

[edit] Critical response

Q magazine had mixed reactions to 1987, saying that there are "too few ideas being spread too thin". The magazine criticized some songs as "overlong" and questioned the overuse of sampling as "the impression of a random hotchpotch". Q also unfavourably commented that The JAMs' "use of the beatbox is altogether weedy". However it liked some of its tracks: "there are some wickedly amusing ideas and moments of pure poetry in the lyrics while some of the musical juxtapositions are both killingly funny and strong enough to stand repeated listenings".[16]

A reviewer for Melody Maker found 1987 "inspirational", and "the most

exciting, most original record [he'd] heard in years". However, he argued that: "Some snatches [of plagiarised music] rather outstay their welcome, tugging tell-tale glitz away from the clifftop and dangerously close to smug obviousness, but when the blows are kept short, sharp and very bloody, they make anything else you're very likely to hear on the radio dull and desperately humourless." [11] "It's easy to dismiss The JAMs frolics as little more than a brightly coloured sideshow to the shabbiest circus in town", a later article said, but "believe me, it's far more than a gimmick". [32]

In awarding 1987 the highest rating, a maximum five stars, Sounds a publication that offered the duo's work consistent approval mused, "Taking the sound of the moment (hip hop) as a backbone, 1987 steals sound artefacts from anywhere ... and meshes them together with King Boy's hysterical 'Clydeside' rap method with bewildering effect. ... [Y]ou could call this sampling technology's answer to T. S. Eliot's arch cut up work, The Wasteland." [20] "What's so good about The JAMs", the magazine said, "is the way they are capturing on disc the whole social and musical confusion and instability of 1987 Britain". [5]

NME's Danny Kelly was not so impressed. He also felt that the record was underdeveloped and The JAMs were not the most skilled of practitioners. "Audacity, completely unfounded self-confidence, utter ruthlessness and a fast car will, of course, be useful attributes to the go-ahead noise-pirate of the 90s, but skill, feel, instinct, vision - y'know, boring old talent - will still be bottom line compulsories.... it's in these latter commodities that the JAMs seem conspicuously undertooled." Compared to the output of DJ Code Money or Cut Creator ("all humour, vibrancy and colour... - aerosoled version[s] of The Book of Kells") Kelly felt Drummond's efforts to be a "glitter-crusted charity Christmas card". [22] A later NME item, however, called 1987 "the best comment on sampling culture ever made". [33]

A retrospective review by Allmusic negatively commented that 1987 is "a hilarious record" filled with "comments on music terrorism and [The JAMs'] own unique take on the Run-D.M.C. type of old-school rapping"; [13] and The Penguin Price Guide for Record & CD Collectors called 1987 an "entirely brilliant example of the art of disc-jockey-as-producer". [34] Giving another retrospective review from across the Atlantic, Trouser Press described 1987 as "energetic" and "a loopy dance album that isn't unlike a lot of sampled records, but proceeds from an entirely different cultural understanding." [35]

[edit] Personnel

Bill Drummond and Jimmy Cauty were responsible for the concept and production of 1987, its lyrics and the TR-808 beatbox rhythms. Drummond provided rap, and an additional rapper introduced as 'Chike' appears on "Don't Take Five (Take What You Want)" and "Rockman Rock (Parts 2 and 3)". Duy Khiem contributed lead vocals to "Má<sup>o</sup> Ru Con", as well as clarinet and tenor sax to "Rockman Rock (Parts 2 and 3)" and "Next". Uncredited female vocalists on "Hey Hey We Are Not The Monkees", "Rockman Rock (Parts 2 & 3)" and "All You Need Is Love (106 bpm)" are identified by one source as Cressida Cauty (Jimmy's wife) and June Montana, the lead vocalists of the KLF Communications side project Disco 2000. [36]

[edit] Track listing

Side one

"Hey Hey We Are Not The Monkees (100 BPM)" [37] ^ 6:00

"Mind the Gap" [unlisted sample of ambient noise in a London Underground station] ^ 1:02

"Don't Take Five (Take What You Want) (89 BPM)" ^ 3:59

"Rockman Rock Parts 2 and 3 (105 BPM)" ^ 6:29

"Why Did You Throw Away Your Giro?" [unlisted two people making a reference to a song on the album] ^ 0:20

Side two

"Má<sup>o</sup> Ru Con (0 BPM)" ^ 2:23

"The Queen and I (99 BPM)" ^ 4:43

"Top of the Pops" [unlisted samples of television programmes including Top of

the Pops]Â ^ 2:51

"All You Need Is Love (106 BPM)"Â ^ 4:55

"Next (100 BPM)"Â ^ 7:15

[edit] "1987: The JAMs 45 Edits"

Following the enforced deletion of the 1987 album, the Justified Ancients of Mu Mu promptly released an edited version as a 12" single, with all of the unauthorised samples removed, leaving sparse instrumentation, Drummond's social commentary and, in several cases, long periods of silence; the "Top of the Pops" section of the original LP yielded three full minutes of silence on 45 Edits, while the only sample remaining from the original was The Fall's "Totally Wired."

The edited single was sold through normal retail channels and also offered as a "reward" to anyone who returned a copy of the LP to The JAMs' post office box.[38] The single was released on 16 October 1987,[2] and on 31 October 1987 The JAMs announced that the case with ABBA "is now closed".[39] The sleeve notes to "1987: The JAMs 45 Edits" explain to the purchaser in a rather tongue-in-cheek fashion how to recreate the original 1987 album for themselves:

This record is a version of our now deleted and illegal LP '1987, What The Fuck Is Going On?' with all of the copyright infringing 'samples' edited out. As this leaves less than 25 minutes of music we are able to sell it as a 12-inch 45. If you follow the instructions below you will, after some practice, be able to simulate the sound of our original record. To do this you will need 3 wired-up record decks, a pile of selected discs, one t.v. set and a video machine loaded with a cassette of edited highlights of last weeks 'Top of the Pops'. Deck one is to play this record on, the other two are to scratch in the missing parts using the selected records. For added authentic effect you could use a Roland 808 drum machine (well cheap and what we used in the original recordings) to play along behind your scratching.[10]

By 2000, a copy of the original version of 1987 in mint condition was worth Â£60, whereas a mint copy of "1987: The JAMs 45 Edits" was worth a mere Â£10.[34]  
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^ BBC Radio 1 "Story Of Pop" documentary interview with Bill Drummond. First BBC broadcast believed to have been in late 1994, and was transmitted by Australian national broadcaster ABC on 1 January 2005 (link).

^ a b Longmire, Ernie et al. (2005). KLF discography Compiled by Ernie Longmire, this has been the authoritative KLF discography on the internet for some 10 years or more and has been the subject of long-term scrutiny and peer review by KLF fans and collectors. It is now maintained by the fan site klf.de.

^ King Boy D had been unmasked as Bill Drummond in weekly music paper NME as early as 28 March ("World Domination Part 458", NME, 28 March 1987). The press continued to refer to The JAMs almost exclusively by their pseudonyms throughout their career. The aliases, "King Boy" and "Rockman", survived The Justified Ancients of Mu-Mu transition into The KLF, although they were briefly changed to "Time Boy" and "Lord Rock" during promotion of The Timelords' first and only single, "Doctorin' the Tardis".

^ a b "All You Need Is Love" review, Sounds, 14 March 1987.

^ a b c d "The Justified Ancients of Mu Mu", Sounds, 16 May 1987.

^ Underground Magazine, April 1987 (link)

^ "The KLF", Musicmatch (link)

^ a b Drummond, B., "KLF Info Sheet", October 1987 (link). This was the first of many "Information Sheet"s that KLF Communications would send out to fans and the press.

^ News item, Sounds Magazine, 9 May 1987. Sounds reviewed a pre-release copy of the album in the 16 May 1987 edition.

^ a b c d e f "How to recreate that authentic 1987 sound", sleeve notes to "1987: The JAMs 45 Edits", JAMS 25T, KLF Communications (link). Being a guide to recreating the record at home, this communique from The JAMs provided

detailed information about the construction of the album and the samples used.

- ^ a b c d e f 1987 (What the Fuck Is Going On?) review, Melody Maker, 20 June 1987.
- ^ Transcript of a Bill Drummond interview on "Bomlagadafshipoin" (Norwegian national radio house-music show), September 1991 (link).
- ^ a b c Bush, J., 1987 (What the Fuck Is Going On?) review, Allmusic (link). Retrieved 7 October 2006.
- ^ a b Morton, R., "One Coronation under a Groove", NME, 12 January 1991 (link).
- ^ Further commentary on the production values of The KLF is available in many sources, such as the following reviews of their final album, 1991's The White Room: "the artistic peak of late-'80s acid-house" (Bush, J., Allmusic (link)); "awesome vitality", "more subtle" than previous works (George, Iestyn, Q magazine, March 1991 (link)); Harrison, A., Splendid Magazine (link).
- ^ a b c Cranna, I. 1987 (What the Fuck Is Going On?) review, Q Magazine, July (?) 1987 (link).
- ^ See, for example, Sounds Magazine's "All You Need Is Love" review, 14 March 1987, which comments on the juxtaposition of samples of Samantha Fox and "Ring a Ring O'Roses" to "[highlight] explicitly the depth of contradiction embedded in society's attitude towards death through sex". Similar commentary on the situational use of samples was provided in Melody Maker's review of 1987, 20 June 1987.
- ^ The duo's adoption of themes from The Illuminatus! Trilogy - including their name, The Justified Ancients of Mu Mu - is covered in detail in The KLF and All You Need Is Love (The JAMs song) and is widely referenced in external sources. See, for example: Home, S., "Doctorin' Our Culture", published on the website of The Stewart Home Society (link)
- ^ "Formerly part of Hey Hey We Are Not The Monkees", "Justified and Ancient" entry, The White Room sleevenotes, JAMS CD6, KLF Communications, 1991.
- ^ a b c d 1987 (What the Fuck is Going On?) review, Sounds, 20 June 1987.
- ^ a b c News item, Sounds, 12 September 1987.
- ^ a b Kelly, D., "JAMs on dry bread" (1987 - What The Fuck Is Going On? review), NME, 20 June 1987 (link)
- ^ It would appear that the record was distributed by Rough Trade Distribution but the available sources are not explicit. Bill Drummond told Underground magazine in March 1987 that "we approached Rough Trade but they've not said anything yet." (link). In The Manual (ISBN 0-86359-616-9) the duo said: "Our experience was with Rough Trade. When we went to them with our first record on KLF they didn't want to know. They saw it as something that might sell five hundred copies, the bulk of those going to unsuspecting export accounts. This record then received good reviews in the rock press so they agreed to distribute it. It was not until we were about to record our second LP that they considered it worth their while to handle the manufacturing as well." This is almost certainly a reference to 1987. Manufacture of 1987 was arranged by The JAMs themselves, the record being pressed by MPO in France. (Sources: Sounds Magazine, 9 May 1987; 1987 vinyl inner groove).
- ^ Didcock, Barry, "Bitter Swede symphony", Sunday Herald (Glasgow), 21 October 2001, p4.
- ^ Davage, I., letter from the MCPS to The JAMs, reproduced in "The KLF 1987 Completeist List" [sic], an insert to Who Killed The JAMs?, KLF Communications JAMS LP2, 1988.
- ^ Brown, J., "Thank You For The Music", NME, 17 October 1987, passim.
- ^ a b Smith, M. E., "The Great TUNE Robbery", Melody Maker, 12 December 1987 (link).
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- ^ KLF Communications, advertisement, The Face, April 1988.
- ^ King, S., "Grand Ideas: Part 91", Sounds, 16 April 1988.
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- ^ "Excerpts from Amply Sam(ply) Fox's 'Touch Me'", Melody Maker, 4 July 1987
- ^ "Tate tat and arty", NME, 20 November 1993 (link)

^ a b Hamlyn, Nick, *The Penguin Price Guide for Record & CD Collectors* (Fourth Edition), Penguin Books, 2000, ISBN 0-14-051466-X, p526.  
^ Robbins, I., Trouser Press (link). Retrieved 19 April 2006.  
^ Brown, J., "I Gotta CD" review, NME, 28 November 1987 (link).  
^ The "BPM" values (beats per minute) are taken from the sleeve of 1987. They are presented here as printed on the sleeve and may not be accurate.  
^ "Warning", Sounds, 19 September 1987 (link).  
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The coronation of the British monarch is a ceremony (specifically, initiation rite) in which the monarch of the United Kingdom is formally crowned and invested with regalia. It corresponds to coronation ceremonies that formerly occurred in other European monarchies, which have currently abandoned coronations in favour of inauguration or enthronement ceremonies.

The coronation usually takes place several months after the death of the previous monarch, as it is considered a joyous occasion that would be inappropriate when mourning still continues. This also gives planners enough time to complete the elaborate arrangements required. For example, Elizabeth II was crowned on 2 June 1953, despite having ascended the throne on 6 February 1952, the instant her father died. The throne is not left vacant and the new monarch succeeds the old one immediately.

The ceremony is performed by the Archbishop of Canterbury, the most senior cleric in the Church of England. Other clergy and members of the nobility also have roles; most participants in the ceremony are required to wear ceremonial uniforms or robes. Many other government officials and guests attend, including representatives of foreign countries.

The essential elements of the coronation have remained largely unchanged for the past thousand years. The sovereign is first presented to, and acclaimed by, the people. He or she then swears an oath to uphold the law and the Church. Following that, the monarch is anointed with oil, crowned, and invested with the regalia, before receiving the homage of his or her subjects.

[edit] History

The timing of the coronation has varied throughout British history. The first Norman monarch, William I "The Conqueror", was crowned on the day he became King ~25 December 1066.[1] Most of his successors were crowned within weeks, or even days, of their accession. Edward I was fighting in the Ninth Crusade when he acceded to the throne in 1272; he was crowned soon after his return in 1274.[2] Edward II's coronation, similarly, was delayed by a campaign in Scotland in 1307.[3] Henry VI was only a few months old when he acceded in 1422; he was crowned in 1429, but did not officially assume the reins of government until he was deemed of sufficient age, in 1437.[4] Under the Hanoverian monarchs in the late eighteenth and nineteenth centuries, it was deemed appropriate to extend the waiting period to several months, following a period of mourning for the previous monarch and to allow time for preparation of the ceremony.[5] In the case of every monarch since and including George IV, at least one year has passed between accession and coronation, with the exception of George VI, whose predecessor did not die but abdicated.[6] The coronation date had already been set; planning simply continued with a new monarch.[7]

Since a period of time has often passed between accession and coronation, some monarchs were never crowned. Edward V and Lady Jane Grey were both deposed before they could be crowned, in 1483 and 1553, respectively.[8] Edward VIII also went uncrowned, as he abdicated in 1936 before the end of the customary one-year period between accession and coronation.[6] A monarch, however, accedes to the throne the moment their predecessor dies, not when they are crowned. i.e. "The King is dead. Long live the King." [9]

The Anglo-Saxon monarchs used various locations for their coronations, including Bath, Kingston upon Thames, London, and Winchester. The last Anglo-Saxon monarch, Harold II, was crowned at Westminster Abbey in 1066; the location was preserved for all future coronations.[10] The basic elements of the coronation ceremony have also remained the same for the last thousand years; it was devised in 973 by Dunstan.[5][11] When London was under the control of the French,[12] Henry III was crowned at Gloucester in 1216; he later chose to have a second coronation at Westminster in 1220.[13] Two hundred years later, Henry VI also had two coronations; as King of England in London in 1429, and as King of France in Paris in 1431.[4]

Following the English Civil War, Oliver Cromwell declined the crown but underwent a coronation in all but name in his second investiture as Lord Protector in 1657.[14]

Coronations may be performed for a person other than the reigning monarch. In 1170, Henry the Young King, heir apparent to the throne, was crowned as a second king of England, subordinate to his father Henry II;[15] such coronations were common practice in mediaeval France and Germany, but this is only one of two instances of its kind in England (the other being that of Ecgfrith of Mercia in 796, crowned whilst his father, Offa of Mercia, was still alive).[16] More commonly, a king's wife is crowned as queen consort. If the king is already married at the time of his coronation, a joint coronation of both king and queen may be performed.[5] The first such coronation was of Henry II of England and Eleanor of Aquitaine in 1154; seventeen such coronations have been performed, including that of the co-rulers William III and Mary II.[17] The most recent was that of George VI and the former Elizabeth Bowes-Lyon in 1937. If the king married, or remarried, after his coronation, or if his wife were not crowned with him for some other reason, she might be crowned in a separate ceremony. The first such separate coronation of a queen consort in England was that of Matilda of Flanders in 1068;[18] the last was Anne Boleyn's in 1533.[19] The most recent King to wed post-coronation, Charles II, did not have a separate coronation for his bride, Catherine of Braganza.[20]

Elizabeth II's coronation in 1953 was televised by the British Broadcasting Corporation. Originally only events as far as the choir screen were to be televised live, with the remainder to be filmed and released later after any mishaps were edited out. This would prevent television viewers from seeing most of the main events of the coronation, including the actual crowning, live. This led to controversy in the press, and even questions in Parliament.[21] The decision was subsequently altered, and the entire ceremony televised, with the exception of the anointing and communion, which had also been excluded from photography at the previous coronation. It was not revealed until 30 years later that the about-face was due to the personal intervention of the Queen. It is estimated that over twenty million individuals viewed the programme in the United Kingdom, an audience unprecedented in television history. The coronation greatly increased public interest in televisions.[22]

The monarch is simultaneously crowned as sovereign of multiple nations; Elizabeth II was asked, for example: "Will you solemnly promise and swear to govern the Peoples of the United Kingdom of Great Britain and Northern Ireland, Canada, Australia, New Zealand, the Union of South Africa, Pakistan and Ceylon, and of your Possessions and other Territories to any of them belonging or pertaining, according to their respective laws and customs?"[23]

[edit] Participants

Attendees include foreign and Commonwealth dignitaries as well as Britons, some of whom will participate in the ceremony directly. For Elizabeth II's coronation in 1953, 7,500 guests were squeezed into the Abbey and each person had to make do with a maximum of 18 inches (460 mm) of seating.[24]

[edit] Clergy

The Archbishop of Canterbury, who has precedence over all other clergymen and over all laymen except members of the Royal Family,[25] traditionally officiates at coronations;[26] during his absence, another bishop appointed by the monarch may take his place.[27] There have, however, been several



exceptions. William I was crowned by the Archbishop of York, since the Archbishop of Canterbury had been appointed by the Antipope Benedict X, and this appointment was not recognised as valid by the Pope.[28] Edward II was crowned by the Bishop of Winchester because the Archbishop of Canterbury had been exiled by Edward I.[29] Mary I, a Catholic, refused to be crowned by the Protestant Archbishop Thomas Cranmer; the coronation was instead performed by the Bishop of Winchester.[30] Finally, when James II was deposed and replaced with William III and Mary II jointly, the Archbishop of Canterbury refused to recognise the new Sovereigns; he had to be replaced by the Bishop of London.[31] Hence, in almost all cases where the Archbishop of Canterbury has failed to participate, his place has been taken by a senior cleric: the Archbishop of York is second in precedence, the Bishop of London third, the Bishop of Durham fourth, and the Bishop of Winchester fifth.[25] Elizabeth I was crowned by the Bishop of Carlisle (to whose see is attached no special precedence) because the senior prelates were "either dead, too old and infirm, unacceptable to the queen, or unwilling to serve".[32]

[edit] Great Officers of State

The Great Officers of State traditionally participate during the ceremony. The offices of Lord High Steward and Lord High Constable have not been regularly filled since the 15th and 16th centuries respectively; they are, however, revived for coronation ceremonies.[33][34] The Lord Great Chamberlain enrobes the Sovereign with the ceremonial vestments, with the aid of the Groom of the Robes and the Master (in the case of a king) or Mistress (in the case of a queen) of the Robes.[23]

The Barons of the Cinque Ports also participated in the ceremony. Formerly, the Barons were the Members of the House of Commons representing the Cinque Ports of Hastings, New Romney, Hythe, Dover and Sandwich. Reforms in the nineteenth century, however, integrated the Cinque Ports into a regular constituency system applied throughout the nation. At later coronations, Barons were specially designated from among the city councillors for the specific purpose of attending coronations. Originally, the Barons were charged with bearing a ceremonial canopy over the Sovereign. The last time the Barons performed such a task was at the coronation of George IV in 1821. The Barons did not return for the coronations of William IV (who insisted on a simpler, cheaper ceremonial) and Victoria. At coronations since Victoria's, the Barons have attended the ceremony, but they have not carried canopies.[35]

[edit] Other claims to attend the coronation

Many landowners and other persons have honorific "duties" or privileges at the coronation. Such rights are determined by a special Court of Claims, over which the Lord High Steward traditionally presided. The first recorded Court of Claims was convened in 1377 for the coronation of Richard II. By the Tudor period, the hereditary post of Lord High Steward had merged with the Crown, and so Henry VIII began the modern tradition of naming a temporary Steward for the coronation only, with separate commissioners to carry out the actual work of the court.[33]

In 1952, for example, the Court accepted the claim of the Dean of Westminster to advise the Queen on the proper procedure during the ceremony (for nearly a thousand years he and his predecessor abbots have kept an unpublished Red Book of practices), the claim of the Lord Bishop of Durham and the Lord Bishop of Bath and Wells to walk beside the Queen as she entered and exited the Abbey and to stand on either side of her through the entire coronation ritual, the claim of the Earl of Shrewsbury in his capacity as Lord High Steward of Ireland to carry a white staff, and the claim of the Queen's Scholars of Westminster School to be the first to acclaim the monarch on behalf of the common people (their shouts of "Vivat! Vivat Regina!" were incorporated into an anthem).[36]

[edit] Sovereign's robes

The Sovereign wears a variety of different robes and other garments during the course of the ceremony:

Crimson surcoat â ^ the regular dress during most of the ceremony, worn under all other robes. In 1953, Elizabeth II wore a newly made gown in place of a

surcoat.[37]

Robe of State of crimson velvet or Parliament Robe â ^ the first robe used at a coronation, worn on entry to the Abbey and later at State Openings of Parliament. It consists of an ermine cape and a long crimson velvet train lined with further ermine and decorated with gold lace.[37]

Anointing gown â ^ a simple and austere garment worn during the anointing. It is plain white, bears no decoration and fastens at the back.[37]

Colobium sindonis ("shroud tunic") â ^ the first robe with which the Sovereign is invested. It is a loose white undergarment of fine linen cloth edged with a lace border, open at the sides, sleeveless and cut low at the neck. It symbolises the derivation of Royal authority from the people.[37]

Supertunica â ^ the second robe with which the Sovereign is invested. It is a long coat of gold silk which reaches to the ankles and has wide-flowing sleeves. It is lined with rose-coloured silk, trimmed with gold lace, woven with national symbols and fastened by a sword belt. It derives from the full dress uniform of a consul of the Byzantine Empire.[37]

Robe Royal or Pallium Regale â ^ the main robe worn during the ceremony and used during the Crowning.[23] It is a four-square mantle, lined in crimson silk and decorated with silver coronets, national symbols and silver imperial eagles in the four corners. It is lay, rather than liturgical, in nature.[37]

Stole Royal or armilla â ^ a gold silk scarf which accompanies the Robe Royal, richly and heavily embroidered with gold and silver thread, set with jewels and lined with rose-coloured silk and gold fringing.[37]

Purple surcoat â ^ the counterpart to the crimson surcoat, worn during the final part of the ceremony.[37]

Imperial Robe of purple velvet â ^ the robe worn at the conclusion of the ceremony, on exit from the Abbey. It comprises an embroidered ermine cape with a train of purple silk velvet, trimmed with Canadian ermine and fully lined with pure silk English satin. The purple recalls the imperial robes of Roman Emperors.[37]

In contrast to the history and tradition which surround the Regalia, it is customary for most coronation robes to be newly made for each monarch. The present exceptions are the supertunica and Robe Royal, which both date from the coronation of George IV in 1821.[38]

[edit] Official costume

Several participants in the ceremony wear special costumes, uniforms or robes. Peers' robes comprise a full-length crimson velvet coat, and an ermine cape. Rows of sealskin spots on the cape designate the peer's rank; dukes use four rows, marquesses three and a half, earls three, viscounts two and a half, and barons and lords of Parliament two. Royal dukes use six rows of ermine, ermine on the front of the cape and long trains borne by pages. Peeresses' ranks are designated not by sealskin spots, but by the length of their trains and the width of the ermine edging on the same. For duchesses, the trains are two yards (2Â m) long, for marchionesses one and three-quarters yards, for countesses one and a half yards, for viscountesses one and a quarter yards, and for baronesses and ladies one yard (1Â m). The ermine edgings are five inches (127Â mm) in width for duchesses, four inches (102Â mm) for marchionesses, three inches (76Â mm) for countesses, and two inches for viscountesses, baronesses and ladies. The robes of peers and peeresses are used only during coronations.[39]

[edit] Crowns and coronets

Peers wear coronets, as do most members of the Royal Family; such coronets display heraldic emblems based on rank or association to the monarch. The heir-apparent's coronet displays four crosses-pattÃ alternating with four fleurs-de-lis, surmounted by an arch. The same style, without the arch, is used for the children and siblings of Sovereigns. The coronets of children of the heir-apparent display four fleurs-de-lis, two crosses-pattÃ and two strawberry leaves. A fourth style, including four crosses-pattÃ and four strawberry leaves, is used for the children of the sons and brothers of Sovereigns. The aforementioned coronets are borne instead of any coronets based on peerage dignities. The coronets of dukes show eight strawberry leaves, those of

marquesses four strawberry leaves alternating with four raised silver balls, those of earls eight strawberry leaves alternating with eight raised silver balls, those of viscounts sixteen silver balls and those of barons six silver balls. Peeresses use the same design, except that they appear on smaller circlets than the peers' coronets.[40]

Aside from kings and queens, the only individuals authorised to wear crowns (as opposed to coronets) are the Kings of Arms, the United Kingdom's senior heraldic officials.[41] Garter, Clarenceaux, and Norroy and Ulster Kings of Arms have heraldic jurisdiction over England, Wales and Northern Ireland;[42] Lord Lyon King of Arms is responsible for Scotland.[43] In addition, there is a King of Arms attached to each of the Order of the Bath, Order of St. Michael and St. George and the Order of the British Empire. These have only a ceremonial role, but are authorised by the statutes of their orders to wear the same crown as Garter at a coronation.[44] The crown of a King of Arms is silver-gilt and consists of sixteen acanthus leaves alternating in height, and inscribed with the words *Miserere mei Deus secundum magnam misericordiam tuam* (Latin: "Have mercy on me O God according to Thy great mercy", from Psalm 51).[41] The Lord Lyon King of Arms has worn a crown of this style at all coronations since that of George III. Prior to that he wore a replica of the Crown of Scotland. In 2004 a new replica of this crown was created for use by the Lord Lyon at future coronations.[45]

[edit] Other participants

Along with persons of nobility, the coronation ceremonies are also attended by a wide range of political figures, including the Prime Minister and all members of the Cabinet of the United Kingdom, all Governors-General and Prime Ministers of the Commonwealth realms, all Governors of British Crown Colonies, as well as the Heads of State of dependent nations. Dignitaries and representatives from other nations are also customarily invited.[5]

[edit] Recognition and oath

The Sovereign enters Westminster Abbey wearing the crimson surcoat and the Robe of State of crimson velvet.

Once the Sovereign takes his or her seat on the Chair of Estate, the Garter Principal King of Arms, the Archbishop of Canterbury, the Lord Chancellor, the Lord Great Chamberlain, the Lord High Constable and the Earl Marshal go to the east, south, west and north of the Abbey. At each side, the Archbishop calls for the Recognition of the Sovereign, with the words, "Sirs, I here present unto you ..., your undoubted King. Wherefore all you who are come this day to do your homage and service, are you willing to do the same?" After the people acclaim the Sovereign at each side, the Archbishop administers an oath to the Sovereign.[23] Since the Glorious Revolution, the Coronation Oath Act of 1688 has required, among other things, that the Sovereign "Promise and Sweare to Gouverne the People of this Kingdome of England and the Dominions thereto belonging according to the Statutes in Parlyament Agreed on and the Laws and Customs of the same".[46] The oath has been modified without statutory authority; for example, at the coronation of Elizabeth II, the exchange between the Queen and the Archbishop was as follows:

The Archbishop of Canterbury: "Will you solemnly promise and swear to govern the Peoples of the United Kingdom of Great Britain and Northern Ireland, Canada, Australia, New Zealand, the Union of South Africa, Pakistan and Ceylon, and of your Possessions and other Territories to any of them belonging or pertaining, according to their respective laws and customs?"

The Queen: "I solemnly promise so to do."

The Archbishop of Canterbury: "Will you to your power cause Law and Justice, in Mercy, to be executed in all your judgments?"

The Queen: "I will."

The Archbishop of Canterbury: "Will you to the utmost of your power maintain the Laws of God and the true profession of the Gospel? Will you to the utmost of your power maintain in the United Kingdom the Protestant Reformed Religion established by law? Will you maintain and preserve inviolable the settlement of the Church of England, and the doctrine, worship, discipline, and government

thereof, as by law established in England? And will you preserve unto the Bishops and Clergy of England, and to the Churches there committed to their charge, all such rights and privileges, as by law do or shall appertain to them or any of them?"

The Queen: "All this I promise to do. The things which I have here before promised, I will perform, and keep. So help me God." [23]

The monarch additionally swears an oath to preserve Presbyterian church government in the Church of Scotland. This part of the oath is taken before the coronation. [27]

Once the taking of the oath concludes, an ecclesiastic presents a Bible to the Sovereign, saying "Here is Wisdom; This is the royal Law; These are the lively Oracles of God." [23] The Bible used is a full King James Bible, including the Apocrypha. [47] At Elizabeth II's coronation, the Bible was presented by the Moderator of the General Assembly of the Church of Scotland. Once the Bible is presented, the Holy Communion is celebrated, but the service is interrupted after the Nicene Creed. [23]

[edit] Anointing and crowning

After the Communion service is interrupted, the crimson robe is removed, and the Sovereign proceeds to King Edward's Chair, [23] which has been set in a most prominent position, wearing the anointing gown. (In 1953, King Edward's Chair stood atop a dais of several steps.) [48] This mediaeval chair has a slot in the base into which the Stone of Scone is fitted for the ceremony. Also known as the "stone of destiny", it was used for ancient Scottish coronations until brought to England by Edward I. It has been used for every coronation at Westminster Abbey since. Until 1996 the stone was kept with the chair in Westminster Abbey between coronations, but it was returned that year to Scotland, where it will remain on display in Edinburgh Castle until it is needed for a coronation. [49]

Once seated in this chair, a canopy is held over the monarch's head for the anointing. The duty of acting as canopy-bearers was performed in recent coronations by four Knights of the Garter. [23] This element of the coronation service is considered sacred and is concealed from public gaze; [50] it was not photographed in 1937 or televised in 1953. The Dean of Westminster pours consecrated oil from an eagle-shaped ampulla into a spoon with which the Archbishop of Canterbury anoints the Sovereign on the hands, head, and heart. [23] The filigreed spoon is the only part of the mediaeval crown jewels which survived the commonwealth. [51] The Archbishop concludes by reciting a blessing. [23]

The Sovereign is then enrobed in the colobium sindonis, over which is placed the supertunica. [23]

The Lord Great Chamberlain presents the spurs, [23] which represent chivalry. [51] The Archbishop of Canterbury, assisted by other bishops, then presents the Sword of State to the Sovereign. The Sovereign is then further robed, this time putting the Robe Royal and Stole Royal on top of the supertunica. The Archbishop then delivers several Crown Jewels to the Sovereign. First, he delivers the Orb, [23] a hollow golden sphere set with numerous precious and semi-precious stones. The Orb is surmounted by a cross, representing the rule of Jesus over the world; [52] it is returned to the Altar immediately after being received. [23] Next, the Sovereign receives a ring representing the "marriage" between him or her and the nation. [53] The Sceptre with the Dove (so called because it is surmounted by a dove representing the Holy Spirit) and the Sceptre with the Cross (which incorporates Cullinan I) are delivered to the Sovereign. [54] As the Sovereign holds the two sceptres, the Archbishop of Canterbury places St Edward's Crown on his or her head. All cry "God Save the King [Queen]", placing their coronets and caps on their heads. Cannons are fired from the Tower of London. [23]

[edit] End of the ceremony

The Sovereign is then borne into the Throne. The Archbishops and Bishops swear their fealty, saying "I, N., Archbishop [Bishop] of N., will be faithful and true, and faith and truth will bear unto you, our Sovereign Lord [Lady], King

[Queen] of this Realm and Defender of the Faith, and unto your heirs and successors according to law. So help me God." The peers then proceed to pay their homage, saying "I, N., Duke [Marquess, Earl, Viscount, Baron or Lord] of N., do become your liege man of life and limb, and of earthly worship; and faith and truth will I bear unto you, to live and die, against all manner of folks. So help me God." [23] The clergy pay homage together, led by the Archbishop of Canterbury. Next, members of the Royal Family pay homage individually. The peers are led by the premier peers of their rank: the Dukes by the Premier Duke, the Marquesses by the Premier Marquess, and so forth. [23]

If there is a queen consort, she is anointed and crowned in a simple ceremony immediately after homage is paid. The Communion ceremony interrupted earlier is resumed and completed. [5]

The Sovereign then exits the Coronation Theatre, entering St Edward's Chapel (also within the Abbey), preceded by the bearers of the Sword of State, the Sword of Spiritual Justice, the Sword of Temporal Justice and the Sword of Mercy (the last has a blunt tip). [55] The Crown and Sceptres worn by the Sovereign, as well as all other regalia, are laid at the Altar; [23] the Sovereign removes the Robe Royal and Stole Royal, exchanges the crimson surcoat for the purple surcoat [37] and is enrobed in the Imperial Robe of purple velvet. He or she then wears the Imperial State Crown and takes into his or her hands the Sceptre with the Cross and the Orb and leaves the chapel while all present sing the National Anthem. [23]

Music played at coronations is primarily classical and religiously inspired. The most oft-used piece is Zadok the Priest, a religious composition by George Frideric Handel based on texts from the Bible. The work was commissioned for George II's coronation in 1727, and has featured in every coronation since, an achievement unparalleled by any other piece. Hubert Parry's I Was Glad was written as the entrance anthem for the coronation of Edward VII, and contains a bridge section partway through so that the King's or Queen's Scholars of Westminster School can exercise their right to be the first commoners to acclaim the sovereign, shouting their traditional "vivat"s as he or she enters the coronation theatre. This anthem and Charles Villiers Stanford's Gloria in Excelsis have also been used regularly in recent coronations, as has the national anthem, God Save the Queen (or King). [56] Other composers whose music featured in Elizabeth II's coronation include Sir George Dyson, Gordon Jacob, Sir William Henry Harris, Herbert Howells, Sir William Walton, Samuel Sebastian Wesley, Ralph Vaughan Williams and the Canadian-resident but English-born Healey Willan. [57] Ralph Vaughan Williams suggested that a congregational hymn be included. This was approved by the Archbishop of Canterbury, so Vaughan Williams recast his 1928 setting of the English metrical version of Psalm 100, the Jubilate Deo ("All people that on earth do dwell") for congregation, organ and orchestra: the setting has become ubiquitous at festal occasions in the Anglophone world. [58]

[edit] Coronation banquet

Traditionally, the coronation was immediately followed by a banquet, held in Westminster Hall in the Palace of Westminster (which also serves as the home to the Houses of Parliament). The King or Queen's Champion (the office being held by the Dymoke family in connection with the Manor of Scrivelsby) would ride into the hall on horseback, wearing a knight's armour, with the Lord High Constable riding to his right and the Earl Marshal riding to his left. A herald would then make a proclamation of the readiness of the Champion to fight anyone denying the monarch. After 1800, the form for this was as follows: [59]

"If any person, of what degree soever, high or low, shall deny or gainsay our Sovereign Lord ..., King of the United Kingdom of Great Britain and Ireland, Defender of the Faith, son and next heir unto our Sovereign Lord the last King deceased, to be the right heir to the Imperial Crown of this Realm of Great Britain and Ireland, or that he ought not to enjoy the same; here is his Champion, who saith that he lieth, and is a false traitor, being ready in person to combat with him; and in this quarrel will adventure his life against him, on what day soever he shall be appointed." [59]

The King's Champion would then throw down the gauntlet; the ceremony would be repeated at the centre of the hall and at the High Table (where the Sovereign would be seated). The Sovereign would then drink to the Champion from a gold cup, which he would then present to the latter.[59]

The offices of Chief Butler of England, Grand Carver of England and Master Carver of Scotland were also associated with the coronation banquet.[60]

Banquets have not been held since the coronation of George IV in 1821. George IV's coronation was the most elaborate in history; his brother and successor William IV eliminated the banquet, and William's desire to eliminate the costly banquet has now apparently become the custom.[61] A banquet was considered in 1902 for Edward VII but his sudden illness put a stop to the plans.[60] In 1953, the dish Coronation Chicken was created for the informal meal served to the guests.[26]

[edit] Dates of recent coronations

[edit] Enthronement as Emperor

Victoria assumed the title Empress of India in 1876.[62] A durbar (court) was held at Delhi on 1Â January 1877 to proclaim the assumption of the title. Victoria did not attend personally, but was represented by the Viceroy, Lord Lytton.[63] A similar durbar was held on 1Â January 1903 to celebrate the accession of Edward VII, who was represented by his brother the Duke of Connaught.[64] In 1911, George V also held a coronation durbar; however, he and his wife attended in person. Since it was deemed inappropriate for the Christian anointing and coronation to take place in a largely non-Christian nation, George V was not crowned in India; instead, he wore a crown as he entered the Durbar. The law prohibited the removal of the British Crown Jewels from the United Kingdom; therefore, a separate crown, known as the Imperial Crown of India, was created for him. The Emperor was enthroned, and the Indian princes paid homage to him. Thereafter, certain political decisions, such as the decision to move the capital from Calcutta to Delhi, were announced at the Durbar. The ceremony was not repeated, and the imperial title was abandoned by George VI in 1948 (though India had become independent a year earlier).[65]

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#### [edit] External links

Richard Barre (c. 1130Â â ^ c. 1202) was a medieval English justice, clergyman and scholar. He was educated at the law school of Bologna and entered royal service under King Henry II of England, later working for Henry's son and successor Richard I. He was also briefly in the household of Henry's son Henry the Young King. Barre served the elder Henry as a diplomat and was involved in a minor way with the king's quarrel with Thomas Becket, which earned Barre a condemnation from Becket. After King Henry's death, Barre became a royal justice during Richard's reign and was one of the main judges in the period from 1194 to 1199. After disagreeing with him earlier in his career, Barre was discharged from his judgeship during John's reign as king. Barre was also archdeacon of Ely and the author of a work of biblical extracts dedicated to one of his patrons, William Longchamp, the Bishop of Ely and Chancellor of England.

#### [edit] Early life

Whether Barre was a native of England or of Normandy is unknown, but his surname appears to derive from the Norman village of La Barre, near Bernay, in the present-day department of Eure.[1] He was likely born around 1130[2] and was related to Normandy's Sifrewast family,[a] knights in Berkshire. Barre had a relative, Hugh Barre, who was Archdeacon of Leicester in the 1150s. Barre studied law at Bologna in Italy before 1150 and was a student there with Stephen of Tournai, who became Bishop of Tournai in 1192.[1] Another fellow student wrote a short verse addressed to Barre: "Pontificum causas regumque negocia tractes, Qui tibi divicias deliciasque parant", which translates to "May you manage the causes of bishops and the affairs of kings, Who provide riches and delights for you." [3] After finishing his schooling, Barre seems to have worked for either Robert de Chesney, the Bishop of Lincoln, or Nicholas, Archdeacon of Huntingdon; the main evidence for this is that Barre witnessed charters for both men from 1160 to 1164. By 1165, Barre had joined the household of King Henry II of England.[1]

[edit] Service to King Henry

Barre served King Henry during the king's quarrel with Thomas Becket, the Archbishop of Canterbury, who had gone into exile in 1164 over the dispute about the limits of royal authority over the English Church.[4] Because of Barre's close ties to King Henry, Becket considered him one of the king's "evil counselors", and Barre was the subject of denunciations by the archbishop.[5] In late August 1169, Barre was in Normandy with Henry, where Barre was part of a group of ecclesiastics advising the king on how to resolve the Becket dispute.[6][b] In September 1169, Barre was sent along with two other clerks to Rome to complain about the behaviour of papal envoys during negotiations with Becket held at the beginning of September. The papal negotiators at first agreed to a compromise, but the next day claimed that the proposal was unacceptable. With the failure of the negotiations, Becket restored the sentences of excommunication on a number of royal officials, but Barre was not included among those specifically named even though many of his colleagues were. The historian Frank Barlow argues that Barre was not specifically named in the restoration of excommunications, as Becket considered him already excommunicated because of his association with those under the church's ban.[7]

During January and February 1170 the king sent Barre on a diplomatic mission to the pope in Rome, on a matter related to the king's dispute with Becket.[5] The mission attempted to secure the rescinding of the excommunication of those whom Becket had placed under clerical ban, but it was unsuccessful;[2] rumours circulated that the mission sought and secured papal permission for the coronation of King Henry's eldest living son by someone other than Becket. When Becket protested to Pope Alexander III over this usurpation of the right of the archbishop to crown English kings, Alexander not only stated that no such permission had been granted but threatened to suspend or depose any bishop who crowned Henry's heir.[8] Barlow thinks it possible that Barre received a verbal agreement from the pope in January to allow the coronation, but there is no written evidence that Alexander agreed to allow the coronation in 1170.[9][c]

After Becket's murder in December 1170[4] King Henry sent Barre to Rome, accompanied by the Archbishop of Rouen, the bishops of Avranches and Worcester, and other royal clerks, to plead the royal case with the papacy.[10] The mission's objective was to make it clear to Alexander that Henry had had nothing to do with Becket's murder and that the king was horrified that it had taken place. Barre was at first refused a meeting with Alexander, but eventually the envoys were allowed to meet with the pope.[2] Although the mission was not a complete success, the royal commission did manage to persuade the papacy not to impose an interdict, or ban on clerical rites, on England or to excommunicate the king.[5][11] Shortly afterwards Barre was granted the office of Archdeacon of Lisieux, probably as a reward for his efforts in Rome in 1171.[5] In September he was named a royal justice.[12] He was named chancellor to King Henry's eldest living son Henry for a brief period in 1172 and 1173, but when the younger Henry rebelled against his father and sought refuge at the French royal court, Barre refused to join him in exile and returned to the king's service. Barre took with him the younger Henry's seal.[5]

In addition to the Lisieux archdeaconry, Barre held the prebend of Hurstborne and Burbage in the Diocese of Salisbury from 1177[13] and the prebend of Moreton and Whaddon in the Diocese of Hereford from 1180 through 1184.[14] He continued to hold the archdeaconry at Lisieux until 1188,[15] and was at Lisieux for most of the late 1170s and 1180s.[16] In 1179 he was at Rouen for the display of the body of Saint Romanus and was one of the witnesses to the event. While holding his Norman archdeaconry, he gave land to the abbey of St-Pierre-sur-Dives along with Ralph, Bishop of Lisieux.[17] In 1187, King Henry sent Barre on a diplomatic mission to the continent with letters to the German Emperor, the King of Hungary, and the Emperor at Constantinople, seeking assistance for his projected crusade,[18] but Henry died in 1189 before the crusade could set off.[19]

[edit] Later years and death

After the death of King Henry, Barre joined the service of William Longchamp, the Bishop of Ely, who was justiciar and Lord Chancellor. Longchamp named Barre as Archdeacon of Ely,[20] with the appointment occurring before 4 July 1190.[15] Longchamp sent Barre as a royal justice to the counties near Ely in 1190. However, Longchamp was driven into exile in late 1191 owing to the hostility of the English nobility and Richard's brother Prince John during Richard's absence on the Third Crusade.[21] Longchamp's exile meant that Barre did not serve as a royal justice again until King Richard I returned to England in 1194.[20] Although Longchamp eventually returned to England, he did not return to his diocese, and much of the administration of Ely would have devolved on Barre during Longchamp's absence.[22][d]

Barre was one of the main royal justices between 1194 and 1199.[20] He also served as a lawyer for the new Bishop of Ely, Eustace,[16] who was elected in August 1197.[25] But Barre had incurred the hostility of the king's younger brother Prince John, and when John succeeded Richard as king in 1199, Barre ceased to be employed as a royal justice, instead returning to Ely and business in his clerical office. His last sure mention in the historical record is on 9 August 1202,[26] when he was serving as a judge-delegate for Pope Innocent III,[16] but he may have been alive as late as 1213, as he was part of a papal panel deciding a case that can only be securely dated to between 1198 and 1213.[26] Barre maintained his friendship with Stephen of Tournai, who corresponded with him later in their lives.[27]

[edit] Literary work

Barre wrote a work on the Bible entitled *Compendium de veteri et novo testamento*, which he dedicated to William Longchamp. The work arranged passages from the Bible under topics, and then annotated the passages with marginal notations such as were done with glosses on Roman law.[27] It is still extant in two manuscript (MS) copies, MS British Library Harley 3255, and Lambeth Palace MS 105.[2] The Harley manuscript is shorter than the Lambeth manuscript. Richard Sharpe, a modern historian who studied both works, stated that the Harley manuscript "provides [a] well structured and systematic (though not complete) coverage of the whole Bible." Because of the dedication to William Longchamp as "bishop, legate, and chancellor", it is likely that the work was composed between January 1190 and October 1191, as Longchamp only held those three offices together during that period.[22] The prologue to the work describes it as something to be used privately, and thus Sharpe feels that it was not intended to be a publicly published work; instead Barre may have intended it for Longchamp's private use in preparing sermons.[28]

A third copy of Barre's *Compendium* may have existed at Leicester Abbey, where a late 15th-century library catalogue records a work by Barre on the Bible that the catalogue titles "*Compendium Ricardi Barre super utroque testamento*". The title and contents make this manuscript likely to be a copy of the *Compendium*. The same catalogue also records five books once owned by Barre—copies of Gratian's *Decretum*, Justinian's *Codex*, glossed copies of the *Psalter* and some of the *Epistles of Paul*, as well as Peter Lombard's *Sentences*. Also, another Leicester Abbey manuscript records some satirical verses that were said to have been written by Barre.[28]

^ The Sifrewast family was from Normandy, near the place called now Chiffrevast at Tamerville near Valognes.[2]

^ This group advising the king included two continental archbishops—^ from Rouen and Bordeaux, a number of bishops—^ including all the Norman bishops, other French bishops and an English bishop, and abbots from Norman, Breton, and English monasteries. The assemblage was rounded out by scholars such as Geoffrey of Auxerre and royal clerks such as Geoffrey Ridel and John of Oxford. However, although Gilbert Foliot, one of the main opponents of Becket was in the area, he was not able to consult with the king because he was excommunicate.[6]

^ Alexander had earlier given permission for the coronation, likely in June 1161, but in 1166 Alexander revoked the permission at the instigation of

Becket.[8]

^ The author Duncan Lunan, in an investigative article about the Green Children of Woolpit, argues that Barre married Agnes, one of the mysterious children, and had at least one child by her.[23] No other reference mentions any marriage or children for Barre.[2][15][24]

#### [edit] Citations

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^ a b Huscroft Ruling England pp. 192â ^195

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[edit] Further reading

[edit] External links

Persondata

Name

Barre, Richard

Alternative names

Short description

Archdeacon of Ely; Archdeacon of Lisieux; Royal justice

Date of birth

c. 1130

Place of birth

Date of death

c. 1202

Place of death

Cleveland (pron.: /ˈkliːvəlɪnd/) is a city in the U.S. state of Ohio and is the county seat of Cuyahoga County,[5] the most populous county in the state. The city is located in northeastern Ohio on the southern shore of Lake Erie, approximately 60 miles (97 km) west of the Pennsylvania border. It was founded in 1796 near the mouth of the Cuyahoga River, and became a manufacturing center owing to its location on the lake shore, as well as being connected to numerous canals and railroad lines. Cleveland's economy has diversified sectors that include manufacturing, financial services, healthcare, and biomedical. Cleveland is home to the Rock and Roll Hall of Fame.[6]

As of the 2010 Census, the city proper had a total population of 396,815, making Cleveland the 45th largest city in the United States,[7] and the second largest city in Ohio.[8][9] Greater Cleveland, the Cleveland-Elyria-Mentor Metropolitan Statistical Area, ranked 28th largest in the United States with 2,068,283 people in 2011.[10] Cleveland is part of the larger Cleveland-Akron-Elyria Combined Statistical Area, which in 2011 had a population of 2,871,084, and ranked as the country's 16th largest CSA.[11]

Residents of Cleveland are called "Clevelanders". Nicknames for the city include "The Forest City", "Metropolis of the Western Reserve", "The Rock and Roll Capital of the World", "C-Town", "The Cleve", and the more historical "Sixth City".[12][13][14] Due to Lake Erie's proximity to the city, the Cleveland area is sometimes locally referred to as "The North Coast".[12]

[edit] History

Cleveland obtained its name on July 22, 1796 when surveyors of the Connecticut Land Company laid out Connecticut's Western Reserve into townships and a capital city they named "Cleaveland" after their leader, General Moses Cleaveland. Cleaveland oversaw the plan for what would become the modern downtown area, centered on Public Square, before returning home, never again to visit Ohio. The first settler in Cleaveland was Lorenzo Carter, who built a cabin on the banks of the Cuyahoga River. The Village of Cleaveland was incorporated on December 23, 1814.[9] In spite of the nearby swampy lowlands and harsh winters, its waterfront location proved to be an advantage. The area began rapid growth after the 1832 completion of the Ohio and Erie Canal. This key link between the Ohio River and the Great Lakes connected the city to the Atlantic Ocean via the Erie Canal and later via the St. Lawrence Seaway; and the Gulf of Mexico via the Mississippi River. Growth continued with added railroad links.[15] Cleveland incorporated as a city in 1836.[9]

In 1836, the city, then located only on the eastern banks of the Cuyahoga River, nearly erupted into open warfare with neighboring Ohio City over a bridge connecting the two.[16] Ohio City remained an independent municipality until its annexation by Cleveland in 1854.[9]

The city's prime geographic location as transportation hub on the Great Lakes has played an important role in its development as a commercial center. Cleveland serves as a destination point for iron ore shipped from Minnesota, as well as coal transported by rail. In 1870, John D. Rockefeller founded Standard Oil in Cleveland, and moved its headquarters to New York City in 1885.[17] Cleveland emerged in the early 20th Century as an important American manufacturing center, which included automotive companies such as Peerless, People's,[18] Jordan, and Winton, maker of the first car driven across the U.S.[19] Other manufacturers located in Cleveland produced steam-powered cars, which included White and Gaeth, as well as the electric car company Baker. By 1920, due in large part to the city's economic prosperity, Cleveland became the nation's fifth largest city.[9] The city counted Progressive Era politicians such as the populist Mayor Tom L. Johnson among its leaders. Many prominent Clevelanders from this era are buried in the historic Lake View Cemetery, including President James A. Garfield,[20] and John D. Rockefeller.

In commemoration of the centennial of Cleveland's incorporation as a city, the Great Lakes Exposition debuted in June 1936 along the Lake Erie shore north of downtown. Conceived as a way to energize a city after the Great Depression, it drew four million visitors in its first season, and seven million by the end of its second and final season in September 1937.[21] The exposition was housed on grounds that are now used by the Great Lakes Science Center, the Rock and Roll Hall of Fame and Burke Lakefront Airport, among others.[22] Following World War II, the city experienced a prosperous economy. In sports, the Indians won the 1948 World Series and the Browns dominated professional football in the 1950s. Businesses proclaimed that Cleveland was the "best location in the nation".[23][24][25] In 1940, non-Hispanic whites represented 90.2% of Cleveland's population.[26] The city's population reached its peak of 914,808, and in 1949 Cleveland was named an All-America City for the first time.[27] By the 1960s, the economy slowed, and residents sought new housing in the suburbs,

reflecting the national trends of urban flight and suburban growth.[28]

During the African-American Civil Rights Movement of the 1950s and 1960s, social unrest occurred in Cleveland, resulting in the Hough Riots from July 18, 1966 to July 23, 1966 and the Glenville Shootout from July 23, 1968 to July 25, 1968. In December 1978, Cleveland became the first major American city to enter into a financial default on federal loans since the Great Depression.[9] Suburbanization changed the city in the late 1960s and 1970s, when financial difficulties and a notorious 1969 fire on the Cuyahoga River challenged the city. This, along with the city's struggling professional sports teams, drew negative national press; as a result, Cleveland was often derided as "The Mistake on the Lake".[29]

By the beginning of the 1980s, several factors, including changes in international free trade policies, inflation and the Savings and Loans Crisis contributed to the recession that impacted cities like Cleveland.[30] While unemployment during the period peaked in 1983,[31] Cleveland's rate of 13.8% was higher than the national average due to the closure of several production centers.[32][33][34]

The metropolitan area began a gradual economic recovery under Mayors George Voinovich and Michael R. White. Redevelopment within the city limits has been strongest in the downtown area near the Gateway complex consisting of Progressive Field and Quicken Loans Arena, and near North Coast Harbor including the Rock and Roll Hall of Fame, Cleveland Browns Stadium, and the Great Lakes Science Center. Cleveland has been hailed by local media as the "Comeback City,"[35] while economic development of the inner-city neighborhoods and improvement of the school systems are municipal priorities.[36] In 1999, Cleveland was identified as an emerging global city.[37]

In the 21st century, the city has improved infrastructure, is more diversified, and has invested in the arts. Cleveland is generally considered an example of revitalization. In studies conducted by The Economist in 2005 Cleveland was ranked as one of the most livable cities in the United States,[38] and the city was ranked as the best city for business meetings in the continental U.S.[39] The city's goals include additional neighborhood revitalization and increased funding for public education.[40]

[edit] Geography

[edit] Topography

According to the United States Census Bureau, the city has a total area of 82.47 square miles (213.60 km<sup>2</sup>), of which, 77.70 square miles (201.24 km<sup>2</sup>) is land and 4.77 square miles (12.35 km<sup>2</sup>) is water.[1] The shore of Lake Erie is 569 feet (173 m) above sea level; however, the city lies on a series of irregular bluffs lying roughly parallel to the lake. In Cleveland these bluffs are cut principally by the Cuyahoga River, Big Creek, and Euclid Creek. The land rises quickly from the lakeshore. Public Square, less than a mile (2 km) inland, sits at an elevation of 650 feet (198 m), and Hopkins Airport, only 5 miles (8 km) inland from the lake, is at an elevation of 791 feet (241 m).[41]

[edit] Climate

Typical of the Great Lakes region, Cleveland exhibits a continental climate with four distinct seasons, which lies in the humid continental (Köppen Dfa)[42] zone. Summers are hot and humid while winters are cold and snowy. The Lake Erie shoreline is very close to due east-west from the mouth of the Cuyahoga west to Sandusky, but at the mouth of the Cuyahoga it turns sharply northeast. This feature is the principal contributor to the lake effect snow that is typical in Cleveland (especially on the city's East Side) from mid-November until the surface of Lake Erie freezes, usually in late January or early February. The lake effect also causes a relative differential in geographical snowfall totals across the city: while Hopkins Airport, on the city's far West Side, has only reached 100 inches (254 cm) of snowfall in a season three times since 1968,[43] seasonal totals approaching or exceeding 100 inches (254 cm) are not uncommon as the city ascends into the Heights on the east, where the region known as the 'Snow Belt' begins. Extending from the city's East Side and its suburbs, the Snow Belt reaches up the Lake Erie shore



as far as Buffalo.[44]

The all-time record high in Cleveland of 104 °F (40 °C) was established on June 25, 1988, and the all-time record low of -20 °F (-29 °C) was set on January 19, 1994. On average, July is the warmest month with a mean temperature of 72.8 °F (22.7 °C), and January, with a mean temperature of 27.3 °F (-2.6 °C), is the coldest. Normal yearly precipitation based on the 30-year average from 1981 to 2010 is 39.1 inches (990 mm).[45] The least precipitation occurs on the western side and directly along the lake, and the most occurs in the eastern suburbs. Parts of Geauga County to the east receive over 44 inches (1,100 mm) of liquid precipitation annually.[46]

Occasionally, severe thunderstorms strike Cleveland bringing with them the threat of large hail, damaging winds and tornadoes. The threat is greatest during spring and early summer.

Climate data for Cleveland (Cleveland Airport)

Month

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Year

Record high °F (°C)

73

(23)

74

(23)

83

(28)

88

(31)

92

(33)

104

(40)

103

(39)

102

(39)

101

(38)

90

(32)

82

(28)

77

(25)

104

(40)

Average high °F (°C)

34.2

(1.2)

37.3

(2.9)

46.3  
(7.9)  
58.9  
(14.9)  
69.3  
(20.7)  
78.4  
(25.8)  
82.4  
(28.0)  
80.6  
(27.0)  
73.7  
(23.2)  
62.1  
(16.7)  
50.6  
(10.3)  
38.1  
(3.4)  
59.3  
(15.2)  
Average low  $^{\circ}\text{F}$  ( $^{\circ}\text{C}$ )  
20.5  
( $\hat{\text{a}}$  6.4)  
22.4  
( $\hat{\text{a}}$  5.3)  
29.0  
( $\hat{\text{a}}$  1.7)  
39.3  
(4.1)  
49.0  
(9.4)  
58.7  
(14.8)  
63.2  
(17.3)  
62.0  
(16.7)  
54.9  
(12.7)  
44.2  
(6.8)  
35.7  
(2.1)  
25.3  
( $\hat{\text{a}}$  3.7)  
42.0  
(5.6)  
Record low  $^{\circ}\text{F}$  ( $^{\circ}\text{C}$ )  
 $\hat{\text{a}}$  20  
( $\hat{\text{a}}$  29)  
 $\hat{\text{a}}$  16  
( $\hat{\text{a}}$  27)  
 $\hat{\text{a}}$  5  
( $\hat{\text{a}}$  21)  
10  
( $\hat{\text{a}}$  12)  
25  
( $\hat{\text{a}}$  4)

31  
(â '1)  
41  
(5)  
38  
(3)  
32  
(0)  
19  
(â '7)  
0  
(â '18)  
â '15  
(â '26)  
â '20  
(â '29)

Precipitation inches (mm)

2.71  
(68.8)  
2.33  
(59.2)  
2.93  
(74.4)  
3.49  
(88.6)  
3.65  
(92.7)  
3.43  
(87.1)  
3.45  
(87.6)  
3.51  
(89.2)  
3.81  
(96.8)  
3.07  
(78)  
3.62  
(91.9)  
3.10  
(78.7)  
39.10  
(993.1)

Snowfall inches (cm)

18.9  
(48)  
15.3  
(38.9)  
12.2  
(31)  
3.3  
(8.4)  
0  
(0)  
0  
(0)  
0  
(0)  
0  
(0)

0  
(0)  
.2  
(0.5)  
4.3  
(10.9)  
14.0  
(35.6)  
68.3  
(173.5)

Avg. precipitation days (â ¥ 0.01 in)

17.1  
13.9  
14.2  
14.4  
13.2  
11.1  
10.3  
9.8  
10.0  
11.4  
13.5  
16.0  
154.9

Avg. snowy days (â ¥ 0.1 in)

13.5  
10.0  
7.2  
2.3  
0  
0  
0  
0  
0  
.2  
3.3  
9.9  
46.4

Mean monthly sunshine hours

102.3  
124.3  
167.4  
216.0  
263.5  
294.0  
306.9  
263.5  
219.0  
170.5  
90.0  
68.2  
2,285.6

Source #1: NOAA (1981â ´2010 normals; extremes 1871â ´present)[47]

Source #2: HKO (sun only, 1961â ´1990)[48]

[edit] Cityscape

[edit] Architecture

Cleveland's downtown architecture is diverse. Many of the city's government and civic buildings, including City Hall, the Cuyahoga County Courthouse, the Cleveland Public Library, and Public Auditorium, are clustered around an open mall and share a common neoclassical architecture. Built in the early 20th

century, they are the result of the 1903 Group Plan, and constitute one of the most complete examples of City Beautiful design in the United States.[49] The Terminal Tower, dedicated in 1930, was the tallest building in North America outside New York City until 1964 and the tallest in the city until 1991.[50] It is a prototypical Beaux-Arts skyscraper. The two newer skyscrapers on Public Square, Key Tower (currently the tallest building in Ohio) and the 200 Public Square, combine elements of Art Deco architecture with postmodern designs. Another of Cleveland's architectural treasures is The Arcade (sometimes called the Old Arcade), a five-story arcade built in 1890 and renovated in 2001 as a Hyatt Regency Hotel.[51] Cleveland's landmark ecclesiastical architecture includes the historic Old Stone Church in downtown Cleveland and the onion domed St. Theodosius Russian Orthodox Cathedral in Tremont, along with myriad ethnically inspired Roman Catholic churches.[52]

Running east from Public Square through University Circle is Euclid Avenue, which was known for its prestige and elegance. In the late 1880s, writer Bayard Taylor described it as "the most beautiful street in the world." [53] Known as "Millionaire's Row", Euclid Avenue was world-renowned as the home of such internationally known names as Rockefeller, Hanna, and Hay.[54]

[edit] Parks and gardens

Cleveland is home to four of the parks in the countywide Cleveland Metroparks system, as well as the: Washington Park, Brookside Park and parts of the Rocky River and Washington Reservations. Known locally as the "Emerald Necklace", the Olmsted-inspired Metroparks encircle Cuyahoga county. Included in the system is the Cleveland Metroparks Zoo. Located in Big Creek valley, the zoo contains one of the largest collection of primates in North America.[55] In addition to the Metroparks system, the Cleveland Lakefront State Park district provides public access to Lake Erie.[56] This cooperative between the City of Cleveland and the State of Ohio contains six parks: Edgewater Park, located on the city's near west side between the Shoreway and the lake; East 55th Street Marina, Euclid Beach Park and Gordon Park. The Cleveland Public Parks District is the municipal body that oversees the city's neighborhood parks, the largest of which is the historic Rockefeller Park, notable for its late-19th century historical landmark bridges and Cultural Gardens.[57]

[edit] Neighborhoods

Downtown Cleveland is centered around Public Square and includes a wide range of diversified districts. Downtown Cleveland is home to the traditional Financial District and Civic Center, as well as the distinct Theater District, which is home to Playhouse Square Center. Mixed-use neighborhoods such as the Flats and the Warehouse District are occupied by industrial and office buildings as well as restaurants and bars. The number of downtown housing units in the form of condominiums, lofts, and apartments has been on the increase since 2000. Recent developments include the revival of the Flats, the Euclid Corridor Project, and the developments along East 4th Street.[58][59]

Cleveland residents geographically define themselves in terms of whether they live on the east or west side of the Cuyahoga River.[60] The east side includes the neighborhoods of Buckeye-Shaker, Central, Collinwood, Corlett, Euclid-Green, Fairfax, Forest Hills, Glenville, Payne/Goodrich-Kirtland Park, Hough, Kinsman, Lee Harvard/Seville-Miles, Mount Pleasant, Nottingham, St. Clair-Superior, Union-Miles Park, University Circle, Little Italy, and Woodland Hills. The west side includes the neighborhoods of Brooklyn Centre, Clark-Fulton, Detroit-Shoreway, Cudell, Edgewater, Ohio City, Tremont, Old Brooklyn, Stockyards, West Boulevard, and the four neighborhoods colloquially known as West Park: Kamm's Corners, Jefferson, Puritas-Longmead, and Riverside. Three neighborhoods in the Cuyahoga Valley are sometimes referred to as the south side: Industrial Valley/Duck Island, Slavic Village (North and South Broadway), and Tremont.

Several inner-city neighborhoods have begun to gentrify in recent years. Areas on both the west side (Ohio City, Tremont, Detroit-Shoreway, and Edgewater) and the east side (Collinwood, Hough, Fairfax, and Little Italy) have been successful in attracting increasing numbers of creative class members, which in

turn is spurring new residential development.[61] Furthermore, a live-work zoning overlay for the city's near east side has facilitated the transformation of old industrial buildings into loft spaces for artists.[62]

[edit] Suburbs

Cleveland's older, inner-ring suburbs include Bedford, Bedford Heights, Brook Park, Brooklyn, Brooklyn Heights, Cleveland Heights, Cuyahoga Heights, East Cleveland, Euclid, Fairview Park, Garfield Heights, Lakewood, Linndale, Maple Heights, Newburgh Heights, Parma, Parma Heights, Shaker Heights, South Euclid, University Heights, and Warrensville Heights. Many are members of the Northeast Ohio First Suburbs Consortium.[63]

[edit] Culture

[edit] Performing arts

Cleveland is home to Playhouse Square Center, the second largest performing arts center in the United States behind New York's Lincoln Center.[64]

Playhouse Square includes the State, Palace, Allen, Hanna, and Ohio theaters within what is known as the Theater District of Downtown Cleveland.[65]

Playhouse Square's resident performing arts companies include Cleveland Play House, Opera Cleveland, Cleveland State University Department of Theatre and Dance, and Great Lakes Theater Festival. The center hosts various Broadway musicals, special concerts, speaking engagements, and other events throughout the year.[65]

One Playhouse Square, now the headquarters for Cleveland's public broadcasters, was originally used as the broadcast studios of WJW (AM), where disc jockey Alan Freed first popularized the term "rock and roll".[66] Located between Playhouse Square and University Circle is the and Karamu House, a well-known African American performing and fine arts center, founded in the 1920s.[67]

Cleveland is home to the Cleveland Orchestra, widely considered one of the finest orchestras in the world, and often referred to as the finest in the United States.[68] It is one of the "Big Five" major orchestras in the United States. The Orchestra plays at Severance Hall in University Circle during the winter and at Blossom Music Center in Cuyahoga Falls during the summer.[69] The city is also home to the Cleveland Pops Orchestra.

There are two main art museums in Cleveland. The Cleveland Museum of Art is a major American art museum,[70] with a collection that includes more than 40,000 works of art ranging over 6,000 years, from ancient masterpieces to contemporary pieces. Museum of Contemporary Art Cleveland showcases established and emerging artists, particularly from the Cleveland area, through hosting and producing temporary exhibitions.[71]

The Gordon Square Arts District on Detroit Road, in the Detroit-Shoreway neighborhood, features a movie theater called the Capitol Theatre and an off-off-Broadway playhouse, the Cleveland Public Theatre.

[edit] Film and television

Cleveland has served as the setting for several major studio and independent films. Players from the 1948 Cleveland Indians, winners of the World Series, appear in *The Kid from Cleveland* (1949). Cleveland Municipal Stadium features prominently in both that film and *The Fortune Cookie* (1966); written and directed by Billy Wilder, the picture marked Walter Matthau and Jack Lemmon's first on-screen collaboration and features gameday footage of the 1965 Cleveland Browns. Director Jules Dassin's first American film in nearly twenty years, *Up Tight!* (1968) is set in Cleveland of April 1968 immediately following the assassination of Martin Luther King, Jr. Set in 1930s Cleveland, Sylvester Stallone stars as a warehouse worker who leads the local labor union in *F.I.S.T.* (1978). Paul Simon chose Cleveland as the opening for his first and only venture into filmmaking, *One-Trick Pony* (1980); Simon spent six weeks filming concert scenes at the Cleveland Agora. The boxing-match-turned-riot near the start of *Raging Bull* (1980) takes place at the Cleveland Arena in 1941. Clevelander Jim Jarmusch's critically acclaimed and independently produced *Stranger Than Paradise* (1984)~a deadpan comedy about two New Yorkers who travel to Florida by way of Cleveland~was a favorite of the Cannes Film

Festival, winning the Cam ra d'Or. The cult-classic mockumentary *This Is Spinal Tap* (1984) includes a memorable scene where the parody band gets lost backstage just before performing at a Cleveland rock concert (origin of the phrase "Hello, Cleveland!"). *Howard the Duck* (1986), George Lucas' heavily criticized adaptation of the Marvel comic of the same name, begins with the title character crashing into Cleveland after drifting in outer space. Michael J. Fox and Joan Jett play the sibling leads of a Cleveland rock group in *Light of Day* (1987); directed by Paul Schrader, much of the film was shot in the city. Both *Major League* (1989) and *Major League II* (1994) reflected the actual perennial struggles of the Cleveland Indians during the 1960s, 70s, and 80s. Kevin Bacon stars in *Telling Lies in America* (1997), the semi-autobiographical tale of Clevelander Joe Eszterhas, a former reporter for *The Plain Dealer*. Cleveland serves as the setting for fictitious insurance giant Great Benefit in *The Rainmaker* (1997); in the film, Key Tower doubles as the firm's main headquarters. A group of Cleveland teenagers try to scam their way into a Kiss concert in *Detroit Rock City* (1999), and several key scenes from director Cameron Crowe's *Almost Famous* (2000) are set in Cleveland. Antwone Fisher (2002) recounts the real-life story of the Cleveland native. Brothers Joe and Anthony Russo's native Clevelanders and Case Western Reserve University alumni filmed their comedy *Welcome to Collinwood* (2002) entirely on location in the city. *American Splendor* (2003) the biopic of Harvey Pekar, author of the autobiographical comic of the same name was also filmed on location throughout Cleveland, as was *The Oh in Ohio* (2006). Much of *The Rocker* (2008) is set in the city, and Cleveland native Nathaniel Ayers' life story is told in *The Soloist* (2009). *Kill the Irishman* (2011) follows the real-life turf war in 1970s Cleveland between Irish mobster Danny Greene and the Italian mafia. Most recently, the modern day teenage comedy *Fun Size* (2012) takes place in and around Cleveland on Halloween night.[72][73][74][75][76]

Cleveland has also doubled for other locations in film. The wedding and reception scenes in *The Deer Hunter* (1978), while set in the small Pittsburgh suburb of Clairton, were actually shot in the Cleveland neighborhood of Tremont; U.S. Steel also permitted the production to film in one of its Cleveland mills. Francis Ford Coppola produced *The Escape Artist* (1982), much of which was shot in Downtown Cleveland near City Hall and the Cuyahoga County Courthouse, as well as the Flats. *A Christmas Story* (1983) was set in Indiana, but drew many of its external shots including the Parker family home from Cleveland. *Double Dragon* (1994) filmed in an abandoned warehouse along Cleveland's Lake Erie shoreline, the Flats along the Cuyahoga River and Tower City Center. Much of *Happy Gilmore* (1996) was also shot in Cleveland, and the opening shots of *Air Force One* (1997) were filmed in and above Severance Hall. More recently, a complex chase and battle scene in *Spider-Man 3* (2007), though set in New York City, was actually filmed along Cleveland's Euclid Avenue. Downtown's East 9th Street also doubled for New York in the climactic end sequence of *The Avengers* (2012); in addition, the production shot on Cleveland's Public Square as a fill-in for Stuttgart, Germany. The Greater Cleveland Film Commission works to bring future productions to the Cleveland area.[72][73][74][77]

In television, the city is well known as the setting for the popular network sitcom *The Drew Carey Show* starring Cleveland native Drew Carey. Currently host of *The Price Is Right* and formerly the host of *Whose Line Is It Anyway?*, Carey joins three other Cleveland natives who have hosted prominent national shows talk show pioneer Phil Donahue, former late night host Arsenio Hall, and Family Feud host Steve Harvey, who also starred in the network sitcom *The Steve Harvey Show*. Winner of the premiere season of *The Next Iron Chef*, Cleveland chef Michael Symon regularly appears on the Food Network, while *Crime 360* follows real-life homicide detectives in Cleveland and other U.S. cities. *Hot in Cleveland*, a comedy airing on TV Land, premiered on June 16, 2010.[78][79][80]

[edit] Literature

The American modernist poet Hart Crane was born in nearby Garrettsville, Ohio

in 1899. His adolescence was divided between Cleveland and Akron before moving to New York City, finally in 1916. Aside from factory work during the first world war, he served as reporter to The Plain Dealer for a short period, before achieving recognition in the Modernist literary scene. A diminutive memorial park is dedicated to Crane along the left bank of the Cuyahoga in Cleveland. In University Circle, a historical marker sits at the location of his Cleveland childhood house on E. 115 near the Euclid Ave intersection. On Case Western Reserve University campus, a statue of him stands immediately behind the Kelvin Smith Library.

Langston Hughes, preeminent poet of the Harlem Renaissance and child of an itinerant couple, attended high school in Cleveland in the 1910s.

Cleveland was the home of Joe Shuster and Jerry Siegel, who created the comic book character Superman in 1932. Both attended Glenville High School, and their early collaborations resulted in the creation of "The Man of Steel".[81]D. A. Levy wrote: "Cleveland: The Rectal Eye Visions". Mystery author Richard Montanari's first three novels, Deviant Way, The Violet Hour, and Kiss of Evil are set in Cleveland. Mystery writer, Les Roberts's Milan Jacovich series is also set in Cleveland.

Harlan Ellison, noted author of speculative fiction, was born in Cleveland in 1934; his family subsequently moved to the nearby suburb of Painesville, though Ellison moved back to Cleveland in 1949. As a youngster, he published a series of short stories appearing in the Cleveland News; he also performed in a number of productions for the Cleveland Play House.

[edit] Cuisine

Cleveland's melting pot of immigrant groups and their various culinary traditions have long played an important role in defining the local cuisine. Examples of these can particularly be found in neighborhoods such as Little Italy, Slavic Village, and Tremont.

Local mainstays of Cleveland's cuisine include an abundance of Central and Eastern European contributions, such as kielbasa, stuffed cabbage and pierogies.[82] Cleveland also has plenty of corned beef, with nationally renowned Slyman's, on the near East Side, a perennial winner of various accolades from Esquire Magazine, including being named the best corned beef sandwich in America in 2008.[83] Other famed sandwiches include the Cleveland original, Polish Boy, a local favorite found at many BBQ and Soul food restaurants.[84][82] With its blue-collar roots well intact, and plenty of Lake Erie perch available, the tradition of Friday night fish fries remains alive and thriving in Cleveland, particularly in the church-based settings.[85] The award-winning Great Lakes Brewing Company, located across the street from the historic West Side Market, offers several locally styled beers and ales.[86]

Cleveland is noted in the world of haute cuisine. Famous local figures include chef Michael Symon and food writer Michael Ruhlman, both of whom achieved local and national attentions for their contributions in the culinary world. On November 11, 2007, Symon helped gain the spotlight when he was named "The Next Iron Chef" on the Food Network. In 2007, Ruhlman collaborated with Anthony Bourdain, to do an entire episode of his Anthony Bourdain: No Reservations focusing on Cleveland's restaurant scene.[87]

The national food pressâ ~including publications Gourmet, Food & Wine, Esquire and Playboyâ ~has heaped praise on several Cleveland spots for awards including 'best new restaurant', 'best steakhouse', 'best farm-to-table programs' and 'great new neighborhood eateries'. In early 2008, the Chicago Tribune ran a feature article in its 'Travel' section proclaiming Cleveland, America's "hot new dining city".[87]

[edit] Tourism

FiveÂ miles (8Â km) east of downtown Cleveland is University Circle, a 550-acre (2.2Â km2) concentration of cultural, educational, and medical institutions, including the Cleveland Botanical Garden, Case Western Reserve University, University Hospitals, Severance Hall, the Cleveland Museum of Art, the Cleveland Museum of Natural History, and the Western Reserve Historical Society. A 2011 study by Walk Score ranked Cleveland 17th most walkable of



fifty largest U.S. cities.[88] Cleveland is home to the I. M. Pei-designed Rock and Roll Hall of Fame, located on the Lake Erie waterfront at North Coast Harbor downtown. Neighboring attractions include Cleveland Browns Stadium, the Great Lakes Science Center, the Steamship Mather Museum, and the USS Cod, a World War II submarine.[89] Cleveland has an attraction for visitors and fans of A Christmas Story, A Christmas Story House and Museum to see props, costumes, rooms, photos and everything referenced to a yuletide film classic from the mind of Jean Shepherd. Cleveland is home to many festivals throughout the year. Cultural festivals such as the annual Feast of the Assumption in the Little Italy neighborhood, the Harvest Festival in the Slavic Village neighborhood, and the more recent Cleveland Asian Festival in the Asia Town neighborhood are popular events. Vendors at the West Side Market in Ohio City offer many different ethnic foods for sale. Cleveland hosts an annual parade on Saint Patrick's Day that brings hundreds of thousands to the streets of downtown.[90]

Fashion Week Cleveland, the city's annual fashion event, is one of the few internationally recognized fashion industry happenings in North America.[91] The show is considered by many to be the best in the Midwest—perhaps second only to New York for fashion weeks in the US. In addition to the cultural festivals, Cleveland hosted the CMJ Rock Hall Music Fest, which featured national and local acts, including both established artists and up-and-coming acts, but the festival was discontinued in 2007 due to financial and manpower costs to the Rock Hall.[92] The annual Ingenuity Fest, Notacon and TEDxCLE conference focus on the combination of art and technology.[93][94] The Cleveland International Film Festival has been held annually since 1977, and it drew a record 66,476 people in March 2009.[95] Cleveland also hosts an annual holiday display lighting and celebration, dubbed Winterfest, which is held downtown at the city's historic hub, Public Square.[96]

Cleveland also has the Horseshoe Casino Cleveland. Phase I opened on May 14, 2012 on Public Square, in the historic former Higbee's Building at Tower City Center. Phase II will open along the bend of the Cuyahoga River behind Tower City Center.

The new Greater Cleveland Aquarium is located on the west bank of the Cuyahoga River near Downtown.[97]

[edit] Sports

Cleveland's professional sports teams include the Cleveland Indians (Major League Baseball), Cleveland Browns (National Football League), Cleveland Cavaliers (National Basketball Association), Lake Erie Monsters (American Hockey League), the Cleveland Gladiators (Arena Football League), and the Cleveland Crush (Lingerie Football League). Local sporting facilities include Progressive Field, Cleveland Browns Stadium, Quicken Loans Arena and the Wolstein Center.

The Indians last reached the World Series in 1997, losing to the Florida Marlins, and have not won the series since 1948. Between 1995 and 2001, Progressive Field (then known as Jacobs Field) sold out 455 consecutive games, a Major League Baseball record until it was broken in 2008.[98] The Cavs won the Eastern Conference in 2007, but were defeated in the NBA Finals by the San Antonio Spurs. Although the Browns are historically among the winningest franchises in the NFL, the team has not won a championship since 1964.

The city's failure to win a trophy in any major professional sport since 1964 has earned it a reputation of being a cursed sports city, which ESPN validated by proclaiming Cleveland as its "most tortured sports city" in 2004.[99] In addition, changes in the Cleveland sports landscape have led to further heartbreak and resentment among local fans, the most notable instances being Art Modell's relocation of the Browns to Baltimore after the 1995 season (that franchise became the Ravens, with the current Browns team starting play in 1999), and Akron native LeBron James' decision to leave the Cavaliers in 2010 for the Miami Heat.[100]

A notable Cleveland athlete is Jesse Owens, who grew up in the city after moving from Alabama when he was nine. He participated in the 1936 Summer

Olympics in Berlin, where he achieved international fame by winning four gold medals: one each in the 100 meters, the 200 meters, the long jump, and as part of the 4 x 100 meter relay team.

Cleveland facilities have hosted the Major League Baseball All-Star Game five times, the NBA All-Star Game twice, and the United States Figure Skating Championships four times. The city hosted the Gravity Games, an extreme sports series, from 2002 to 2004, and the Dew Action Sports Tour Right Guard Open in 2007. Cleveland will host the 2014 Gay Games.[101]

[edit] Past teams

The city has been home to several additional professional sports franchises, including a women's basketball team and multiple soccer teams. Cleveland has also been home to several ice hockey franchises, beginning in 1937 with the AHL member Cleveland Barons.[102] The original Barons, although having been the most successful team in AHL history at that point, moved to Jacksonville, Florida, where they subsequently folded after one season.[103] The salient cause of the Barons' move came from Nick Mileti's short-lived WHA franchise, the Cleveland Crusaders, which shared the old Cleveland Arena with the Barons in beginning in 1972.[104] The new league ultimately created a financial disparity that the Barons could not compete with.[105] Local philanthropist George Gund III facilitated the relocation of the NHL's California Golden Seals to Cleveland in 1976 and renamed them the Barons. However, this latest incarnation was short lived, with the team merging with the Minnesota North Stars following the 1977-78 season.[105] In 1992 the Cleveland Lumberjacks of the (also now-defunct) IHL began play, lasting until 2001. Later in 2001, a third incarnation of the Barons was established, this time having returned to the AHL. The Barons moved to Worcester, Massachusetts following the 2006 season.

In 1997 Cleveland was awarded one of the original eight franchises in the WNBA, the Cleveland Rockers.[106] Although the Rockers finished first in the WNBA Eastern Conference on two occasions, they never made an appearance in the WNBA Finals. The team folded in 2003 after the league was unable to find a new owner. Previous owner Gordon Gund had dropped the team from operation, citing financial losses and poor attendance.[107]

From 1978 to 1988, Cleveland was home to the Cleveland Force of the MISL. After the Force folded in 1988 they were replaced by the Cleveland Crunch of the NPSL and MISL, who played from 1989 to 2005. The Crunch won three league championships in the 1990s, being the first Cleveland sports team to win a championship since the 1964 Cleveland Browns. They re-adopted the Force name in 2002 before ceasing operations in 2005.

Outdoor soccer has also been represented in Cleveland via the Cleveland Cobras (1972-Cleveland Stars, 1973-1981 Cobras) of the ASL and the Cleveland Stokers (1967-1968) of the North American Soccer League

The Cleveland City Stars played in the United Soccer Leagues from 2006 to 2009, winning the USL Second Division championship in 2008 before folding after the 2009 season.

[edit] College sports

The headquarters of the Mid-American Conference (MAC) are located in Cleveland. The conference also stages both its men's and women's basketball tournaments at Quicken Loans Arena.

The Cleveland State Vikings men's and women's basketball teams play their home games at the Wolstein Center. The university is considering forming a non-scholarship Division I FCS football program.[108][109][110]

Cleveland's sole remaining daily newspaper is The Plain Dealer. Defunct major newspapers include the Cleveland Press, an afternoon publication which printed its last edition on June 17, 1982; and the Cleveland News, which ceased publication in 1960. Additional newspaper coverage includes the Thursdays-only Sun Post-Herald and Parma Sun Post, which serve a few neighborhoods on the city's west side. The city is also served by Cleveland Magazine, a regional culture magazine published monthly; Crain's Cleveland Business, a weekly business newspaper; Cleveland Jewish News, a weekly Jewish newspaper; and

Cleveland Scene, a free alternative weekly paper which absorbed its competitor, the Cleveland Free Times, in 2008. In addition, nationally distributed rock magazine Alternative Press was founded in Cleveland in 1985, and the publication's headquarters remain based in the city.[111][112][113]

Combined with nearby Akron and Canton, Cleveland is ranked as the 18th-largest television market by Nielsen Media Research (as of 2009<sup>10</sup>). The market is served by 10 stations affiliated with major American networks including: WEWS-TV (ABC), WJW (Fox), WKYC (NBC), WOIO (CBS), WVIZ (PBS), WBNX-TV (The CW), WUAB (MyNetworkTV), WVPX-TV (ION), WQHS-DT (Univision), and WDLI-TV (TBN). The Mike Douglas Show, a nationally syndicated daytime talk show, began in Cleveland in 1961 on KYW-TV (now WKYC), while The Morning Exchange on WEWS-TV served as the model for Good Morning America. Tim Conway and Ernie Anderson first established themselves in Cleveland while working together at KYW-TV and later WJW-TV (now WJW). Anderson both created and performed as the immensely popular Cleveland horror host Ghoulardi on WJW-TV's Shock Theater, and was later succeeded by the long-running late night duo Big Chuck and Lil' John.[114][115][116][117]

Cleveland is directly served by 31 AM and FM radio stations, 22 of which are licensed to the city. News/talk station WTAM serves as the AM flagship for Cleveland's three major sports teams (the Browns, Cavaliers, and Indians), and as such, is frequently among the highest rated stations in the market. Commercial FM music stations consistently account for the rest of Arbitron's top-ten: WAKS (contemporary hit radio), WDOK (adult contemporary), WENZ (mainstream urban), WHLK (adult hits), WGAR-FM (country), WMJI (classic hits), WMMS (active rock), WNCX (classic rock), WQAL (hot adult contemporary), and WZAK (urban adult contemporary). WCPN public radio functions as the local NPR affiliate, and until 2013, classical station WCLV was one of the few remaining commercial outlets in the country. College radio stations include WBWC (Baldwin Wallace University), WCSB (Cleveland State University), WJCU (John Carroll University), and WRUW-FM (Case Western Reserve University). WKRK-FM covers sports via CBS Sports Radio, and serves as the flagship for the Cleveland Gladiators. WKNR covers sports via ESPN Radio, and serves as the flagship for the Lake Erie Monsters; as WJW<sup>11</sup> (AM), the station was once the home of Alan Freed<sup>12</sup> the Cleveland disc-jockey credited with first using and popularizing the term "rock and roll" to describe the music genre. News/talk station WHK was one of the first radio stations to broadcast in the United States and the very first in Ohio; its former sister station, rock station WMMS, dominated Cleveland radio in the 1970s and 80s and was at that time one of the highest rated radio stations in the country. In 1972, WMMS Program Director Billy Bass coined the phrase "The Rock and Roll Capital of the World" to describe Cleveland. In 1987, Playboy named WMMS DJ Kid Leo (Lawrence Travaglini) "The Best Disc Jockey in the Country".[14][118][119][120][121][122]

[edit] Economy

Cleveland's geographic location on the Cuyahoga River and Lake Erie has been key to its growth. The Ohio and Erie Canal coupled with rail links helped establish the city as an important business center. Steel and many other manufactured goods emerged as leading industries.[123]

The city diversified its economy in addition to its manufacturing sector. Cleveland is home to the corporate headquarters of many large companies such as Applied Industrial Technologies, Eaton, Forest City Enterprises, Sherwin-Williams Company and KeyCorp. NASA maintains a facility in Cleveland, the Glenn Research Center. Jones Day, one of the largest law firms in the U.S, began in Cleveland.[124] Cleveland and its surrounding suburbs are also home to several private equity firms including The Riverside Company, Kirtland Capital Partners, Resilience Capital Partners and Primus Capital.[125]

The Duke Realty Corp. is one of the area's largest landlords and holds a large office building portfolio in the southern suburbs.[126][127] In 2007, Cleveland's commercial real estate market experienced rebound with a record pace of purchases,[128][129] with a housing vacancy of ten percent.[130][131]

The Cleveland Clinic is the city's largest private employer with a workforce

of over 37,000 as of 2008.[132] It carries the distinction as being among America's best hospitals with top ratings published in U.S. News & World Report.[133] Cleveland's healthcare sector includes University Hospitals of Cleveland, a renowned center for cancer treatment,[134] and MetroHealth medical center. Cleveland is also noted in the fields of biotechnology and fuel cell research, led by Case Western Reserve University, the Cleveland Clinic, and University Hospitals of Cleveland. Cleveland is among the top recipients of investment for biotech start-ups and research.[135] Case Western Reserve, the Clinic, and University Hospitals have recently announced plans to build a large biotechnology research center and incubator on the site of the former Mt. Sinai Medical Center, creating a research campus to stimulate biotech startup companies that can be spun off from research conducted in the city.[136]

City leaders stepped up efforts to grow the technology sector in the first decade of the 21st century. Former Mayor Jane L. Campbell appointed a "tech czar" whose job is to actively recruit tech companies to the downtown office market, offering connections to the high-speed fiber networks that run underneath downtown streets in several "high-tech offices" focused on the Euclid Avenue area. Cleveland State University hired a Technology Transfer Officer to work full time on cultivating technology transfers from CSU research to marketable ideas and companies in the Cleveland area, and appointed a Vice President for Economic Development to leverage the university's assets in expanding the city's economy. Case Western Reserve University participates in technology initiatives such as the OneCommunity project,[137] a high-speed fiber optic network linking the area's major research centers intended to stimulate growth. OneCommunity's work attracted the attention of Intel and in mid-2005, Cleveland was named an Intel "Worldwide Digital Community" along with Corpus Christi, Texas, Philadelphia, Pennsylvania, and Taipei, Taiwan. This distinction added about \$12 million for marketing to expand regional technology partnerships, create a city-wide WiFi network, and develop a tech economy. In addition to this Intel initiative, in January 2006 a New York-based think tank, the Intelligent Community Forum, selected Cleveland as the sole American city among its seven finalists for the "Intelligent Community of the Year" award. The group announced that it nominated the city for its OneCommunity network with potential broadband applications.[138] The OneCommunity Network is collaborating with Cisco Systems to deploy a cutting-edge wireless network that could provide widespread access to the region. Cisco is testing new technologies in wireless "mesh" networking. OneCommunity and Cisco officially launched the first phase in September 2006, blanketing several square miles of University Circle with wireless connectivity.[139]

[edit] Law and government

Cleveland's position as a center of manufacturing established it as a hotbed of union activity early in its history. While other parts of Ohio, particularly Cincinnati and the southern portion of the state, have historically supported the Republican Party, Cleveland commonly breeds the strongest support in the state for the Democrats;[140] At the local level, elections are nonpartisan. However, Democrats still dominate every level of government. Cleveland is split between two congressional districts. Most of the western part of the city is in the 10th District, represented by Dennis Kucinich. Most of the eastern part of the city, as well as most of downtown, is in the 11th District, represented by Marcia Fudge. Both are Democrats. During the 2004 Presidential election, although George W. Bush carried Ohio by 2.1%, John Kerry carried Cuyahoga County 66.6% to 32.9%,[141] his largest margin in any Ohio county. The city of Cleveland supported Kerry over Bush by the even larger margin of 83.3% to 15.8%.[142] The city of Cleveland operates on the mayor-council (strong mayor) form of government.[143] The mayor is the chief executive of the city, and the office is held in 2010 by Frank G. Jackson. Previous mayors of Cleveland include progressive Democrat Tom L. Johnson, World War I era War Secretary and founder of Baker Hostetler law firm Newton D. Baker, United States Supreme Court Justice Harold Hitz Burton, Republican Senator George V. Voinovich, two-term Ohio Governor and Senator, current Representative Dennis

Kucinich of Ohio's 10th district, Frank J. Lausche, and Carl B. Stokes, the first African American mayor of a major American city.[144] The state of Ohio lost two Congressional seats as a result of the 2010 Census which effects Cleveland's districts in the northeast part of the state.[145]

Based on the Morgan Quitno Press 2008 national crime rankings, Cleveland ranked as the 7th most dangerous city in the nation among US cities with a population of 100,000 to 500,000 and the 11th most dangerous overall.[146] Violent crime from 2005 to 2006 was mostly unchanged nationwide, but increased more than 10% in Cleveland. The murder rate dropped 30% in Cleveland, but was still far above the national average. Property crime from 2005 to 2006 was virtually unchanged across the country and in Cleveland, with larceny-theft down by 7% but burglaries up almost 14%.[147]

In October 2010, Cleveland had two neighborhoods appear on ABC News's list of 'America's 25 Most Dangerous Neighborhoods': both in sections just blocks apart in the city's Central neighborhood on the East Side. Ranked 21st was in the vicinity of Quincy Avenue and E.40th Streets, while an area near E. 55th and Scovill Avenue ranked 2nd in the nation, just behind a section of the East Garfield Park neighborhood in Chicago, which ranked 1st.[148][149]

A study in 1971â ^72 found that although Cleveland's crime rate was significantly lower than other large urban areas, most Cleveland residents feared crime.[150] In the 1980s, gang activity was on the rise, associated with crack cocaine. A task force was formed and was partially successful at reducing gang activity by a combination of removing gang-related graffiti and educating news sources to not name gangs in news reporting.[151]

The distribution of crime in Cleveland is highly heterogeneous. Relatively few crimes take place in downtown Cleveland's business district, but the perception of crime in the downtown has been pointed to by the Greater Cleveland Growth Association[152] as damaging to the city's economy.[153] More affluent areas of Cleveland and its suburbs have lower rates of violent crime than areas of lower socioeconomic status. Statistically speaking, higher incidences of violent crimes have been noted in some parts of Cleveland with higher populations of African Americans, although the causes of these crimes are complex and ambiguous.[154] A study of the relationship between employment access and crime in Cleveland found a strong inverse relationship, with the highest crime rates in areas of the city that had the lowest access to jobs. Furthermore, this relationship was found to be strongest with respect to economic crimes.[155] A study of public housing in Cleveland found that criminals tend to live in areas of higher affluence and move into areas of lower affluence to commit crimes.[156]

[edit] Fire department

Cleveland is protected by the paid firefighters of the Cleveland Division of Fire.[157] The department currently operates out of 27 fire stations in six battalions under the command of six battalion chiefs and one assistant chief per shift.[158] The Division of Fire operates a fire apparatus fleet of 23 engine companies, ten ladder companies, three tower companies, four rescue squad companies, one tactical rescue company, one fireboat, one technical rescue unit, and numerous other special, support, and reserve units. The current chief is Timothy O'Toole.

[edit] Demographics

Historical populations

Census

Pop.

%±

1820

606

â ~

1830

1,075

77.4%

1840

6,071  
464.7%  
1850  
17,034  
180.6%  
1860  
43,417  
154.9%  
1870  
92,829  
113.8%  
1880  
160,146  
72.5%  
1890  
261,353  
63.2%  
1900  
381,768  
46.1%  
1910  
560,663  
46.9%  
1920  
796,841  
42.1%  
1930  
900,429  
13.0%  
1940  
878,336  
â '2.5%  
1950  
914,808  
4.2%  
1960  
876,050  
â '4.2%  
1970  
750,903  
â '14.3%  
1980  
573,822  
â '23.6%  
1990  
505,616  
â '11.9%  
2000  
478,403  
â '5.4%  
2010  
396,815  
â '17.1%  
Est. 2011  
393,806  
[159]  
â '0.8%  
[160][161]  
[edit] 2010 census

As of the census[3] of 2010, there were 396,815 people, 167,490 households,

and 89,821 families residing in the city. The population density was 5,107.0 inhabitants per square mile (1,971.8/km<sup>2</sup>). There were 207,536 housing units at an average density of 2,671.0 per square mile (1,031.3/km<sup>2</sup>). The racial makeup of the city was 37.3% White, 53.3% African American, 0.3% Native American, 1.8% Asian, 4.4% from other races, and 2.8% from two or more races. Hispanic or Latino of any race were 10.0% of the population.

There were 167,490 households out of which 29.7% had children under the age of 18 living with them, 22.4% were married couples living together, 25.3% had a female householder with no husband present, 6.0% had a male householder with no wife present, and 46.4% were non-families. 39.5% of all households were made up of individuals and 10.7% had someone living alone who was 65 years of age or older. The average household size was 2.29 and the average family size was 3.11.

The median age in the city was 35.7 years. 24.6% of residents were under the age of 18; 11% were between the ages of 18 and 24; 26.1% were from 25 to 44; 26.3% were from 45 to 64; and 12% were 65 years of age or older. The gender makeup of the city was 48.0% male and 52.0% female.

[edit] 2000 census

As of the 2000 Census, there were 478,403 people, 190,638 households, and 111,904 families residing in the city. The population density was 6,166.5 people per square mile (2,380.9/km<sup>2</sup>). There were 215,856 housing units at an average density of 2,782.4 per square mile (1,074.3/km<sup>2</sup>). Ethnic groups include Germans (9.2%), Irish (8.2%), Poles (4.8%), Italians (4.6%), and English (2.8%).[162] There are also substantial communities of Slovaks, Hungarians, French, Slovenes,[163]Czechs, Ukrainians, Arabs, Dutch, Scottish, Russian, Scotch Irish, Croats,[164]Puerto Ricans, West Indians, Romanians, Lithuanians, and Greeks.[162] The presence of Hungarians within Cleveland proper was, at one time, so great that the city boasted the highest concentration of Hungarians in the world outside of Budapest.[165] The availability of jobs attracted African Americans from the South. Between 1920 and 1960, the black population of Cleveland increased from 35,000 to 251,000.[166]

Out of 190,638 households, 29.9% have children under the age of 18 living with them, 28.5% were married couples living together, 24.8% had a female householder with no husband present, and 41.3% were nonfamilies. 35.2% of all households were made up of individuals and 11.1% had someone living alone who is 65 years of age or older. The average household size was 2.44 and the average family size was 3.19. The population was spread out with 28.5% under the age of 18, 9.5% from 18 to 24, 30.4% from 25 to 44, 19.0% from 45 to 64, and 12.5% who are 65 years of age or older. The median age was 33 years. For every 100 females there were 90.0 males. For every 100 females age 18 and over, there were 85.2 males.[167]

The median income for a household in the city was \$25,928, and the median income for a family was \$30,286. Males had a median income of \$30,610 versus \$24,214 for females. The per capita income for the city was \$14,291. 26.3% of the population and 22.9% of families were below the poverty line. Out of the total population, 37.6% of those under the age of 18 and 16.8% of those 65 and older were living below the poverty line.[167]

[edit] Education

[edit] Public schools

The Cleveland Metropolitan School District is the largest K-12 district in the state of Ohio, with 127 schools and an enrollment of 55,567 students during the 2006-2007 academic year.[168] It is the only district in Ohio that is under direct control of the mayor, who appoints a school board.[169]

Approximately 1 square mile (2.6 km<sup>2</sup>) of Cleveland, adjacent the Shaker Square neighborhood, is part of the Shaker Heights City School District. The area, which has been a part of the Shaker school district since the 1920s, permits these Cleveland residents to pay the same school taxes as the Shaker residents, as well as vote in the Shaker school board elections.[170]

[edit] Private schools

[edit] Colleges and universities

Cleveland is home to a number of colleges and universities. Most prominent among these is Case Western Reserve University, a world-renowned research and teaching institution located in University Circle. A private university with several prominent graduate programs, CWRU was ranked 37th in the nation in 2012 by U.S. News & World Report.[172] University Circle also contains Cleveland Institute of Art and the Cleveland Institute of Music. Cleveland State University (CSU), based in Downtown Cleveland, is the city's public four-year university. In addition to CSU, downtown hosts the metropolitan campus of Cuyahoga Community College, the county's two-year higher education institution. Ohio Technical College is based in Cleveland.[173]

[edit] Transportation

[edit] Airports

Cleveland Hopkins International Airport is the city's major airport and an international airport that serves as one of the ten main hubs for United Airlines. It holds the distinction of having the first airport-to-downtown rapid transit connection in North America, established in 1968. In 1930, the airport was the site of the first airfield lighting system and the first air traffic control tower. Originally known as Cleveland Municipal Airport, it was the first municipally owned airport in the country. Cleveland Hopkins is a significant regional air freight hub hosting FedEx Express, UPS Airlines, United States Postal Service, and major commercial freight carriers. In addition to Hopkins, Cleveland is served by Burke Lakefront Airport, on the north shore of downtown between Lake Erie and the Shoreway. Burke is primarily a commuter and business airport.[174]

[edit] Seaport

The Port of Cleveland, located at the Cuyahoga River's mouth, is a major bulk freight terminal on Lake Erie, receiving much of the raw materials used by the region's manufacturing industries.[175]

[edit] Railroads

Amtrak, the national passenger rail system, provides service to Cleveland, via the Capitol Limited and Lake Shore Limited routes, which stop at Cleveland Lakefront Station. Cleveland has also been identified as a hub for the proposed Ohio Hub project, which would bring high-speed rail to Ohio.[176] Cleveland hosts several inter-modal freight railroad terminals.[177][178] There have been several proposals for commuter rail in Cleveland, including an ongoing (as of January 2011[179]) study into a Sanduskyâ ^Cleveland line.[180]

[edit] Transit systems

Cleveland has a bus and rail mass transit system operated by the Greater Cleveland Regional Transit Authority (RTA). The rail portion is officially called the RTA Rapid Transit, but local residents refer to it as The Rapid. It consists of two light rail lines, known as the Green and Blue Lines, and a heavy rail line, the Red Line. In 2008, RTA completed the HealthLine, a bus rapid transit line, for which naming rights were purchased by the Cleveland Clinic and University Hospitals. It runs along Euclid Avenue from downtown through University Circle, ending at the Louis Stokes Station at Windermere in East Cleveland.[181] In 2007, the American Public Transportation Association named Cleveland's mass transit system the best in North America.[182]

[edit] Inter-city bus lines

National intercity bus service is provided at a Greyhound station, located just behind the Playhouse Square theater district. Megabus provides service to Cleveland and has a stop outside of Tower City Center in downtown Cleveland.[183] Lakefront Trailways provides regional inter-city bus service to popular destinations from their terminal south of Cleveland in Brook Park.[184] Akron Metro, Brunswick Transit Alternative, Laketran, Lorain County Transit, and Medina County Transit provide connecting bus service to the Greater Cleveland Regional Transit Authority. Geauga County Transit and Portage Area Regional Transportation Authority (PARTA) also offer connecting bus service in their neighboring areas.[185]

Cleveland's road system consists of numbered streets running roughly north-south, and named avenues, which run roughly east-west. The numbered



streets are designated "east" or "west", depending where they lie in relation to Ontario Street, which bisects Public Square.[186] The numbered street system extends beyond the city limits into some suburbs on both the west and east sides. The named avenues that lie both on the east side of the Cuyahoga River and west of Ontario Street receive a "west" designation on street signage. The two downtown avenues which span the Cuyahoga change names on the west side of the river. Superior Avenue becomes Detroit Avenue on the west side, and Carnegie Avenue becomes Lorain Avenue. The bridges that make these connections are often called the Detroitâˆ“Superior Bridge and the Lorainâˆ“Carnegie Bridge.

[edit] Freeways

Three two-digit Interstate highways serve Cleveland directly. Interstate 71 begins just southwest of downtown and is the major route from downtown Cleveland to the airport. I-71 runs through the southwestern suburbs and eventually connects Cleveland with Columbus and Cincinnati. Interstate 77 begins in downtown Cleveland and runs almost due south through the southern suburbs. I-77 sees the least traffic of the three interstates, although it does connect Cleveland to Akron. Interstate 90 connects the two sides of Cleveland, and is the northern terminus for both I-71 and I-77. Running due eastâˆ“west through the west side suburbs, I-90 turns northeast at the junction with and I-490, and is known as the Innerbelt through downtown. At the junction with the Shoreway, I-90 makes a 90-degree turn known in the area as Dead Man's Curve, then continues northeast, entering Lake County near the eastern split with Ohio State Route 2. Cleveland is also served by two three-digit interstates, Interstate 480, which enters Cleveland briefly at a few points and Interstate 490, which connects I-77 with the junction of I-90 and I-71 just south of downtown.[187]

Two other limited-access highways serve Cleveland. The Cleveland Memorial Shoreway carries State Route 2 along its length, and at varying points also carries US 6, US 20 and I-90. The Jennings Freeway (State Route 176) connects I-71 just south of I-90 to I-480 near the suburbs of Parma and Brooklyn Heights. A third highway, the Berea Freeway (State Route 237 in part), connects I-71 to the airport, and forms part of the boundary between Cleveland and Brook Park.[188]

[edit] Sister cities

Cleveland has twenty-two sister cities:[189]

Achill Island, Ireland

Alexandria, Egypt

Bahir Dar, Ethiopia

Bangalore, India

Beit She'an, Israel Since 1995[190]

BraÅŸov, Romania

Bratislava, Slovakia[191]

Cleveland, England, United Kingdom

Conakry, Guinea

Fier, Albania

GdaÅ„sk, Poland since 1990[192]

Guadalajara, Mexico

Ibadan, Nigeria

Klaipėda, Lithuania

Lima, Peru

Ljubljana, Slovenia

Miskolc, Hungary

Nettuno, Italy

Vicenza, Italy

Rouen, France[193]

Segundo Montes, Morazán, El Salvador

Taipei, Republic of China

Volgograd, Russia

[edit] See also

[edit] References

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*Ailanthus altissima* (pron.: /eɪˈæːl ˈnɪːs ˈlɪːtɪsˈmɛ /), [2] commonly known as tree of heaven, ailanthus, or in Standard Chinese as chouchun (Chinese: 臭椿; pinyin: chǒu chūn; literally "foul smelling tree"), is a deciduous tree in the Simaroubaceae family. It is native to both northeast and central China and Taiwan. Unlike other members of the genus *Ailanthus*, it is found in temperate climates rather than the tropics. The tree grows rapidly and is capable of reaching heights of 15 metres (49 ft) in 25 years. However, the species is also short lived and rarely lives more than 50 years.

In China, the tree of heaven has a long and rich history. It was mentioned in the oldest extant Chinese dictionary and listed in countless Chinese medical texts for its purported ability to cure ailments ranging from mental illness to baldness. The roots, leaves and bark are still used today in traditional Chinese medicine, primarily as an astringent. The tree has been grown extensively both in China and abroad as a host plant for the ailanthus silkmoth, a moth involved in silk production. *Ailanthus* has become a part of western culture as well, with the tree serving as the central metaphor and subject matter of the best-selling American novel *A Tree Grows in Brooklyn* by Betty Smith.

The tree was first brought from China to Europe in the 1740s and to the United States in 1784. It was one of the first trees brought west during a time when chinoiserie was dominating European arts, and was initially hailed as a beautiful garden specimen. However, enthusiasm soon waned after gardeners became familiar with its suckering habits and its foul smelling odour. Despite this, it was used extensively as a street tree during much of the 19th century. Outside of Europe and the United States, the plant has been spread to many other areas beyond its native range. In a number of these, it has become an invasive species due to its ability both to colonise disturbed areas quickly, including areas of rubble in war-torn Afghanistan, and to suppress competition

with allelopathic chemicals. It is considered a noxious weed in Australia, the United States, New Zealand and several countries in southern and eastern Europe. The tree also resprouts vigorously when cut, making its eradication difficult and time consuming. In many urban areas, it has acquired the derisive nicknames of "ghetto palm" and "stink tree".

[edit] Description

*A. altissima* is a medium-sized tree that reaches heights between 17 and 27 metres (56 and 90 ft) with a diameter at breast height of about 1 metre (40 in). [3] The bark is smooth and light grey, often becoming somewhat rougher with light tan fissures as the tree ages. The twigs are stout, smooth to lightly pubescent, and reddish or chestnut in colour. They have lenticels as well as heart-shaped leaf scars (i.e. a scar left on the twig after a leaf falls) with many bundle scars (i.e. small marks where the veins of the leaf once connected to the tree) around the edges. The buds are finely pubescent, dome shaped, and partially hidden behind the petiole, though they are completely visible in the dormant season at the sinuses of the leaf scars. [4] The branches are light to dark gray in colour, smooth, lustrous, and containing raised lenticels that become fissures with age. The ends of the branches become pendulous. All parts of the plant have a distinguishing strong odour that is often likened to peanuts, cashews, [5] or rotting cashews. [6]

The leaves are large, odd- or even-pinnately compound, and arranged alternately on the stem. They range in size from 30 to 90 cm (0.98 to 3.0 ft) in length and contain 10–41 leaflets organised in pairs, with the largest leaves found on vigorous young sprouts. The rachis is light to reddish-green with a swollen base. The leaflets are ovate-lanceolate with entire margins, somewhat asymmetric and occasionally not directly opposite to each others. Each leaflet is 5 to 18 cm (2.0 to 7.1 in) long and 2.5 to 5 cm (0.98 to 2.0 in) wide. They have a long tapering end while the bases have two to four teeth, each containing one or more glands at the tip. [4] The leaflets' upper sides are dark green in colour with light green veins, while the undersides are a more whitish green. The petioles are 5 to 12 mm (0.20 to 0.47 in) long. [5] The lobed bases and glands distinguish it from similar sumac species.

The flowers are small and appear in large panicles up to 50 cm (20 in) in length at the end of new shoots. The individual flowers are yellowish green to reddish in colour, each with five petals and sepals. [3] [5] The sepals are cup-shaped, lobed and united while the petals are valvate (i.e. they meet at the edges without overlapping), white and hairy towards the inside. [4] [7] [8] They appear from mid-April in the south of its range to July in the north. *A. altissima* is dioecious, with male and female flowers being borne on different individuals. Male trees produce three to four times as many flowers as the females, making the male flowers more conspicuous. Furthermore, the male plants emit a foul-smelling odour while flowering to attract pollinating insects. Female flowers contain ten (or rarely five through abortion) sterile stamens (stamenoides) with heart-shaped anthers. The pistil is made up of five free carpels (i.e. they are not fused), each containing a single ovule. Their styles are united and slender with star-shaped stigmas. [4] [7] The male flowers are similar in appearance, but they of course lack a pistil and the stamens do function, each being topped with a globular anther and a glandular green disc. [4] The seeds borne on the female trees are 5 mm in diameter and each is encapsulated in a samara that is 2.5 cm long (1 in) and 1 cm (0.39 in) broad, appearing July through August, but can persist on the tree until the next spring. The samara is large and twisted at the tips, making it spin as it falls, assisting wind dispersal, [3] [5] and aiding buoyancy for long-distance dispersal through hydrochory. [9] The females can produce huge amounts of seeds, normally around 30,000 per kilogram (14,000/lb) of tree, [3] and fecundity can be estimated non-destructively through measurements of dbh. [9]

[edit] Taxonomy

The first scientific descriptions of the tree of heaven were made shortly after it was introduced to Europe by the French Jesuit Pierre Nicholas d'Incarville. D'Incarville had sent seeds from Peking via Siberia to his

botanist friend Bernard de Jussieu in the 1740s. The seeds sent by d'Incarville were thought to be from the economically important and similar looking Chinese varnish tree (*Toxicodendron vernicifluum*), which he had observed in the lower Yangtze region, rather than the tree of heaven. D'Incarville attached a note indicating this, which caused much taxonomic confusion over the next few decades. In 1751, Jussieu planted a few seeds in France and sent others on to Philip Miller, the superintendent at the Chelsea Physic Garden, and to Philip C. Webb, the owner of an exotic plant garden in Busbridge, England.[4]

Confusion in naming began when the tree was described by all three men with three different names. In Paris, Linnaeus gave the plant the name *Rhus succedanea*, while it was known commonly as *grand vernis du Japon*. In London the specimens were named by Miller as *Toxicodendron altissima* and in Busbridge it was dubbed in the old classification system as *Rhus Sinese foliis alatis*. There are extant records from the 1750s of disputes over the proper name between Philip Miller and John Ellis, curator of Webb's garden in Busbridge. Rather than the issue being resolved, more names soon appeared for the plant: Jakob Friedrich Ehrhart observed a specimen in Utrecht in 1782 and named it *Rhus cacodendron*. [4]

Light was shed on the taxonomic status of *ailanthus* in 1788 when René Louiche Desfontaines observed the samaras of the Paris specimens, which were still labelled *Rhus succedanea*, and came to the conclusion that the plant was not a sumac. He published an article with an illustrated description and gave it the name *Ailanthus glandulosa*, placing it in the same genus as the tropical species then known as *A. integrifolia* (white siris, now *A. triphysa*). The name is derived from the Ambonese word *ailanto*, meaning "heaven-tree" or "tree reaching for the sky". [4][10] The specific *glandulosa*, referring to the glands on the leaves, persisted until as late as 1957, but it was ultimately made invalid as a later homonym at the species level. [4] The current species name comes from Walter T. Swingle who was employed by the United States Department of Plant Industry. He decided to transfer Miller's older specific name into the genus of Desfontaines, resulting in the accepted name *Ailanthus altissima*. [11] *Altissima* is Latin for "tallest", [12] and refers to the sizes the tree can reach. The plant is sometimes incorrectly cited with the specific epithet in the masculine (*glandulosus* or *altissimus*), which is incorrect since botanical, like Classical Latin, treats most tree names as feminine.

There are three varieties of *A. altissima*:

*A. altissima* var. *altissima*, which is the type variety and is native to mainland China.

*A. altissima* var. *tanakai*, which is endemic to northern Taiwan highlands. It differs from the type in having yellowish bark, odd-pinnate leaves that are also shorter on average at 45 to 60 cm (18 to 24 in) long with only 13 to 25 scythe-like leaflets. [13][14][15] It is listed as endangered in the IUCN Red List of threatened species due to loss of habitat for building and industrial plantations. [16]

*A. altissima* var. *sutchuenensis*, which differs in having red branchlets. [13][14] [edit] Distribution and habitat

*A. altissima* is native to northern and central China, Taiwan [17] and northern Korea. [18] In Taiwan it is present as var. *takanai*. [16] In China it is native to every province except Gansu, Heilongjiang, Hainan, Jilin, Ningxia, Qinghai, Xinjiang, and Tibet. [13]

The tree prefers moist and loamy soils, but is adaptable to a very wide range of soil conditions and pH values. It is drought-hardy, but not tolerant of flooding. It also does not tolerate deep shade. [3] In China it is often found in limestone-rich areas. [14] The tree of heaven is found within a wide range of climatic conditions. [3] In its native range it is found at high altitudes in Taiwan [16] as well as lower ones in mainland China. [4] In the U.S. it is found in arid regions bordering the Great Plains, very wet regions in the southern Appalachians, and cold areas of the lower Rocky Mountains. Prolonged cold and snow cover cause dieback, though the trees re-sprout from the roots. [3]

[edit] As an exotic plant

The earliest introductions of *A. altissima* to countries outside of its native range were to the southern areas of Korea as well as to Japan. It is possible that the tree is native to these areas, but it is generally agreed that the tree was a very early introduction.[19] Within China itself it has also been naturalised beyond its native range in areas such as Qinghai, Ningxia and Xinjiang.[14]

In 1784, not long after Jussieu had sent seeds to England, some were forwarded to the United States by William Hamilton, a gardener in Philadelphia. In both Europe and America it quickly became a favoured ornamental, especially as a street tree, and by 1840 it was available in most nurseries.[4][10] The tree was separately brought to California in the 1890s by Chinese immigrants who came during the California Gold Rush. It has escaped cultivation in all areas where it was introduced, but most extensively in the United States.[17] It has naturalised across much of Europe, including Germany,[20] Austria, Switzerland, the Pannonian region (i.e. southeastern Europe from Italy and Hungary south to Bosnia and Herzegovina) and most countries of the Mediterranean Basin.[18] In Montenegro[21] and Albania[22][23] *A. altissima* is widespread in both rural and urban areas and while in the first it was introduced as an ornamental plant, it very soon invaded native ecosystems with disastrous results and became an invasive species.[21] *Ailanthus* has also been introduced to Argentina,[17] Australia (where it is a declared weed in New South Wales and Victoria),[24] New Zealand (where it is listed under the National Pest Plant Accord and is classed an "unwanted organism"),[25] the Middle East and in some countries in South Asia such as Pakistan.[26]

In North America, *A. altissima* is present from Massachusetts in the east, west to southern Ontario, southwest to Iowa, south to Texas, and east to the north of Florida. On the west coast it is found from New Mexico west to California and north to Washington.[3][17] In the east of its range it grows most extensively in disturbed areas of cities, where it was long ago present as a planted street tree.[4][17] It also grows along roads and railways. For example, a 2003 study in North Carolina found the tree of heaven was present on 1.7% of all highway and railroad edges in the state and had been expanding its range at the rate of 4.76% counties per year.[27] Similarly, another study conducted in southwestern Virginia determined that the tree of heaven is thriving along approximately 30% of the state's interstate highway system length or mileage.[28] It sometimes enters undisturbed areas as well and competes with native plants.[17] In western North America it is most common in mountainous areas around old dwellings and abandoned mining operations.[29][30]

#### [edit] Ecology

*Ailanthus* is an opportunistic plant that thrives in full sun and disturbed areas. It spreads aggressively both by seeds and vegetatively by root sprouts, re-sprouting rapidly after being cut.[3] It is considered a shade-intolerant tree and cannot compete in low-light situations,[31] though it is sometimes found competing with hardwoods, but such competition rather indicates it was present at the time the stand was established.[3] On the other hand, a study in an old-growth hemlock-hardwood forest in New York found that *Ailanthus* was capable of competing successfully with native trees in canopy gaps where only 2 to 15% of full sun was available. The same study characterised the tree as using a "gap-obligate" strategy in order to reach the forest canopy, meaning it grows rapidly during a very short period rather than growing slowly over a long period.[32] It is a short lived tree in any location and rarely lives more than 50 years.[3] *Ailanthus* is among the most pollution-tolerant of tree species, including sulfur dioxide, which it absorbs in its leaves. It can withstand cement dust and fumes from coal tar operations, as well as resist ozone exposure relatively well. Furthermore, high concentrations of mercury have been found built up in tissues of the plant.[17]

*Ailanthus* has been used to re-vegetate areas where acid mine drainage has occurred and it has been shown to tolerate pH levels as low as 4.1 (approximately that of tomato juice). It can withstand very low phosphorus levels and high salinity levels. The drought-tolerance of the tree is strong

due to its ability to effectively store water in its root system.[17] It is frequently found in areas where few trees can survive. The roots are also aggressive enough to cause damage to subterranean sewers and pipes.[4] Along highways it often forms dense thickets in which few other tree species are present, largely due to the toxins it produces to prevent competition.[17]

*Ailanthus* produces an allelopathic chemical called ailanthone, which inhibits the growth of other plants.[33] The inhibitors are strongest in the bark and roots, but are also present in the leaves, wood and seeds of the plant. One study showed that a crude extract of the root bark inhibited 50% of a sample of garden cress (*Lepidium sativum*) seeds from germinating. The same study tested the extract as an herbicide on garden cress, redroot pigweed (*Amaranthus retroflexus*), velvetleaf (*Abutilon theophrastii*), yellow bristlegrass (*Setaria glauca*), barnyard grass (*Echinochloa crusgalli*), pea (*Pisum sativum* cv. Sugar Snap) and maize (*Zea mays* cv. Silver Queen). It proved able to kill nearly 100% of seedlings with the exception of velvetleaf, which showed some resistance.[34] Another experiment showed a water extract of the chemical was either lethal or highly damaging to 11 North American hardwoods and 34 conifers, with the white ash (*Fraxinus americana*) being the only plant not adversely affected.[35] The chemical does not, however, affect the tree of heaven's own seedlings, indicating that *A. altissima* has a defence mechanism to prevent autotoxicity.[33] Resistance in various plant species has been shown to increase with exposure. Populations without prior exposure to the chemicals are most susceptible to them. Seeds produced from exposed plants have also been shown to be more resistant than their unexposed counterparts.[36]

The tree of heaven is a very rapidly growing tree, possibly the fastest growing tree in North America.[37] Growth of one to two metres (3.3 to 6.6 ft) per year for the first four years is considered normal. Shade considerably hampers growth rates. Older trees, while growing much slower, still do so faster than other trees. Studies found that Californian trees grew faster than their East Coast counterparts, and American trees in general grew faster than Chinese ones.[37]

In northern Europe the tree of heaven was not considered naturalised in cities until after the Second World War. This has been attributed to the tree's ability to colonise areas of rubble of destroyed buildings where most other plants would not grow.[18] In addition, the warmer microclimate in cities offers a more suitable habitat than the surrounding rural areas. For example, one study in Germany found the tree of heaven growing in 92% of densely populated areas of Berlin, 25% of its suburbs and only 3% of areas outside the city altogether.[18] In other areas of Europe this is not the case as climates are mild enough for the tree to flourish. It has colonised natural areas in Hungary, for example, and is considered a threat to biodiversity at that country's Aggtelek National Park.[18]

Several species of *Lepidoptera* utilise the leaves of *ailanthus* as food, including the Indian moon moth (*Actias selene*) and the common grass yellow (*Eurema hecabe*). In North America the tree is the host plant for the *ailanthus* webworm (*Atteva aurea*), though this ermine moth is native to Central and South America and originally used other members of the mostly tropical *Simaroubaceae* as its hosts.[38] In its native range *A. altissima* is associated with at least 32 species of arthropods and 13 species of fungi.[14]

Due to the tree of heaven's weedy habit, landowners and other organisations often resort to various methods of control in order to keep its populations in check. For example, the city of Basel in Switzerland has an eradication program for the tree.[18] It can be very difficult to eradicate, however. Means of eradication can be physical, thermal, managerial, biological or chemical. A combination of several of these can be most effective, though they must of course be compatible. All have some positive and negative aspects, but the most effective regimen is generally a mixture of chemical and physical control. It involves the application of foliar or basal herbicides in order to kill existing trees, while either hand pulling or mowing seedlings in order to prevent new growth.[39][note 1]



In addition to its use as an ornamental plant, the tree of heaven is also used for its wood, medicinal properties, and as a host plant to feed silkworms of the moth *Samia cynthia*, which produces silk that is stronger and cheaper than mulberry silk, although with inferior gloss and texture. It is also unable to take dye. This type of silk is known under various names: "pongee", "eri silk" and "Shantung silk", the last name being derived from Shandong Province in China where this silk is often produced. Its production is particularly well known in the Yantai region of that province. The moth has also been introduced in the United States.[4]

The pale yellow, close-grained and satiny wood of *Ailanthus* has been used in cabinet work.[40] It is flexible and well suited to the manufacture of kitchen steamers, which are important in Chinese cuisine for cooking mantou, pastries and rice. Zhejiang Province in eastern China is most famous for producing these steamers.[4] It is also considered a good source of firewood across much of its range as it is moderately hard and heavy, yet readily available.[41] There are problems with using the wood as lumber, however. Because the trees exhibit rapid growth for the first few years, the trunk has uneven texture between the inner and outer wood, which can cause the wood to twist or crack during drying. Techniques have been developed for drying the wood so as to prevent this cracking, allowing it to be commercially harvested. Although the live tree tends to have very flexible wood, the wood is quite hard once properly dried.[42]

#### [edit] Cultivation

Tree of heaven is a popular ornamental tree in China and valued for its tolerance of difficult growing conditions.[14] It was once very popular in cultivation in both Europe and North America, but this popularity dropped, especially in the United States, due to the disagreeable odor of its blossoms and the weediness of its habit. The problem of odor was previously avoided by only selling pistillate plants since only males produce the smell, but a higher seed production also results.[10] Michael Dirr, a noted American horticulturalist and professor at the University of Georgia, reported meeting, in 1982, a grower who could not find any buyers. He further writes (his emphasis):

For most landscaping conditions, it has no value as there are too many trees of superior quality; for impossible conditions this tree has a place; selection could be made for good habit, strong wood and better foliage which would make the tree more satisfactory; I once talked with an architect who tried to buy *Ailanthus* for use along polluted highways but could not find an adequate supply [...]

~ Michael A. Dirr, *Manual of Woody Landscape Plants*[43]

In Europe, however, the tree is still used in the garden to some degree as its habit is generally not as invasive as it is in America. In the United Kingdom it is especially common in London squares, streets, and parks, though it is also frequently found in gardens of southern England and East Anglia. It becomes rare in the north, occurring only infrequently in southern Scotland. It is also rare in Ireland.[44] In Germany the tree is commonly planted in gardens.[20] The tree has furthermore become unpopular in cultivation in the west because it is short-lived and that the trunk soon becomes hollow, making trees more than two feet in diameter unstable in high winds.[40]

A few cultivars exist, but they are not often sold outside of China and probably not at all in North America:

~ "Hongye" ~ The name is Chinese and means "red leaves". As the name implies it has attractive vivid red foliage[45]

~ "Thousand Leaders" [45]

~ "Metro" ~ A male cultivar with a tighter crown than usual and a less weedy habit[46]

~ "Erythrocarpa" ~ The fruits are a striking red[46]

~ "Pendulifolia" ~ Leaves are much longer and hang elegantly[46]

[edit] Medicinal

Nearly every part of *A. altissima* has some application in Chinese traditional medicine. One of the oldest recipes, recorded in a work from 732 AD, is used for treating mental illness. It involved chopped root material, young boys' urine and douchi. After sitting for a day the liquid was strained out and given to the patient over the course of several days.[4]

Another source from 684 AD, during the Tang dynasty and recorded in Li Shizhen's *Compendium of Materia Medica*, states that when the leaves are taken internally, they make one incoherent and sleepy, while when used externally they can be effectively used to treat boils, abscesses and itches. Yet another recipe recorded by Li uses the leaves to treat baldness. This formula calls for young leaves of ailanthus, catalpa and peach tree to be crushed together and the resulting liquid applied to the scalp to stimulate hair growth.[4]

The dried bark, however, is still an officinal drug and is listed in the modern Chinese materia medica as *chun bai pi* (Chinese: 春白皮; pinyin: chūn bái pí), meaning "white bark of spring". Modern works treat it in detail, discussing chemical constituents, how to identify the product and its pharmaceutical uses. It is prepared by felling the tree in fall or spring, stripping the bark and then scraping off the hardest, outermost portion, which is then sun-dried, soaked in water, partially re-dried in a basket and finally cut into strips. The bark is said to have cooling and astringent properties and is primarily used to treat dysentery, intestinal hemorrhage, menorrhagia and spermatorrhea. It is only prescribed in amounts between 4 and 10 grams, so as not to poison the patients. Li's *Compendium* has 18 recipes that call for the bark. Asian and European chemists have found some justification for its medical use as it contains a long list of active chemicals that include quassin and saponin, while ailanthone, the allelopathic chemical in the tree of heaven, is a known antimalarial agent.[47] It is available in most shops dealing in Chinese traditional medicine.[4] A tincture of the root-bark has been used successfully in treating cardiac palpitation, asthma and epilepsy.[7]

The samaras are also used in modern Chinese medicine under the name *feng yan cao* (simplified Chinese: 凤眼草; traditional Chinese: 鳳眼草; pinyin: fēng yǎn cǎo), meaning "herbal phoenix eye". They are used as a hemostatic agent, spermatorrhea and for treating patients with blood in their feces or urine. It was clinically shown to be able to treat trichomoniasis, a vaginal infection caused by the protozoan *Trichomonas vaginalis*. [4] In occident, an extract of the bark sold under the synonym *A. glandulosa* is sometimes used as an herbal remedy for various ailments including cancer.[48]

Anecdotal evidence suggests that the plant may be mildly toxic. The noxious odours have been associated with nausea and headaches, as well as with contact dermatitis reported in both humans and sheep, who also developed weakness and paralysis. It contains a quinone irritant, 2,6-dimethoxybenzoquinone, as well as active quassinoids (ailanthone itself being one) which may account for these effects, but they have, however, proved difficult or impossible to reproduce in humans and goats. In one trial a tincture from the blossom and foliage caused nausea, vomiting and muscular relaxation.[47]

*Ailanthus altissima* swingle has potent anti-anaphylactic and anti-inflammatory properties.[49]

[edit] Culture

In addition to the tree of heaven's various uses, it has also been a part of Chinese culture for many centuries and has more recently attained a similar status in the west. Within the oldest extant Chinese dictionary, the *Erya*, written in the 3rd century BC, the tree of heaven is mentioned second among a list of trees. It was mentioned again in a materia medica compiled during the Tang dynasty in 656 AD. Each work favoured a different character, however, and there is still some debate in the Chinese botanical community as to which character should be used. The current name, *chouchun* (Chinese: 臭椿; pinyin: chǒu chūn), means "stinking spring", and is a relatively new appellation. People living near the lower Yellow River know it by the name *chunshu* (simplified Chinese: 春舒; traditional Chinese: 春樹; pinyin: chūn shū), meaning "spring

tree". The name stems from the fact that *A. altissima* is one of the last trees to come out of dormancy, and as such its leaves coming out would indicate that winter was truly over.[4]

In Chinese literature, ailanthus is often used for two rather extreme metaphors, with a mature tree representing a father and a stump being a spoiled child. This manifests itself occasionally when expressing best wishes to a friend's father and mother in a letter, where one can write "wishing your ailanthus and daylily are strong and happy", with ailanthus metaphorically referring to the father and daylily to the mother. Furthermore, one can scold a child by calling him a "good-for-nothing ailanthus stump sprout", meaning the child is irresponsible. This derives from the literature of Zhuangzi, a Taoist philosopher, who referred to a tree that had developed from a sprout at the stump and was thus unsuitable for carpentry due to its irregular shape. Later scholars associated this tree with ailanthus and applied the metaphor to children who, like stump sprouts of the tree, will not develop into a worthwhile human being if they don't follow rules or traditions.[50]

[edit] United States

The 1943 book *A Tree Grows in Brooklyn* by Betty Smith uses the tree of heaven as its central metaphor, using it as an analogy for the ability to thrive in a difficult environment. At the time as well as now, ailanthus was common in neglected urban areas.[10][51] She writes:

There's a tree that grows in Brooklyn. Some people call it the Tree of Heaven. No matter where its seed falls, it makes a tree which struggles to reach the sky. It grows in boarded up lots and out of neglected rubbish heaps. It grows up out of cellar gratings. It is the only tree that grows out of cement. It grows lushly...survives without sun, water, and seemingly earth. It would be considered beautiful except that there are too many of it.

~A Tree Grows in Brooklyn,~ Introduction

Ailanthus is also sometimes counter-nicknamed "tree from hell" due to its prolific invasiveness and the difficulty in eradicating it.[51][52] In certain parts of the United States, the species has been nicknamed the "ghetto palm" because of its propensity for growing in the inhospitable conditions of urban areas, or on abandoned and poorly maintained properties.[53][54]

Until March 26, 2008, a 60-foot (18 m)-tall member of the species was a prominent "centerpiece" of the sculpture garden at the Noguchi Museum in the borough of Queens in New York City. The tree had been spared by the sculptor Isamu Noguchi when in 1975 he bought the building which would become the museum and cleaned up its back lot. The tree was the only one he left in the yard, and the staff would eat lunch with Noguchi under it. "[I]n a sense, the sculpture garden was designed around the tree", said a former aide to Noguchi, Bonnie Rychlak, who later became the museum curator. By 2008, the old tree was found to be dying and in danger of crashing into the building, which was about to undergo a major renovation. The museum hired the Detroit Tree of Heaven Woodshop, an artists' collective, to use the wood to create benches, sculptures and other amenities in and around the building. The tree's rings were counted, revealing its age to be 75, and museum officials hoped it would regenerate from a sucker.[55]

[edit] Europe

Ingo Vetter, a German artist and professor of fine arts at Umeå University in Sweden, was influenced by the idea of the "ghetto palm" and installed a living ailanthus tree taken from Detroit for an international art show called *Shrinking Cities* at the Kunst-Werke Institute for Contemporary Art in Berlin in 2004.[53][54]

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Mereka Bilang, Saya Monyet! (released internationally as They Say I'm a Monkey!) is a 2008 Indonesian film directed by Djenar Maesa Ayu. Starring Titi Sjuman, Henidar Amroe, and Ray Sahetapi, it tells the life story of Adjeng, who was sexually abused as a child by her mother's boyfriend. Filmed over 18 days after several years of development, the film adapted two of Ayu's short stories from her debut anthology of the same name. Owing to its low budget of Rp 620 million, its cast and crew were mostly amateurs and students, although several established actors appeared at reduced rates.

Mereka Bilang, Saya Monyet! has been described as "anti-Sjuman" because of the disparity between Ayu's more personal directing style and the social realism of her father, Sjumandjaja. Although commercially unsuccessful, the film was well received by critics. It won five national-level awards and was screened at several international film festivals. Two Indonesian publications, Tempo and The Jakarta Post, selected it as among the best films of 2008.

Adjeng (Titi Sjuman) lives alone in an apartment paid for by her boyfriend, a rich businessman (Joko Anwar). A writer of children's stories, she wishes to write short stories for adults; in this, she is mentored by Asmoro (Ray Sahetapi) with whom she is also having sex. Meanwhile, Adjeng's mother (Henidar Amroe) handles various aspects of her life, constantly calling her and visiting without giving notice. This has led Adjeng's friends, Venny (Ayu Dewi) and Andien (Fairuz Faisal), to tease her about her overbearing mother.

When Adjeng goes clubbing with her friends, she drinks too much and vomits, later passing out in a toilet. As she lies with her head on the seat she recalls that, as a child (Nadya Rompies), she had been forced to eat vegetables she had previously vomited. Later, when Andien uses her apartment for a one-night stand, Adjeng peeks and recalls how she had observed her mother having sex with her lover (Bucek Depp), a man who had previously molested Adjeng an act which is not shown explicitly. This background, as well as her recollections of life as a teenager (played by Banyu Bening) at the home of her womanising father (August Melasz) are worked into Adjeng's short story "Lintah" ("Leech").

When Asmoro reads the story, he says that it is unrealistic and that readers need a climax. However, Adjeng insists that reality is unrealistic and that not all victims of rape are willing to call the police. Several days later, while they are lying in bed, Asmoro shows Adjeng that "Lintah" had been published in Kompas. Adjeng's mother, aware of the story's autobiographical nature, is furious and, after going to Adjeng's apartment, blames everything on Adjeng's father abandoning them.

Upset, Adjeng goes out with Venny and Andien, but when the two begin arguing about motherhood Adjeng leaves them both in the street. She then goes to a café to drink with Asmoro, who comforts her. When she returns home she checks her messages, most of which are about the short story. Venny and Andien, meanwhile, return to their families and think of the importance of children.

The following day, Asmoro sees the businessman, Adjeng's boyfriend, leaving her apartment, which puts him in a foul mood. He and Adjeng fight, and Asmoro almost smothers Adjeng with a pillow before saying that they are through. As Adjeng lays on the bed, she recalls how her mother's lover raped her and how her mother murdered him. As the phone rings, Adjeng watches the people from her past going about life in a residential complex, smiles, and returns to writing.

Titi Sjuman as Adjeng, a young writer who was abused as a child  
Banyu Bening as Adjeng as a teenager, while living at her father's house  
Nadya Rompies as Adjeng as a child, while living at her mother's house  
Henidar Amroe as Adjeng's mother, a former actress who is very controlling with her child

Bucek Depp as Adjeng's mother's boyfriend, a musician who molests the young Adjeng

Ray Sahetapy as Asmoro, Adjeng's mentor and lover

Joko Anwar as a businessman, whom Adjeng dates to receive financial support

August Melasz as Adjeng's father, a writer who enjoys womanising and interacts

with his daughter

Jajang C. Noer as Bi Inah, Adjeng's father's maid

Ayu Dewi as Venny, Adjeng's friend who enjoys clubbing and wants to have a child

Fairuz Faisal as Andien, Adjeng's friend who enjoys clubbing and has a child at home

[edit] Production

The film was originally meant to be based on the titular short story "Mereka Bilang, Saya Monyet!" from Djenar Maesa Ayu's 2002 debut, a critically and commercially successful short story anthology of the same name. However, Djenar later chose to base the film on "Lintah" ("Leech") and "Melukis Jendela" ("Painting the Window"), two other stories from the anthology. Ayu had originally not intended to film her stories, but agreed after she was approached by a consortium who offered to fund her. She asked Indra Herlambang, a writer-cum-television personality, to help her write the screenplay as she "never could write stories with a plot", [a] and she needed him to keep her motivated. The two wrote the screenplay over a period of two years, having difficulty finding new investors after the original ones dropped out.

In 2004 Ayu began taking filmmaking classes to prepare herself to direct the film. She also watched several films directed by her father, the director Sjumandjaja, in preparation for production. Production began in October 2006, with some of the film crew including art director Hardiyansah B. Yasin drawn in after Ayu met them at a cafe in South Jakarta and discovered that they were active in the local indie film scene. The group helped collect the Rp 620 million (US\$ 75,000) needed for production; as a cost-saving measure, numerous crew members were film students.

Many of the roles were written with specific actors in mind, with casting for other roles promoted by word of mouth. Titi Sjuman, a lecturer at the Daya Kemang Institute of Art, was cast in the starring role of Adjeng after Ayu and her husband, Sri Aksana Sjuman (Ayu's brother), convinced her. At first she was uncomfortable with some of her scenes and her lack of training, as this was her first film role. However, she received support from her husband, who told her that she should act professionally and that "in a kissing scene ... [her] body should not reject it". The couple also provided the soundtrack for *Mereka Bilang, Saya Monyet!*, including three original songs "When You Smile", "Someday", and "Love, Sadness & Happiness" performed by Sjuman.

Model turned actress Henidar Amroe was chosen to play Adjeng's mother; Ayu later said that the role had been written with her in mind. Although worried about the sexual content of the film, Amroe accepted the role, calling it a "crazy" plot that "read like a foreign movie". The young Adjeng was played by Ayu's daughter, Banyu Bening. Several of the established actors cast, including Jajang C. Noer, Ray Sahetapy, and August Melasz, agreed to appear in the film for less than their usual fee. Shooting took place over 18 days, although 14 had originally been allocated.

[edit] Style and themes

*Mereka Bilang, Saya Monyet!* deals with the after effects of child molestation in a way that the Indonesian magazine *Tempo* describes as an "interesting time control experiment", [b] replete with flashbacks which clearly establish the time frame in which scenes happen. According to Wicaksono Adi, in his review for *Kompas*, Adjeng's writing is her therapy, as it entails constant reconstruction and deconstruction of her troubled past; he posits that this ultimately allows Adjeng to fight back against the authority figures who had troubled her since she was young. In a making-of documentary on the film, Ayu said that she had no moral message or social criticism in mind when creating the film, considering it instead a form of self-exploration. Admitting that the film could be read as a critique of violence against women and children, she said that she could empathise as a woman.

Adi also sees a love-hate relationship between Adjeng and her mother, which results in Adjeng's promiscuity a common act in the *Sastra Wangi* literary movement of which Ayu is considered a part. The relationship between mother and daughter is reflective of themes in the earlier works *Pasir Berbisik*



(Whispering Sands; 2001), by Nan Achnas, and Eliana, Eliana (2003), by Riri Riza. However, unlike the aforementioned films, *Mereka Bilang, Saya Monyet!* did not end with the daughter and mother on divergent paths. The reviewer Totot Indrarto, also writing for Kompas, wrote that Adjeng was the titular "monkey" of the film, being looked down upon by everyone around her; however, those who judge her do not actually know her, thus, in Indrarto's opinion, making them the "monkeys".

A review in Tempo described the film as "anti-Sjuman" owing to the differences in styles between father and daughter. Sjuman's films tended to fall under social realism, while Ayu's debut had more of a personal, symbolic aspect with a touch of surrealism. The film does not show Adjeng's molestation, instead symbolizing it by showing a leech feeding; in one case, when Adjeng is raped in a bathtub, losing her virginity, the scene is represented by blood-red water and numerous leeches feeding.

[edit] Release and reception

*Mereka Bilang, Saya Monyet!* received a wide release on 3 January 2008. Commercially unsuccessful in the country, the film was screened at several international film festivals, including the 2008 Singapore International Film Festival (SIFF), the 2008 Tallinn Black Nights Film Festival in Estonia, and the 2009 Asian Hot Shot Film Festival in Berlin. The film was released on DVD in Indonesia on 9 May 2008 by Jive! Collection, after passing through the censorship board in March. The DVD featured English-language subtitles, English- and Indonesian-language editions of the source short stories, and a behind-the-scenes documentary.

The film received generally positive reviews. Seno Joko Suyono, in a review for Tempo, stated that the cliched plot of family crisis became more interesting with the introduction of sex; he also called the climax "sweet yet disturbing".[c] Later in 2008 the magazine selected *Mereka Bilang, Saya Monyet!* as the best local movie of 2008, writing that Ayu had taken to directing like "a fish that had long floundered on the dry ground and was finally returned to the sea." [d] Iskandar Liem, writing for The Jakarta Post, also listed the film as among the top ten of the year, alongside international works such as Christopher Nolan's *The Dark Knight* and another Indonesian film, Riri Riza's *Laskar Pelangi* (The Rainbow Warriors). He described the film as "unflinching in its brutal honesty and fluid in its visual allegory", welcoming Ayu as "a rebellious new voice" in Indonesia's film industry.

Ening Nurjanah, an organiser of the women-themed film festival V, described *Djenar* as "an example of director who can portray a strong woman in her films", with the film "breaking new ground" in portraying women's sexuality. The Vietnamese-American actor Dustin Nguyen, who judged the film at SIFF, considered the film unexpected and "un-Indonesian", "well made, well acted, but [with] more of a Western sensibility. Lisabonar Rahman, writing for Rolling Stone Indonesia, praised Sjuman's acting and the film's portrayal of Adjeng's background, on which she wrote "the expression of [the background] is very powerful, keeping us speechless from fear";[e] however, she found the sound quality inadequate.

In his review for Kompas, Adi wrote that Ayu had made a well developed and acted film, a "good debut for [Indonesia's] future director", [f] although he considered the cinematography incapable of fully expressing the character's psychological torment. Indrarto described *Mereka Bilang, Saya Monyet!* as interesting despite technical flaws, containing a strong message that viewers should not judge someone or bother them when they are unlikely to know that person's true background.

[edit] Awards

*Mereka Bilang, Saya Monyet!* was nominated for two Golden Screen Awards at the 2008 Indonesian Movie Awards. It also received six Citra Award nominations at the 2009 Indonesian Film Festival (IFF), winning three. *Aria Kusumadewa's Identitas* (Identity; 2009) bested *Mereka Bilang, Saya Monyet!* in Best Film and Best Director, while Joko Anwar's *Pintu Terlarang* (Forbidden Door; 2009) took Best Editing.

^ Original: "Gue juga tahu kapasitas gue, biasanya itu... kalau menulis tidak pernah bisa pakai plot."  
 ^ Original: "... eksperimen permainan waktu yang menarik."  
 ^ Original: "... manis yang justru mengganggu."  
 ^ Original: "... bak seekor ikan yang sudah lama menggelepar di daratan kering yang dicemplungkan ke dalam laut.."  
 ^ Original: "... tuturannya yang sangat kuat terus membuat kita tergugu"  
 ^ Original: "... debut yang bagus untuk sutradara masa depan kita."

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[edit] External links

Sir Paul McCartneyMBE

McCartney performing in England, 2010

Background information

Birth name

James Paul McCartney

Born

(1942-06-18) 18 June 1942 (age 70)Liverpool, England

Genres

Rock, pop, classical, electronica

Occupations

Musician, singer-songwriter, music and film producer, businessman

Instruments

Vocals, bass guitar, guitar, keyboards, drums

Years active

1957âpresent

Labels

Apple, Capitol, Columbia, Decca, Hear Music, Parlophone, Polydor, Swan, Vee-Jay

Associated acts

The Quarrymen, the Beatles, Wings, the Fireman

Website

[www.paulmccartney.com](http://www.paulmccartney.com)

Notable instruments

Sir James Paul McCartney MBE (born 18 June 1942) is an English musician, singer, songwriter, multi-instrumentalist and composer. With John Lennon, George Harrison and Ringo Starr, he gained worldwide fame as a member of the Beatles, and his collaboration with Lennon is one of the most celebrated songwriting partnerships of the 20th century. After the group's break-up, he pursued a solo career, later forming the band Wings with his first wife, Linda, and singer-songwriter Denny Laine.

Guinness World Records described McCartney as the "most successful composer and recording artist of all time", with 60 gold discs and sales of over 100 million albums and 100 million singles, and as the "most successful songwriter"

in United Kingdom chart history.[1] More than 2,200 artists have covered his Beatles song "Yesterday", more than any other song in history. Wings' 1977 release "Mull of Kintyre", is one of the all-time best-selling singles in the UK. Inducted into the Rock and Roll Hall of Fame as a solo artist in March 1999, McCartney has written, or co-written 32 songs that have reached number one on the Billboard Hot 100, and as of 2013[update] he has sold over 15.5 million RIAA-certified units in the United States.

McCartney has released an extensive catalogue of songs as a solo artist and has composed classical and electronic music. He has taken part in projects to promote international charities related to such subjects as animal rights, seal hunting, landmines, vegetarianism, poverty, and music education. McCartney has married three times and is the father of five children.

#### Childhood

McCartney was born on 18 June 1942, in Walton Hospital, Liverpool, England, where his mother, Mary (née Mohin), had qualified to practise as a nurse. His father, James ("Jim") McCartney, was absent from his son's birth due to his work as a volunteer firefighter during World War II. Paul has one younger brother, Michael (born 7 January 1944). Though the children were baptised in their mother's Roman Catholic faith, their father, a former Protestant turned agnostic, felt Catholic schools sacrificed the education of their students for the sake of their religious teachings, so he and Mary did not emphasise religion in the household.[3]

McCartney had attended Stockton Wood Road Primary School from 1947 until 1949, when he transferred to Joseph Williams Junior School due to overcrowding at Stockton.[4] In 1953, he passed the 11-plus exam, with only three others out of ninety examinees, gaining admission to the Liverpool Institute.[5] In 1954, he met schoolmate George Harrison on the bus to the Institute from his suburban home in Speke. Harrison had also passed the exam, meaning he could attend a grammar school rather than a secondary modern school, where most pupils went until becoming eligible to work. The two quickly became friends; McCartney later admitted: "I tended to talk down to him, because he was a year younger." [6]

As the family's primary wage earner, Mary's income as a midwife had enabled them to move into 20 Forthlin Road in Allerton, where they lived until 1964.[7] She rode a bicycle to her patients; McCartney described an early memory of her leaving at "about three in the morning [the] streets ... thick with snow". On 31 October 1956, when McCartney was fourteen, his mother died of an embolism.[9] McCartney's loss later became a point of connection with John Lennon, whose mother, Julia, had died when he was seventeen.

A trumpet player and pianist who led Jim Mac's Jazz Band in the 1920s, McCartney's father kept an upright piano in the front room, and he encouraged his sons to be musical.[nb 1] Jim gave Paul a nickel-plated trumpet for his fourteenth birthday, but when rock and roll became popular on Radio Luxembourg, Paul traded it for a £15 Framus Zenith (model 17) acoustic guitar, rationalising that it would be difficult to sing while playing a trumpet.[14] He found it difficult to play guitar right-handed, but after noticing a poster advertising a Slim Whitman concert and realising that Whitman also played left-handed, he reversed the order of the strings. McCartney wrote his first song, "I Lost My Little Girl", on the Zenith, and composed another early tune that would become "When I'm Sixty-Four" on the piano. Against his father's advice, he took few piano lessons, preferring to learn by ear. Heavily influenced by American rhythm and blues music, Little Richard was his schoolboy idol. "Long Tall Sally" was the first song McCartney performed in public, at a Butlins holiday camp talent competition.[17]

#### Musical career

1957–1960: the Quarrymen

Main article: The Quarrymen

At the age of fifteen, McCartney met Lennon and his band, the Quarrymen, at the St Peter's Church Hall fête in Woolton on 6 July 1957. The Quarrymen played a mix of rock and roll and skiffle, a type of popular music with jazz, blues

and folk influences.[19] The band invited McCartney to join soon afterwards as a rhythm guitarist, and he formed a close working relationship with Lennon. Harrison joined in 1958 as lead guitarist, followed by Lennon's art school friend Stuart Sutcliffe on bass, in 1960. By May 1960, the band had tried several names, including Beatals, Johnny and the Moondogs and the Silver Beetles. They adopted the name the Beatles in August 1960 and recruited drummer Pete Best shortly before a five-engagement residency in Hamburg.

1960â ~1970: the Beatles

Main article: The Beatles

Informally represented by Allan Williams, the Beatles' first booking was for a series of performances in Hamburg, starting in 1960.[23][nb 2] In 1961, Sutcliffe left the band and McCartney reluctantly became their bass player.[25] They recorded professionally for the first time while in Hamburg, credited as the Beat Brothers, as the backing band for English singer Tony Sheridan on the single "My Bonnie". This brought them to the attention of Brian Epstein, a key figure in their subsequent development and success. He became their manager in January 1962. Ringo Starr replaced Best in August, and the band had their first hit, "Love Me Do", in October, becoming popular in the UK in 1963, and in the US a year later. Their fans' hysteria became known as "Beatlemania", and the press sometimes referred to McCartney as the "cute Beatle".[28][nb 3][nb 4]

In 1965, the Beatles released the McCartney composition "Yesterday", featuring a string quartet. Included on the Help! LP, the song was the group's first recorded use of classical music elements and their first recording that involved only a single band member.[31] "Yesterday" became the most covered song in popular music history.[32] Later that year, during recording sessions for the album Rubber Soul, McCartney began to supplant Lennon as the dominant musical force in the band. Musicologist Ian MacDonald wrote, "from [1965]Â ... [McCartney] would be in the ascendant not only as a songwriter, but also as instrumentalist, arranger, producer, and de facto musical director". Critics described Rubber Soul as a significant advance in the refinement and profundity of the band's music and lyrics.[34] Considered a high point in the Beatles catalogue, both Lennon and McCartney claimed lead authorship for the song, "In My Life".[35] McCartney said of the album, "we'd had our cute period, and now it was time to expand." Recording engineer Norman Smith stated that the Rubber Soul sessions exposed indications of increasing contention within the band: "the clash between John and Paul was becoming obviousÂ ... [and] as far as Paul was concerned, George [Harrison] could do no rightâ ~Paul was absolutely finicky."

In 1966, the Beatles released the album Revolver. Featuring sophisticated lyrics, studio experimentation, and an expanded repertoire of musical genres ranging from innovative string arrangements to psychedelic rock, the album marked an artistic leap for the Beatles. The first of three consecutive McCartney A-sides, the single "Paperback Writer" preceded the LP's release.[39] The Beatles produced a short promotional film for the song, and another for its B-side, "Rain". The films, described by Harrison as "the forerunner of videos", aired on The Ed Sullivan Show and Top of the Pops in June 1966.[40] Revolver also included McCartney's "Eleanor Rigby", which featured a string octet. According to Gould, the song is "a neoclassical tour de force ... a true hybrid, conforming to no recognizable style or genre of song".[41] With the exception of some backing vocals, the song included only McCartney's lead vocal and the strings arranged by producer George Martin.[nb 5]

The band gave their final commercial concert at the end of their 1966 US tour. Later that year, McCartney completed his first musical project apart from the groupâ ~a film score for the UK production The Family Way. The score was a collaboration with Martin, who used two McCartney themes to write thirteen variations. The soundtrack failed to chart, but it won McCartney an Ivor Novello Award for Best Instrumental Theme.

Upon the end of the Beatles' performing career, McCartney sensed unease in the band and wanted them to maintain creative productivity. He pressed them to start a new project, which became Sgt. Pepper's Lonely Hearts Club Band, widely

regarded as rock's first concept album.[47] Inspired to create a new persona for the group, to serve as a vehicle for experimentation and to demonstrate to their fans that they had musically matured, McCartney invented the fictional band of the album's title track.[48] As McCartney explained, "We were fed up with being the Beatles. We really hated that fucking four little mop-top approach. We were not boys we were menÂ ... and [we] thought of ourselves as artists rather than just performers."

Starting in November 1966, the band adopted an experimental attitude during recording sessions for the album. According to engineer Geoff Emerick, "the Beatles were looking to go out on a limb, both musically and sonicallyÂ ... we were utilising a lot of tape varispeeding and other manipulation techniquesÂ ... limiters andÂ ... effects like flanging and ADT." [51] Their recording of "A Day in the Life" required a forty-piece orchestra, which Martin and McCartney took turns conducting.[52] The sessions produced the double A-side single "Strawberry Fields Forever"/"Penny Lane" in February 1967, and the LP followed in June.[nb 6] McCartney's "She's Leaving Home" was an orchestral pop song. MacDonald described the track as "[among] the finest work on Sgt. PepperÂ â ~ imperishable popular art of its time." Based on an ink drawing by McCartney, the LP's cover included a collage designed by pop artists Peter Blake and Jann Haworth, featuring the Beatles in costume as the Sgt. Pepper's Lonely Hearts Club Band, standing with a host of celebrities.[55][nb 7] The Beatles' heavy moustaches reflected the growing influence of hippie style trends on the band, while their clothing "spoofed the vogue in Britain for military fashions", wrote Gould.[57] Scholar David Scott Kastan described Sgt. Pepper as "the most important and influential rock-and-roll album ever recorded".

"After Brian diedÂ ... Paul took over and supposedly led us you knowÂ ... we went round in circlesÂ ... We broke up then. That was the disintegration. I thought, 'we've fuckin' had it.'"

â ~John Lennon, Rolling Stone magazine, 1970

Epstein's death in August 1967 created a void, which left the Beatles perplexed and concerned about their future. McCartney, stepping in to fill that void, gradually became the de facto leader and business manager of the group Lennon had once led. His first creative suggestion after this change of leadership was to propose that the band move forward on their plans to produce a film for television, which was to become Magical Mystery Tour. The project was "an administrative nightmare throughout", according to Beatles' historian Mark Lewisohn. McCartney largely directed the film, which brought the group their first unfavourable critical response. However, the film's soundtrack was more successful. Released in the UK as a six-track double extended play disc (EP), and as an identically titled LP in the US, filled out with five of the band's recent singles. The only Capitol compilation later included in the group's official canon of studio albums, the Magical Mystery Tour LP achieved \$8Â million in sales within three weeks of the release, higher initial sales than any other Capitol LP up to that point.

In January 1968, EMI filmed the Beatles for a promotional trailer intended to advertise the animated film Yellow Submarine, loosely based on the imaginary world evoked by McCartney's 1966 composition. Though critics admired the film for its visual style, humour and music, the soundtrack album issued seven months later received a less enthusiastic response.[65] By late 1968, relations within the band were deteriorating. The tension grew while recording The Beatles, commonly known as the White Album.[nb 8] Matters worsened the following year during the Let It Be sessions, when a camera crew filmed McCartney lecturing the group: "We've been very negative since Mr. Epstein passed awayÂ ... we were always fighting [his] discipline a bit, but it's silly

to fight that discipline if it's our own".[68]

In March 1969, McCartney married Linda Eastman, and in August, the couple had their first child, Mary, named after his late mother.[69] For Abbey Road, the band's last recorded album, Martin suggested "a continuously moving piece of music", urging the group to think symphonically. McCartney agreed, but Lennon did not. They eventually compromised, agreeing to McCartney's suggestion: an LP featuring individual songs on side one, and a long medley on side 2.[nb 9]

On 10 April 1970, in the midst of business disagreements with his bandmates, McCartney announced his departure from the group.[72] He filed suit for the band's formal dissolution on 31 December 1970. More legal disputes followed as McCartney's attorneys, his in-laws John and Lee Eastman, fought Lennon, Harrison, and Starr's business manager, Allen Klein, over royalties and creative control. An English court legally dissolved the Beatles on 9 January 1975, though sporadic lawsuits against their record company EMI, Klein, and each other persisted until 1989.[nb 10][nb 11]

1970â ~1981: Wings

Main article: Wings (band)

"I didn't really want to keep going as a solo artistÂ ... so it became obvious that I had to get a band togetherÂ ... Linda and I talked it through and it was like, 'Yeah, but let's not put together a supergroup, let's go back to square one.'"

â ~McCartney

After the Beatles' break-up in 1970, McCartney continued his musical career with his first solo release, McCartney, a US number-one album. Apart from some vocal contributions from Linda, McCartney is a one-man album, with Paul providing compositions, instrumentation and vocals.[78][nb 12] In 1971, he collaborated with Linda and drummer Denny Seiwell on a second album, Ram. A UK number one and a US top five, Ram included the co-written US number-one hit single "Uncle Albert/Admiral Halsey".[80] Later that year, ex-Moody Blues guitarist Denny Laine joined the McCartneys and Seiwell to form the band Wings. McCartney had this to say on the groups's formation: "Wings were always a difficult ideaÂ ... any group having to follow [the Beatles'] success would have a hard jobÂ ... I found myself in that very position. However, it was a choice between going on or finishing, and I loved music too much to think of stopping." [nb 13] In September 1971, the McCartneys' daughter Stella was born, named in honour of Linda's grandmothers, both of whom were named Stella.[83]

Following the addition of guitarist Henry McCullough, Wings' first concert tour began in 1972 with a debut performance in front of an audience of seven hundred at the University of Nottingham. Ten more dates followed as they travelled across the UK in a van during an unannounced tour of universities, during which the band stayed in modest accommodation and received pay in coinage collected from students, while avoiding Beatles songs during their performances.[84] A seven-week, 25-show tour of Europe followed, during which the band played solely Wings and McCartney solo material with the exception of a few covers, including the Little Richard hit "Long Tall Sally", the only song McCartney played during the tour that had previously been recorded by the Beatles. McCartney wanted the tour to avoid large venues; most of the small halls they played had capacities of fewer than 3,000 people. Of his first two post-Beatles tours, McCartney said, "The main thing I didn't want was to come on stage, faced with the whole torment of five rows of press people with little pads, all looking at me and saying, 'Oh well, he is not as good as he was.' So we decided to go out on that university tour which made me less nervousÂ ... by the end of that tour I felt ready for something else, so we went into Europe."

In March 1973, Wings achieved their first US number-one single, "My Love",

included on their second LP, *Red Rose Speedway*, a US number one and UK top five.[87][nb 14] Paul's collaboration with Linda and former Beatles producer Martin resulted in the song "Live and Let Die", which was the theme song for the James Bond film of the same name. Nominated for an Academy Award, the song reached number two in the US and number nine in the UK. It also earned Martin a Grammy for his orchestral arrangement.[88] Music professor and author Vincent Benitez described the track as "symphonic rock at its best".[89][nb 15]

After the departure of McCullough and Seiwell in 1973, the McCartneys and Laine recorded *Band on the Run*. The album was the first of seven platinum Wings LPs. It was a US and UK number one, the band's first to top the charts in both countries and the first ever to reach *Billboard* magazine's charts on three separate occasions. One of the best-selling releases of the decade, it remained on the UK charts for 124 weeks. *Rolling Stone* named it Album of the Year for 1974, and in 1975 it won Grammy Awards for Best Contemporary/Pop Vocal and Best Engineered Album.[92][nb 16] In 1974, Wings achieved a second US number-one single with the title track.[94] The album also included the top-ten hits "Jet" and "Helen Wheels", and earned the 413th spot on *Rolling Stone*'s list of the 500 Greatest Albums of All Time.[95][nb 17]

Wings followed *Band on the Run* with the chart-topping albums *Venus and Mars* (1975) and *Wings at the Speed of Sound* (1976).[97][nb 18] In 1975, they began the fourteen-month *Wings Over the World Tour*, which included stops in the UK, Australia, Europe and the US. The tour marked the first time McCartney performed Beatles songs live with Wings, with five in the two-hour set list: "I've Just Seen a Face", "Yesterday", "Blackbird", "Lady Madonna" and "The Long and Winding Road".[99] Following the second European leg of the tour and extensive rehearsals in London, the group undertook an ambitious US arena tour that yielded the US number-one live triple LP *Wings over America*. [100]

In September 1977, the McCartneys had a third child, a son they named James. In November, the Wings song "Mull of Kintyre", co-written with Laine, was quickly becoming one of the best-selling singles in UK chart history.[101] The most successful single of McCartney's solo career, it achieved double the sales of the previous record holder, "She Loves You", and went on to sell 2.5Â million copies and hold the UK sales record until the 1984 charity single, "Do They Know It's Christmas?".[102][nb 19]

*London Town* (1978) spawned a US number-one single ("With a Little Luck"), and was Wings' best-selling LP since *Band on the Run*, making the top five in both the US and the UK. Critical reception was unfavourable, and McCartney expressed disappointment with the album.[nb 20] *Back to the Egg* (1979) featured McCartney's collaboration with a rock supergroup dubbed "the Rockestra". Credited to Wings, the band included Pete Townshend, David Gilmour, Gary Brooker, John Paul Jones and John Bonham. Though certified platinum, critics panned *Back to the Egg*. [106] Wings completed their final concert tour in 1979, with twenty shows in the UK that included the live debut of the Beatles songs "Got to Get You into My Life", "The Fool on the Hill" and "Let it Be".[107]

In 1980, McCartney released his second solo LP, the self-produced *McCartney II*, which peaked at number one in the UK and number three in the US. As with his first album, he composed and performed it alone.[108] The album contained the song "Coming Up", the live version of which, recorded in Glasgow, Scotland, in 1979 by Wings, became the group's last number-one hit.[109] By 1981, McCartney felt he had accomplished all he could creatively with Wings and decided he needed a change. The group disbanded in April 1981 following disagreements over royalties and salaries.[nb 21][nb 22]

1982â ~1990

In 1982 McCartney collaborated with Stevie Wonder on the Martin-produced number-one hit "Ebony and Ivory", included on McCartney's *Tug of War* LP, and with Michael Jackson on "The Girl Is Mine" from *Thriller*. [114][nb 23] The following year, he and Jackson worked on "Say Say Say", McCartney's most recent US number one as of 2012[update]. McCartney earned his latest UK number one as of 2012[update] with the title track of his LP release that year, "Pipes of Peace". [116][nb 24]



In 1984, McCartney starred in the musical Give My Regards to Broad Street, a feature film he also wrote and produced which included Starr in an acting role. Disparaged by critics, Variety described the film as "characterless, bloodless, and pointless".[118] Roger Ebert awarded it a single star and wrote, "you can safely skip the movie and proceed directly to the soundtrack".[119] The album fared much better, reaching number one in the UK and producing the US top-ten hit single "No More Lonely Nights", featuring David Gilmour on lead guitar.[120] In 1985, Warner Brothers commissioned McCartney to write a song for the comedic feature film Spies Like Us. He composed and recorded the track in four days, with Phil Ramone co-producing.[nb 25] McCartney participated in Live Aid, performing "Let it Be", but technical difficulties rendered his vocals and piano barely audible for the first two verses, punctuated by squeals of feedback. Equipment technicians resolved the problems and David Bowie, Alison Moyet, Pete Townshend and Bob Geldof joined McCartney on stage, receiving an enthusiastic crowd reaction.

McCartney collaborated with Eric Stewart on Press to Play (1986), with Stewart co-writing more than half the songs on the LP.[nb 26] In 1988, McCartney released ~~Đ;Đ;Đ;Đ²Đ° Đ² Đ;Đ;Đ;Đ~~, released only in the Soviet Union, which contained eighteen covers; recorded over the course of two days.[126] In 1989, he joined forces with fellow Merseysiders Gerry Marsden and Holly Johnson to record an updated version of "Ferry Cross the Mersey", for the Hillsborough disaster appeal fund.[nb 27] That same year, he released Flowers in the Dirt; a collaborative effort with Elvis Costello that included musical contributions from Gilmour and Nicky Hopkins.[129][nb 28] McCartney then formed a band consisting of himself and Linda, with Hamish Stuart and Robbie McIntosh on guitars, Paul "Wix" Wickens on keyboards and Chris Whitten on drums.[131] In September 1989, they launched the Paul McCartney World Tour, his first in over a decade. The following year, he released the triple album, Tripping the Live Fantastic, which contained select performances from the tour.[nb 29][nb 30] In 1990, the US publication Amusement Business presented McCartney with an award for the highest grossing show of the year; his two performances at Berkeley earned over \$3.5Â million.[135] He performed for the largest paying stadium audience in history on 21 April 1990, when 184,000 people attended his concert at Maracanãf Stadium in Rio de Janeiro, Brazil.

1991â ^2000

McCartney ventured into orchestral music in 1991, when the Royal Liverpool Philharmonic Society commissioned a musical piece by him to celebrate its sesquicentennial. He collaborated with composer Carl Davis, producing Liverpool Oratorio. The performance featured opera singers Kiri Te Kanawa, Sally Burgess, Jerry Hadley and Willard White, with the Royal Liverpool Philharmonic Orchestra and the choir of Liverpool Cathedral.[137] Reviews were negative. The Guardian was especially critical, describing the music as "afraid of anything approaching a fast tempo", and adding that the piece has "little awareness of the need for recurrent ideas that will bind the work into a whole". The paper published a letter McCartney submitted in response in which he stated, "happily, history shows that many good pieces of music were not liked by the critics of the time so I am content toÂ ... let people judge for themselves the merits of the work."The New York Times was slightly more generous, stating, "There are moments of beauty and pleasure in this dramatic miscellanyÂ ... the music's innocent sincerity makes it difficult to be put off by its ambitions".[139] Performed around the world after its London premiere, the Liverpool Oratorio reached number one on the UK classical chart, Music Week.[140]

In 1991, McCartney performed a selection of acoustic-only songs on MTV Unplugged and released a live album of the performance titled Unplugged (The Official Bootleg).[141][nb 31] During the 1990s, McCartney collaborated twice with Youth of Killing Joke as the musical duo "the Fireman". The two released their first electronica album together, Strawberries Oceans Ships Forest, in 1993. McCartney released the rock album, Off the Ground, in 1993.[nb 32] The subsequent New World Tour followed, which led to the release of the Paul Is

Live album later that year.[146][nb 33][nb 34]

Starting in 1994, McCartney took a four-year break from his solo career to work on Apple's Beatles Anthology project with Harrison, Starr and Martin. He recorded a radio series called Oobu Joobu in 1995 for the American network Westwood One, which he described as "widescreen radio". Also in 1995, Prince Charles presented him with an Honorary Fellowship of the Royal College of Music "kind of amazing for somebody who doesn't read a note of music", commented McCartney. In March 1997, the Queen of England knighted him for services to music.[151]

In 1997, McCartney released the rock album Flaming Pie. Starr appeared on drums and backing vocals in "Beautiful Night".[nb 35] Later that year, he released the classical work Standing Stone, which topped the UK and US classical charts. In 1998, he released Rushes, the second electronica album by the Fireman.[155] In 1999, McCartney released Run Devil Run.[nb 36] Recorded in one week, and featuring Ian Paice and David Gilmour, it was primarily an album of covers with three McCartney originals. He had been planning such an album for years, having been previously encouraged to do so by Linda, who had died of cancer in April 1998.[157]

In 1999, he continued his experimentation with orchestral music on Working Classical. In 2000, he released the electronica album Liverpool Sound Collage with Super Furry Animals and Youth, using the sound collage and musique concrète techniques that had fascinated him in the mid-1960s. He contributed the song "Nova" to a tribute album of classical, choral music called A Garland for Linda (2000), dedicated to his late wife.[160]

2000–2010

Having witnessed the 11 September 2001 attacks from the JFK airport tarmac, McCartney was inspired to take a leading role in organising the Concert for New York City. His studio album release in November that year, Driving Rain, included the song "Freedom", written in response to the attacks.[161][nb 37] The following year, McCartney formed a band with guitarists Rusty Anderson and Brian Ray, accompanied by Wickens on keyboards and Abe Laboriel, Jr. on drums.[163] They began the Driving World Tour later that year, which included stops in the US, Mexico and Japan. The tour resulted in the double live album Back in the U.S., released internationally in 2003 as Back in the World.[nb 38][nb 39] The tour earned a reported \$126.2 million, an average of over \$2 million per night, and Billboard named it the top tour of the year.[166]

In July 2002, McCartney married Heather Mills. In November, on the first anniversary of Harrison's death, McCartney performed at the Concert for George.[167] He participated in the National Football League's Super Bowl, performing "Freedom" during the pre-game show for Super Bowl XXXVI in 2002 and headlining the halftime show at Super Bowl XXXIX in 2005.[168] The English College of Arms honoured McCartney in 2002 by granting him a coat of arms. His crest, featuring a Liver Bird holding an acoustic guitar in its claw, reflects his background in Liverpool and his musical career. The shield includes four curved emblems which resemble beetles' backs. The arms' motto is Ecce Cor Meum, Latin for "Behold My Heart".[169] In 2003, the McCartneys had a child, Beatrice Milly.

In July 2005, he performed at the Live 8 event in Hyde Park, London, opening the show with "Sgt. Pepper's Lonely Hearts Club Band" (with U2) and closing it with "Drive My Car" (with George Michael), "Helter Skelter", and "The Long and Winding Road".[nb 40] In September, he released the rock album Chaos and Creation in the Backyard, for which he provided most of the instrumentation.[nb 41][nb 42] In 2006, McCartney released the classical work Ecce Cor Meum.[nb 43] The rock album Memory Almost Full followed in 2007.[nb 44] In 2008, he released his third Fireman album, Electric Arguments.[nb 45] Also in 2008, he performed at a concert in Liverpool to celebrate the city's year as European Capital of Culture. In 2009, after a four-year break, he returned to touring and has since performed over 80 shows.[181] More than forty-five years after the Beatles first appeared on American television during The Ed Sullivan Show, he returned to the same New York theatre to perform on Late Show with David Letterman.[182]

On 9 September 2009, EMI reissued the Beatles catalogue following a four-year digital remastering effort, releasing a music video game called The Beatles: Rock Band the same day.[183]

McCartney's enduring fame has made him a popular choice to open new venues. In 2009, he played three sold-out concerts at the newly built Citi Field—a venue constructed to replace Shea Stadium in Queens, New York. These performances yielded the double live album Good Evening New York City later that year. In 2010, McCartney opened the Consol Energy Center in Pittsburgh, Pennsylvania.[185][nb 46]

2011—present

In July 2011, McCartney played two sold-out concerts at the new Yankee Stadium. A New York Times review of the first concert reported that McCartney was "not saying goodbye but touring stadiums and playing marathon concerts." [187] In September 2011, having been commissioned by the New York City Ballet, McCartney released his first score for dance, a collaboration with Peter Martins called Ocean's Kingdom.[188] Also in 2011, McCartney married Nancy Shevell.[189] He released Kisses on the Bottom, a collection of standards, in February 2012; that same month the National Academy of Recording Arts and Sciences honoured him as the MusiCares Person of the Year, two days prior to his performance at the 54th Grammy Awards.[190]

As of 2012[update], McCartney remains one of the world's top draws. He played to over 100,000 people total during two performances in Mexico City in May, the shows grossing nearly \$6 million.[191][nb 47] In June 2012, McCartney closed Queen Elizabeth's Diamond Jubilee Concert held outside Buckingham Palace, performing a set that included "Let It Be" and "Live and Let Die".[193] He closed the opening ceremony of the 2012 Summer Olympics in London on 27 July, singing "The End" and "Hey Jude" and inviting the audience to join in on the coda.[194] Having donated his time, he received £1 from the Olympic organisers.[195] On 12 December, McCartney performed, supported by Krist Novoselic, Dave Grohl, and Pat Smear (all former members of Nirvana), the closing act of 12-12-12: The Concert for Sandy Relief, seen by approximately two billion people worldwide.[196]

Musicianship

Largely a self-taught musician, McCartney's approach was described by musicologist Ian MacDonald as "by nature drawn to music's formal aspects yet wholly untutored—... [he] produced technically 'finished' work almost entirely by instinct, his harmonic judgement based mainly on perfect pitch and an acute pair of ears ... [A] natural melodist—a creator of tunes capable of existing apart from their harmony".[197] McCartney commented, "I prefer to think of my approach to music as—... rather like the primitive cave artists, who drew without training."

Bass guitar

McCartney's skill as a bass player has been acknowledged by other bassists, including Sting, Dr. Dre bassist Mike Elizondo, and Colin Moulding of XTC. Best known for primarily using a plectrum or pick, McCartney occasionally plays fingerstyle. He does not use slapping or muting techniques. Strongly influenced by Motown artists, in particular by James Jamerson, McCartney called him a hero for his melodic style. Also influenced by Brian Wilson, McCartney commented: "because he went to very unusual places". Another favourite bassist is Stanley Clarke.[203]

"Paul is one of the most innovative bass players ... half the stuff that's going on now is directly ripped off from his Beatles period ... He's an egomaniac about everything else, but his bass playing he'd always been a bit coy about."

—Lennon, Playboy magazine, January 1981

During McCartney's early years with the Beatles, he primarily used a Höfner 500/1 bass, though in 1965, he began sporadically using a Rickenbacker 4001S for recording. While typically using Vox amplifiers, by 1967 he had also begun using a Fender Bassman for amplification.[205] During the late 1980s and early 1990s, he used a Wal 5-String, which he said made him play more thick-sounding basslines, in contrast to the much lighter Höfner, which inspired him to play more sensitively, something he considers fundamental to his playing style. He changed back to the Höfner around 1990 for that reason. He uses Mesa Boogie bass amplifiers while performing live.

MacDonald identified "She's a Woman" as the turning point when McCartney's bass playing began to evolve dramatically, and Beatles biographer Chris Ingham singled out Rubber Soul as the moment when McCartney's playing exhibited significant progress, particularly on "The Word".[207] Bacon and Morgan agreed, calling McCartney's groove on the track "a high point in pop bass playing and ... the first proof on a recording of his serious technical ability on the instrument." [208] MacDonald inferred the influence of James Brown's "Papa's Got a Brand New Bag" and Pickett's "In the Midnight Hour", American soul tracks from which McCartney absorbed elements and drew inspiration as he "delivered his most spontaneous bass-part to date".

Bacon and Morgan described his bassline for the Beatles song "Rain" as "an astonishing piece of playing" ... [McCartney] thinking in terms of both rhythm and 'lead bass' ... [choosing] the area of the neck ... he correctly perceives will give him clarity for melody without rendering his sound too thin for groove." MacDonald considered the track the Beatles' best B-side, stating that its "clangorously saturated texture resonates around McCartney's [bassline]", which MacDonald described as "so inventive that it threatens to overwhelm the track". MacDonald also indicated the influence of Indian classical music in "exotic melismas in the bass part".[211] McCartney identified Sgt. Pepper's Lonely Hearts Club Band as containing his strongest and most inventive bass playing, particularly on "Lucy in the Sky with Diamonds".

Acoustic guitar

"If I couldn't have any other instrument, I would have to have an acoustic guitar."

~McCartney, Guitar Player, July 1990

McCartney primarily flatpicks while playing acoustic guitar, though he also uses elements of fingerpicking. Examples of his acoustic guitar playing on Beatles tracks include "Yesterday", "I'm Looking Through You", "Michelle", "Blackbird", "I Will", "Mother Nature's Son" and "Rocky Raccoon".[214] McCartney singled out "Blackbird" as a personal favourite and described his technique for the guitar part in the following way: "I got my own little sort of cheating way of [fingerpicking] ... I'm actually sort of pulling two strings at a time" ... I was trying to emulate those folk players." He employed a similar technique for "Jenny Wren". He played an Epiphone Texan on many of his acoustic recordings, but also used a Martin D-28.[216]

Electric guitar

"Linda was a big fan of my guitar playing, whereas I've got my doubts. I think there are proper guitar players and then there are guys like me who love playing it".

â ~McCartney, Guitar Player, July 1990

McCartney played lead electric guitar on several Beatles recordings, including what MacDonald described as a "fiercely angular slide guitar solo" on "Drive My Car", which McCartney played on an Epiphone Casino. McCartney said of the instrument, "if I had to pick one electric guitar it would be this." [218] He contributed what MacDonald described as "a startling guitar solo" on the Harrison composition "Taxman" and the "shrieking" guitar on "Sgt. Pepper's Lonely Hearts Club Band" and "Helter Skelter". MacDonald also praised McCartney's "coruscating pseudo-Indian" guitar solo on "Good Morning Good Morning". [219] McCartney also played lead guitar on "Another Girl". On his "Taxman" solo, McCartney commented, "I was very inspired by Jimi Hendrix. It was really my first voyage into feedback." In 1990, when asked who his favourite guitar players were he included Eddie Van Halen, Eric Clapton and David Gilmour, stating, "but I still like Hendrix the best." He has primarily used a Gibson Les Paul for electric work, particularly during live performances.

#### Vocals

McCartney's vocals cross several musical genres. On "Call Me Back Again", according to Benitez, "McCartney shines as a bluesy solo vocalist" while MacDonald called "I'm Down" "a rock-and-roll classic" that "illustrates McCartney's vocal and stylistic versatility". [221] MacDonald described "Helter Skelter" as an early attempt at heavy metal, and "Hey Jude" as a "pop/rock hybrid", pointing out McCartney's "use of gospel-style melismas" in the song and his "pseudo-soul shrieking in the fade-out". [222] Benitez identified "Hope of Deliverance" and "Put It There" as examples of McCartney's folk music efforts while musicologist Walter Everett considered "When I'm Sixty-Four" and "Honey Pie" attempts at vaudeville. [223] MacDonald praised the "swinging beat" of the Beatles' twenty-four bar blues song, "She's a Woman" as "the most extreme sound they had manufactured to date", with McCartney's voice "at the edge, squeezed to the upper limit of his chest register and threatening to crack at any moment." MacDonald described "I've Got a Feeling" as a "raunchy, mid-tempo rocker" with a "robust and soulful" vocal performance and "Back in the U.S.S.R." as "the last of [the Beatles'] up-tempo rockers", McCartney's "belting" vocals among his best since "Drive My Car", recorded three years earlier. [225]

#### Keyboards

McCartney played piano on several Beatles songs, including "Every Little Thing", "She's a Woman", "For No One", "A Day in the Life", "Hello, Goodbye", "Hey Jude", "Lady Madonna", "Let It Be" and "The Long and Winding Road". [226] MacDonald considered the piano part in "Lady Madonna" as reminiscent of Fats Domino, and "Let It Be" as having a gospel rhythm. [227] MacDonald called McCartney's Mellotron intro on "Strawberry Fields Forever" an integral feature of the song's character. McCartney played a Moog synthesizer on the Beatles song "Maxwell's Silver Hammer" and the Wings track "Loup (1st Indian on the Moon)". [229] Ingham described the Wings songs "With a Little Luck" and "London Town" as "full of the most sensitive pop synthesizer touches". [230]

#### Drums

McCartney played drums on the Beatles songs "Back in the U.S.S.R.", "Dear Prudence", "Martha My Dear", "Wild Honey Pie" and "The Ballad of John and Yoko". [231] He also played all the drum parts on his first and second solo albums McCartney and McCartney II, as well as on the Wings album Band on the Run and most of the drums on his solo LP Chaos and Creation in the Backyard. [232]

#### Tape loops

In the mid-1960s, when visiting artist friend John Dunbar's flat in London, McCartney brought tapes he had compiled at then-girlfriend Jane Asher's home. They included mixes of various songs, musical pieces and comments made by McCartney that Dick James made into a demo for him. Heavily influenced by American avant-garde musician John Cage, McCartney made tape loops by recording

voices, guitars and bongos on a Brenell tape recorder and splicing the various loops. He referred to the finished product as "electronic symphonies". He reversed the tapes, and speeded them up and slowed them down to create the desired effects, some of which the Beatles later used on the songs "Tomorrow Never Knows" and "The Fool on the Hill".[235]

#### Early influences

â ~McCartney on Presley, The Beatles Anthology, 2000

McCartney's earliest musical influences include Little Richard, Elvis Presley, Buddy Holly, Carl Perkins, and Chuck Berry.[237] When asked why the Beatles did not include Presley on the Sgt. Pepper cover, McCartney replied, "Elvis was too important and too far above the rest even to mention ... so we didn't put him on the list because he was more than merely a ... pop singer, he was Elvis the King." McCartney stated that for his bassline for "I Saw Her Standing There", he directly quoted Berry's "I'm Talking About You".[239]

McCartney called Little Richard an idol, whose falsetto vocalizations inspired McCartney's own vocal technique. McCartney said he wrote "I'm Down" as a vehicle for his Little Richard impersonation.[241] In 1971, McCartney bought the publishing rights to Holly's catalogue, and in 1976, on the fortieth anniversary of Holly's birth, McCartney inaugurated the annual "Buddy Holly Week" in England. The festival has included guest performances by famous musicians, songwriting competitions, drawing contests and special events featuring performances by the Crickets.[242]

#### Lifestyle

##### Creative outlets

While at school during the 1950s, McCartney thrived at art assignments, often earning top accolades for his visual work. However, his lack of discipline negatively affected his academic grades, preventing him from earning admission to art college. During the 1960s, he delved into the visual arts, explored experimental cinema, and regularly attended film, theatrical and classical music performances. His first contact with the London avant-garde scene was through artist John Dunbar, who introduced McCartney to art dealer Robert Fraser. At Fraser's flat he first learned about art appreciation and met Andy Warhol, Claes Oldenburg, Peter Blake, and Richard Hamilton. McCartney later purchased works by Magritte, using his painting of an apple for the Apple Records logo. McCartney became involved in the renovation and publicising of the Indica Gallery in Mason's Yard, London, which Barry Miles had co-founded and where Lennon first met Yoko Ono. Miles also co-founded International Times, an underground paper that McCartney helped to start with direct financial support and by providing interviews to attract advertiser income. Miles later wrote McCartney's official biography, *Many Years From Now* (1997).[247]

McCartney became interested in painting after watching artist Willem de Kooning work in de Kooning's Long Island studio. McCartney took up painting in 1983, and he first exhibited his work in Siegen, Germany, in 1999. The 70-painting show featured portraits of Lennon, Andy Warhol and David Bowie. Though initially reluctant to display his paintings publicly, McCartney chose the gallery because events organiser Wolfgang Suttner showed genuine interest in McCartney's art. In September 2000, the first UK exhibition of McCartney's paintings opened, featuring 500 canvases at the Arnolfini Gallery in Bristol, England.[251] In October 2000, McCartney's art debuted in his hometown of Liverpool. McCartney said, "I've been offered an exhibition of my paintings at the Walker Art Gallery ... where John and I used to spend many a pleasant afternoon. So I'm really excited about it. I didn't tell anybody I painted for 15 years but now I'm out of the closet".[252] McCartney is lead patron of the Liverpool Institute for Performing Arts, a school in the building formerly occupied by the Liverpool Institute for Boys.

When McCartney was a child, his mother read him poems and encouraged him to read books. His father invited Paul and his brother Michael to solve crosswords with him, so as to increase their "word power", as McCartney said.[254] In

2001, McCartney published *Blackbird Singing*, a volume of poems and lyrics to his songs for which he gave readings in Liverpool and New York City.[255] In the foreword of the book, he explains: "When I was a teenager... I had an overwhelming desire to have a poem published in the school magazine. I wrote something deep and meaningful... which was promptly rejected... and I suppose I have been trying to get my own back ever since". In 2005, he released *High in the Clouds: An Urban Furry Tail*, a collaboration with author Philip Ardagh and animator Geoff Dunbar that *The Guardian* labelled an "anti-capitalist children's book".[257]

"I think there's an urge in us to stop the terrible fleetingness of time. Music. Paintings ... Try and capture one bloody moment please."

~ McCartney

In 1981, McCartney asked Geoff Dunbar to direct a short animated film called *Rupert and the Frog Song*; McCartney was the writer and producer, and he also added some of the character voices. In 1992, he worked with Dunbar on an animated film about the work of French artist Honoré Daumier, which won them a BAFTA award.[260] In 2004, they worked together on the animated short film *Tropic Island Hum*. The accompanying single, "Tropic Island Hum"/"We All Stand Together", reached number 21 in the UK.

McCartney also produced and hosted *The Real Buddy Holly Story*, a 1985 documentary featuring interviews with Keith Richards, Phil and Don Everly, the Holly family, and others.[263] In 1995, he made a guest appearance on the *Simpsons* episode "Lisa the Vegetarian" and directed a short documentary about the Grateful Dead.

#### Business

McCartney is one of the UK's wealthiest people, with an estimated fortune of £475 million in 2010.[265] In addition to an interest in Apple Corps and MPL Communications, an umbrella company for his business interests, he owns a significant music publishing catalogue, with access to over 25,000 copyrights, including the publishing rights to the musicals *Guys and Dolls*, *A Chorus Line*, *Annie* and *Grease*. [266] He earned £40 million in 2003, the highest income that year within media professions in the UK.[267] This rose to £48.5 million by 2005.[268]

McCartney's music has appeared on several record labels. In January 1962, Polydor Records issued the first commercially released recording of the Beatles, a single called "My Bonnie". Credited to Tony Sheridan and the Beat Brothers, Decca Records issued the track in the UK in April 1962. The following year, Parlophone released the band's singles "Please Please Me"/"Ask Me Why" and "From Me to You"/"Thank You Girl" in the UK. Vee-Jay Records released them in the US. Also that year, Swan Records released the group's UK Parlophone single "She Loves You"/"I'll Get You" in the US. From then until July 1968, EMI's Capitol (US) and Parlophone (UK) labels released the band's music. Starting with the August 1968 release "Hey Jude"/"Revolution", their new material would be issued with Apple labels, logos and sleeves, but with Parlophone or Capitol serial numbers. Following the break-up of the Beatles, McCartney's music continued to be released by Apple Records under the Beatles' 1967 recording contract with EMI which ran until 1976. Following the formal dissolution of the Beatles' partnership in 1975, McCartney re-signed with EMI worldwide and Capitol in the US and Canada. In 1979, McCartney signed with Columbia Records in the US and Canada reportedly receiving the industry's most lucrative recording contract to date, while remaining with EMI for distribution throughout the rest of the world. McCartney returned to Capitol in 1985 and from 1985 until 2006, Parlophone released McCartney's music in the UK and Capitol in the US.[270] In 2007, McCartney signed with Hear Music, becoming the

label's first artist. He remains there as of 2012[update]'s Kisses on the Bottom.[271]

In 1963, Dick James established Northern Songs to publish the songs of Lennon and McCartney. McCartney initially owned 20% of Northern Songs, which became 15% after a public stock offering in 1965. In 1969, James sold a controlling interest in Northern Songs to Lew Grade's Associated Television (ATV) after which McCartney and John Lennon sold their remaining shares although they remained under contract to ATV until 1973. In 1972, McCartney re-signed with ATV for seven years in a joint publishing agreement between ATV and McCartney Music. Since 1979, MPL Communications has published McCartney's songs. McCartney and Yoko Ono attempted to purchase the Northern Songs catalogue in 1981, but Grade declined their offer and decided to sell ATV in its entirety to businessman Robert Holmes à Court. Michael Jackson subsequently purchased ATV in 1985. In 1995, Jackson merged his catalogue with Sony for a reported £59,052,000 (\$95 million), establishing Sony/ATV Music Publishing, in which he retained half-ownership.[273] McCartney has criticised Jackson's purchase and handling of Northern Songs over the years. Now formally dissolved, in 1995 it became absorbed in the Sony/ATV catalogue.[274] McCartney receives writers' royalties which together are 33 percent of total commercial proceeds in the US, and which vary elsewhere between 50 and 55 percent. Two of the Beatles' earliest songs "Love Me Do" and "P.S. I Love You" were published by an EMI subsidiary, Ardmore & Beechwood, before signing with James. McCartney acquired their publishing rights from Ardmore in the mid-1980s, and they are the only two Beatles songs owned by MPL Communications.[276]

#### Drugs

McCartney first used drugs in the Beatles' Hamburg days, when they often used Preludin to maintain their energy while performing for long periods. Bob Dylan introduced them to marijuana in a New York hotel room in 1964; McCartney recalls getting "very high" and "giggling uncontrollably". His use of the drug soon became habitual, and according to Miles, McCartney wrote the lyrics "another kind of mind" in "Got to Get You into My Life" specifically as a reference to cannabis.[279] During the filming of Help!, McCartney occasionally smoked a joint in the car on the way to the studio during filming, and often forgot his lines. Director Richard Lester overheard two physically attractive women trying to persuade McCartney to use heroin, but he refused. Introduced to cocaine by Robert Fraser, McCartney used the drug regularly during the recording of Sgt. Pepper's Lonely Hearts Club Band, and for about a year total but stopped because of his dislike of the unpleasant melancholy he felt afterwards.[281]

Initially reluctant to try LSD, McCartney eventually did so in late 1966, and took his second "acid trip" in March 1967, with Lennon, after a Sgt. Pepper studio session.[282] He later became the first Beatle to discuss the drug publicly, declaring, "It opened my eyes... [and] made me a better, more honest, more tolerant member of society." He made his attitude about cannabis public in 1967, when he, along with the other Beatles and Epstein, added his name to a July advertisement in The Times, which called for its legalisation, the release of those imprisoned for possession, and research into marijuana's medical uses.

In 1972, a Swedish court fined McCartney £1,000 for cannabis possession. Soon after, Scottish police found marijuana plants growing on his farm, leading to his 1973 conviction for illegal cultivation and a £100 fine. As a result of his drug convictions, the US government repeatedly denied him a visa until December 1973.[285] Arrested again for marijuana possession in 1975, in Los Angeles, Linda took the blame, and the court soon dismissed the charges. In January 1980, when Wings flew to Tokyo for a tour of Japan, customs officials found approximately 8 ounces (200 g) of cannabis in his luggage. They arrested McCartney and brought him to a local jail while the Japanese government decided what to do. After ten days, they released and deported him without charge. In 1984, while on holiday in Barbados, authorities arrested McCartney for possession of marijuana and fined him \$200. Upon his return to England, he stated: "cannabis is ...less harmful than rum punch, whiskey, nicotine and



glue, all of which are perfectly legal ... I don't think ... I was doing anyone any harm whatsoever." In 1997, he spoke out in support of decriminalisation of the drug: "People are smoking pot anyway and to make them criminals is wrong." In 2013, he officially endorsed the decriminalisation of marijuana.[289][unreliable source?]

#### Vegetarianism and activism

Paul and Linda were vegetarians for most of their 30-year marriage. They decided to stop consuming meat after Paul saw lambs in a field as they were eating a meal of lamb. Soon after, the couple became outspoken animal rights activists. In his first interview after Linda's death, he promised to continue working for animal rights, and in 1999 he spent £3,000,000 to ensure Linda McCartney Foods remained free of genetically engineered ingredients.[291] In 1995, he narrated the documentary *Devour the Earth*, written by Tony Wardle.[292] McCartney is a supporter of the animal-rights organization People for the Ethical Treatment of Animals.[293] He has appeared in the group's campaigns and, in 2009, he narrated a short factory farm exposé titled "Glass Walls." [294][295] McCartney has also supported campaigns headed by the Humane Society of the United States, Humane Society International, the World Society for the Protection of Animals, and the David Shepherd Wildlife Foundation.[296][297][298]

Following McCartney's marriage to Mills, he joined her in a campaign against landmines, becoming a patron of Adopt-A-Minefield. He wore an anti-landmines T-shirt during some of the Back in the World tour shows.[299] In 2006, the McCartneys travelled to Prince Edward Island to raise international awareness of seal hunting. The couple debated with Danny Williams, Newfoundland's then Premier, on Larry King Live, stating that fishermen should stop hunting seals and start seal-watching businesses instead.[300] McCartney also supports the Make Poverty History campaign.[301]

McCartney has participated in several charity recordings and performances, including the Concerts for the People of Kampuchea, Ferry Aid, Band Aid, Live Aid and the recording of "Ferry Cross the Mersey".[302] In 2004, he donated a song to an album to aid the "US Campaign for Burma", in support of Burmese Nobel Prize winner Aung San Suu Kyi. In 2008, he donated a song to Aid Still Required's CD, organised as an effort to raise funds to assist with the recovery from the devastation caused in Southeast Asia by the 2004 tsunami.[303]

In 2009, McCartney wrote to Tenzin Gyatso, the 14th Dalai Lama, asking him why he was not a vegetarian. As McCartney explained, "He wrote back very kindly, saying, my doctors tell me that I must eat meat. And I wrote back again, saying, you know, I don't think that's right ... I think he's now being told ... that he can get his protein somewhere else ... It just doesn't seem right ... the Dalai Lama, on the one hand, saying, 'Hey guys, don't harm sentient beings ... Oh, and by the way, I'm having a steak.'" [304]

On the eve of the 2012 U.S. Presidential Election, McCartney issued a video endorsement of President Barack Obama.[305][306]

#### Meditation

In August 1967, McCartney met the Maharishi Mahesh Yogi at the London Hilton, and later went to Bangor in North Wales, to attend a weekend initiation conference, where he and the other Beatles learned the basics of Transcendental Meditation. He explained, "The whole meditation experience was very good and I still use the mantra ... I find it soothing". In 2009, McCartney and Starr headlined a benefit concert at Radio City Music Hall, raising three million dollars for the David Lynch Foundation to fund instruction in Transcendental Meditation for at-risk youth.[309]

McCartney is an avid fan of football, and has publicly professed support for Everton, and also shown favour for Liverpool.[310] In 2008, he ended speculation about his allegiance when he said, "Here's the deal: my father was born in Everton, my family are officially Evertonians, so if it comes down to a derby match or an FA Cup final between the two, I would have to support

Everton. But after a concert at Wembley Arena I got a bit of a friendship with Kenny Dalglish, who had been to the gig and I thought 'You know what? I am just going to support them both because it's all Liverpool.'"[311]

#### Personal relationships

##### Girlfriends

###### Dot Rhone

McCartney's first serious girlfriend in Liverpool was Dot Rhone, whom he met at the Casbah club in 1959. According to Spitz, Rhone felt that McCartney had a compulsion to control situations. He often chose clothes and make-up for her, encouraging her to grow her hair out like Brigitte Bardot's, and at least once insisting she have it re-styled, to disappointing effect.[313] When McCartney first went to Hamburg with the Beatles, he wrote to Rhone regularly, and she accompanied Cynthia Lennon to Hamburg when they played there again in 1962. The couple had a two-and-a-half-year relationship, and were due to marry until Rhone's miscarriage; according to Spitz, McCartney, now "free of obligation", ended the engagement.

###### Jane Asher

McCartney first met British actress Jane Asher on 18 April 1963, when a photographer asked them to pose at a Beatles performance at the Royal Albert Hall in London. The two began a relationship, and in November of that year he took up residence with Asher at her parents' home at 57 Wimpole Street, London. They had lived there for more than two years before the couple moved to McCartney's own home in St. John's Wood, in March 1966.[318] He wrote several songs while living at the Ashers', including "Yesterday", "And I Love Her", "You Won't See Me" and "I'm Looking Through You", the latter three having been inspired by their romance. They had a five-year relationship and planned to marry, but Asher broke off the engagement after she discovered he had become involved with Francie Schwartz.[320]

##### Wives

###### Linda Eastman

Linda Eastman was a music fan who once commented, "all my teen years were spent with an ear to the radio." At times, she skipped school to see artists such as Fabian, Bobby Darin and Chuck Berry. She became a popular photographer with several rock groups, including the Jimi Hendrix Experience, the Grateful Dead, the Doors and the Beatles, whom she first met at Shea Stadium in 1966. She commented, "It was John who interested me at the start. He was my Beatle hero. But when I met him the fascination faded fast, and I found it was Paul I liked." The pair first properly met in 1967 at a Georgie Fame concert at The Bag O'Nails club, during her UK assignment to photograph rock musicians in London. As Paul remembers, "The night Linda and I met, I spotted her across a crowded club, and although I would normally have been nervous chatting her up, I realised I had toÂ ... Pushiness worked for me that night!"[323] Linda said this about their meeting: "I was quite shameless really. I was with somebody else [that night]Â ... and I saw Paul at the other side of the room. He looked so beautiful that I made up my mind I would have to pick him up." The pair married in 1969. About their relationship, Paul said, "We had a lot of fun togetherÂ ... just the nature of how we are, our favourite thing really is to just hang, to have fun. And Linda's very big on just following the moment." He added, "We were crazy. We had a big argument the night before we got married, and it was nearly called offÂ ... [it's] miraculous that we made it. But we did."

The two collaborated musically after the Beatles' break-up, forming Wings in 1971. They faced derision from some fans and critics, who questioned her inclusion. She was nervous about performing with Paul, who explained, "she conquered those nerves, got on with it and was really gutsy." Paul defended her musical ability: "I taught Linda the basics of the keyboardÂ ... She took a couple lessons and learned some bluesy thingsÂ ... she did very well and made it look easier than it wasÂ ... The critics would say, 'She's not really playing' or 'Look at herâ ~she's playing with one finger.' But what they didn't know is that sometimes she was playing a thing called a Minimoog, which could only be

played with one finger. It was monophonic." He went on to say, "We thought we were in it for the fun... it was just something we wanted to do, so if we got it wrong it's a big deal. We didn't have to justify ourselves." Former Wings guitarist McCullough said of collaborating with Linda, "trying to get things together with a learner in the group didn't work as far as I was concerned."

They had four children... Linda's daughter Heather (legally adopted by Paul), Mary, Stella and James... and remained married until Linda's death from breast cancer in 1998. After her death, Paul stated in The Daily Mail, "I got a counsellor because I knew that I would need some help. He was great, particularly in helping me get rid of my guilt [about wishing I'd been] perfect all the time... a real bugger. But then I thought, hang on a minute. We're just human. That was the beautiful thing about our marriage. We were just a boyfriend and girlfriend having babies."

#### Heather Mills

In 2002, McCartney married Heather Mills, a former model and anti-landmines campaigner. In 2003, the couple had a child, Beatrice Milly, named in honour of Mills' late mother, and one of McCartney's aunts. They separated in April 2006 and divorced acrimoniously in March 2008.[332] In 2004, he commented on media animosity toward his partners: "[the British public] didn't like me giving up on Jane Asher... I married [Linda], a New York divorcee with a child, and at the time they didn't like that".[333]

#### Nancy Shevell

McCartney married New Yorker Nancy Shevell in a civil ceremony at Old Marylebone Town Hall, London, on 9 October 2011. The wedding was a modest event attended by a group of about 30 relatives and friends.[189] The couple had been dating since November 2007.[334] She is vice president of a family-owned transportation conglomerate which owns New England Motor Freight.[335] Shevell is a former member of the board of the New York Metropolitan Transportation Authority.[336]

#### Beatles

##### John Lennon

Though McCartney had a strained relationship with Lennon; they briefly became close again in early 1974, and played music together on one occasion.[337] In later years, the two grew apart. While McCartney would often phone, he was apprehensive about the reception he would receive. During one call, Lennon told him, "You're all pizza and fairytales!" In an effort to avoid talking only about business, they often spoke of cats, babies or baking bread.

On 24 April 1976, the two were watching an episode of Saturday Night Live together at Lennon's home in New York City, during which Lorne Michaels made a \$3,000 cash offer for the Beatles to reunite. While they seriously considered going to the SNL studio a few blocks away, they decided it was too late. This was their last time together.[341] VH1 fictionalised this event in the 2000 television film, Two of Us. McCartney's last telephone call to Lennon, days before Lennon and Ono released Double Fantasy, was friendly; he said this about the call: "[It is] a consoling factor for me, because I do feel it was sad that we never actually sat down and straightened our differences out. But fortunately for me, the last phone conversation I ever had with him was really great, and we didn't have any kind of blow-up." [343]

#### Reaction to Lennon's murder

"John is kinda like a constant... always there in my being... in my soul, so I always think of him".[344]

... McCartney, Guitar World, January 2000

On 9 December 1980, McCartney awoke to the news that Lennon had been murdered the previous night, his death creating a media frenzy around the surviving

members of the band. That evening, as he was leaving an Oxford Street recording studio surrounded by reporters who asked him for his reaction, he responded: "It's a drag". The press quickly criticised him for what appeared to be a superficial response. He later explained, "When John was killed somebody stuck a microphone at me and said: 'What do you think about it?' I said, 'It's a dra-a-ag' and meant it with every inch of melancholy I could muster. When you put that in print it says, 'McCartney in London today when asked for a comment on his dead friend said, "It's a drag".' It seemed a very flippant comment to make." He described his first exchange with Ono after the murder, and his last conversation with Lennon:

I talked to Yoko the day after he was killed, and the first thing she said was, "John was really fond of you." The last telephone conversation I had with him we were still the best of mates. He was always a very warm guy, John. His bluff was all on the surface. He used to take his glasses down, those granny glasses, and say, "it's only me." They were like a wall you know? A shield. Those are the moments I treasure.

In 1983, McCartney said, "I would not have been as typically human and standoffish as I was if I knew John was going to die. I would have made more of an effort to try and get behind his "mask" and have a better relationship with him." He said that he went home that night, watched the news on television with his children and cried most of the evening. In 1997, he admitted the ex-Beatles were nervous at the time that they might also be murdered. He told Mojo magazine in 2002 that Lennon was his greatest hero. In 1981, McCartney sang backup on Harrison's tribute to their ex-bandmate, "All Those Years Ago", which featured Starr on drums. McCartney released "Here Today" in 1982, a song Everett described as "a haunting tribute" to McCartney's friendship with Lennon.

George Harrison

Discussing his relationship with McCartney, Harrison said, "Paul would always help along when you'd done his ten songsâ ~then when he got 'round to doing one of my songs, he would help. It was silly. It was very selfish, actuallyÂ ... There were a lot of tracks, though, where I played bassÂ ... because what Paul would doâ ~if he'd written a song, he'd learn all the parts for Paul and then come in the studio and say (sometimes he was very difficult): "Do this". He'd never give you the opportunity to come out with something." [351]

After Harrison's death in November 2001, McCartney issued a statement outside his home in St. John's Wood, calling him "a lovely guy and a very brave man who had a wonderful sense of humour". He went on to say, "We grew up together and we just had so many beautiful times togetherÂ â ^ that's what I am going to remember. I'll always love him, he's my baby brother." [352] On the first anniversary of his death, McCartney played Harrison's "Something" on a ukulele at the Concert for George. He also performed "For You Blue" and "All Things Must Pass", and played the piano on Eric Clapton's rendition of "While My Guitar Gently Weeps".

Ringo Starr

Starr once described McCartney as "pleasantly insincere", though the two generally enjoy each other's company, and at least once went on holiday together in Greece. Starr recalled, "We couldn't understand a word of the songs the hotel band were playing, so on the last night Paul and I did a few rockers like "What'd I Say". There was at times discord between them as well, particularly during sessions for the White Album. As Apple's Peter Brown recalled, "it was a poorly kept secret among Beatle intimates that after Ringo left the studio Paul would often dub in the drum tracks himselfÂ ... [Starr] would pretend not to notice". In August 1968, the two got into an argument over McCartney's critique of Starr's drum part for "Back in the U.S.S.R.", which contributed to Starr temporarily leaving the band. [357] When Starr returned in September, he found bouquets of flowers on his drum kit. Starr commented on working with McCartney: "Paul is the greatest bass player in the world. But he

is also very determinedÂ ... [to] get his own wayÂ ... [thus] musical disagreements inevitably arose from time to time."

McCartney and Starr collaborated on several post-Beatles projects starting in 1973, when McCartney contributed instrumentation and backing vocals for "Six O'Clock", a song McCartney wrote for Starr's album Ringo. McCartney played a kazoo solo on another track from the album, "You're Sixteen". In 1976, McCartney sang backing vocals on another song he wrote for Starr, "Pure Gold", from Ringo's Rotogravure. In 1981, McCartney produced and performed on three songs from Starr's Stop and Smell the Roses, two of which McCartney composed. Ringo appeared in the video for McCartney's 1983 song So Bad (from the Pipes of Peace album). He would also appear the following year in an acting role in McCartney's film Give My Regards to Broad Street.

Starr played drums and sang backing vocals on "Beautiful Night" from McCartney's 1997 album, Flaming Pie. The pair collaborated again in 1998, on Starr's Vertical Man, which featured McCartney's backing vocals on three songs, and instrumentation on one. In 2009, the pair performed "With a Little Help From My Friends" at a benefit concert for the David Lynch Foundation.[361] They collaborated on Starr's album, Y Not, in 2010. McCartney played bass on "Peace Dream", and sang a duet with Starr on "Walk with You.[362] On 7 July 2010, Starr was performing at Radio City Music Hall in New York with his All-Starr Band in a concert celebrating his seventieth birthday. After the encores, McCartney made a surprise, last minute appearance, coming out and performing the Beatles' song "Birthday" backed by members of Starr's band.[363]

#### Legacy

##### Achievements

Inducted into the Rock and Roll Hall of Fame as a solo artist in March 1999, Guinness World Records described McCartney as "the Most Successful Composer and Recording Artist of All Time", with 60 gold discs (42 with the Beatles, 17 solo and 1 with the Beatles and Billy Preston) and sales of 100Â million albums, 100Â million singles, and a writer's credit on forty-three songs that have sold over oneÂ million copies each.[364]

According to Guinness, he is "the most successful songwriter" in UK singles chart history and "the most successful musician of all time". He has written or co-written "188 charted records, of which 129 are different songs. Of these records, 91 reached the Top 10 and 33 made it to number 1. In total, the songs have spent 1,662 weeks in the charts (up to the beginning of 2007)."

McCartney has written, or co-written 32 number-one singles on the Billboard Hot 100: twenty with the Beatles; nine solo and/or with Wings; one as a co-writer of "A World Without Love", a number-one single for Peter and Gordon; one as a co-writer on Elton John's cover of "Lucy in the Sky with Diamonds"; and one as a co-writer with Michael Jackson on "Say Say Say".[367] As of 2012[update], he has sold 15.5Â million RIAA certified units in the United States.[368]

Credited with more number ones in the UK than any other artist, McCartney has participated in twenty-four chart topping singles: seventeen with the Beatles, one solo, and one each with Wings, Stevie Wonder, Ferry Aid, Band Aid, Band Aid 20 and "The Christians et al."[369][nb 48] He is the only artist to reach the UK number one as a soloist ("Pipes of Peace"), duo ("Ebony and Ivory" with Wonder), trio ("Mull of Kintyre", Wings), quartet ("She Loves You", the Beatles), quintet ("Get Back", the Beatles with Billy Preston) and as part of a musical ensemble for charity (Ferry Aid).

"Yesterday" is the most covered song in history with more than 2,200 recorded versions, and according to the BBC, "the track is the only one by a UK writer to have been aired more than sevenÂ million times on American TV and radio and is third in the all-time listÂ ... [and] is the most played song by a British writer [last] century in the US".[372] His 1968 Beatles composition, "Hey Jude", is also a career highlight. It achieved the highest sales in the UK that year, topping the US charts for nine weeks, longer than any other Beatles single. It was also the longest single released by the band, and at seven minutes eleven seconds, the longest ever number one to that point. "Hey Jude"

is the best-selling Beatles single, achieving sales of over five million copies soon after its release.[nb 49]

In July 2005, his performance of "Sgt. Pepper's Lonely Hearts Club Band" with U2 at Live 8 became the fastest-released single in history. Available within forty-five minutes of its recording, hours later it had achieved number one on the UK Official Download Chart

#### Awards

In 1990, the IAU's Minor Planet Center named the planet 4148, "McCartney" in his honour.[376] In May 2000, the British Academy of Songwriters, Composers and Authors awarded him a Fellowship. In 2008, he received a BRIT award for Outstanding Contribution to Music, as well as an honorary Doctor of Music degree from Yale University.[378] In 2010, President Barack Obama honoured McCartney with the Gershwin Prize for his contributions to popular music.[379] He returned to the White House later that year as a recipient of the Kennedy Center Honors.[380] McCartney won two Grammy awards with Wings, and two as a solo artist.[381] In 2012, he became the last Beatle to receive a star on the Hollywood Walk of Fame.[382] On 8 September 2012, during a ceremony in Paris, French President François Hollande decorated McCartney with the Légion d'Honneur, with a rank of officer, for his services to music.[383]

#### Discography

##### Studio albums

##### Live and compilations

##### Tours

Wings[384]

Solo[385]

The Paul McCartney World Tour^ ^ 104 shows, 1989^1990

Unplugged Tour^ ^ 6 shows worldwide, 1992

The New World Tour^ ^ 79 shows, 1993

Driving World Tour^ ^ 55 shows, 2002

Back in the World tour^ ^ 33 shows, 2003

'04 Summer Tour^ ^ 14 shows worldwide, 2004

The 'US' Tour^ ^ 37 shows, 2005

Summer Live '09^ ^ 10 shows in North America, 2009

Good Evening Europe Tour^ ^ 8 shows, 2009

Up and Coming Tour^ ^ 38 shows worldwide, 2010^2011

On the Run Tour^ ^ 38 shows worldwide, 2011^2012

#### Notes

^ Jim McCartney's father Joe played an E-flat tuba. He pointed out the bass parts in songs on the radio, and often took his sons to local brass band concerts.

^ During their extended stays there over the next two years, they performed as the resident group at the Indra, and later the Kaiserkeller, both owned by Bruno Koschmider. Periodically, the band received breaks from playing in Hamburg and returned to Liverpool, performing regularly at the Cavern Club.[24]

^ In 1963, the Beatles released two studio albums: Please Please Me and With the Beatles. Two more albums followed in 1964: A Hard Day's Night and Beatles for Sale.

^ McCartney co-wrote (with Lennon) several of their early hits, including "I Saw Her Standing There", "She Loves You", "I Want to Hold Your Hand" (1963) and "Can't Buy Me Love" (1964).[30]

^ Also included on Revolver was "Here, There and Everywhere", a McCartney composition which is his second favourite after "Yesterday".

^ Written by McCartney as a commentary on his childhood in Liverpool, "Penny Lane" featured a piccolo trumpet solo inspired by Bach's second Brandenburg concerto.

^ The Sgt. Pepper cover piqued a frenzy of analysis.[56]

^ The Beatles was the band's first Apple Records LP release; the label was a subsidiary of Apple Corps, a conglomerate formed as part of Epstein's plan to reduce the group's taxes.[67]

^ In October 1969, a rumour surfaced that McCartney had died in a car crash in 1966 and been replaced by a lookalike, but this was quickly refuted when a November Life magazine cover featured him and his family, accompanied by the caption "Paul is still with us".

^ When the Beatles were inducted into the Rock and Roll Hall of Fame in 1988, their first year of eligibility, McCartney did not attend the ceremony, stating that unresolved legal disputes would make him "feel like a complete hypocrite waving and smiling with [Harrison and Starr] at a fake reunion."

^ The Beatles released twenty-two UK singles and twelve LPs, of which seventeen singles and eleven LPs reached number one on various charts. The band topped the US Billboard Hot 100 twenty times, and recorded fourteen number-one albums, as Lennon and McCartney became one of the most celebrated songwriting partnerships of the 20th century.[75] McCartney was the primary writer of five of their last six US number-one singles: "Hello, Goodbye" (1967), "Hey Jude" (1968), "Get Back (1969)", "Let It Be" and "The Long and Winding Road" (1970).[76]

^ McCartney peaked in the UK at number two, spending thirty-two weeks in the charts.[79]

^ Wings' first album together, Wild Life, reached the top ten in the US and the top twenty in the UK, staying on the UK charts for nine weeks.[82]

^ In May 1973, Wings began a 21-show tour of the UK, this time with supporting act Brinsley Schwarz.

^ "Live and Let Die" became a staple of McCartney's live shows, its modern sound well-suited for the pyrotechnics and laser light displays Wings employed during their 1970s stadium performances.[90]

^ Band on the Run became the UK's first platinum LP.

^ In 1974, McCartney hired guitarist Jimmy McCulloch and drummer Geoff Britton to replace McCullough and Seiwell. Britton subsequently quit during recording sessions in 1975 and was replaced by Joe English.

^ Wings at the Speed of Sound peaked in the UK at number 2, spending 35 weeks in the charts. In the UK, NME was alone in ranking the album number 1. The LP reached number 1 on three charts in the US.[98]

^ In 1977, McCartney released the album Thrillington, an orchestral arrangement of Ram, under the pseudonym Percy "Thrills" Thrillington, with a cover designed by Hipgnosis.[103]

^ During the production of London Town, McCulloch and English quit Wings; they were replaced by guitarist Laurence Juber and drummer Steve Holly.

^ Other factors in Wings' split included tension caused by the disappointment of their last effort, Back to the Egg, and McCartney's 1980 marijuana bust in Japan, which resulted in the cancelling of the tour and caused a major loss of wages for the group. Laine claimed that a significant cause of their dissolution was McCartney's reluctance to tour, fearing for his personal safety after the 1980 murder of Lennon. McCartney's then-spokesman said, "Paul is doing other things, that's all".[111]

^ Wings produced a total of seven studio albums, two of which topped the UK charts and four the US charts. Their live triple LP, Wings over America, was one of only a few live albums ever to achieve the top spot in America.[112] They made six US Billboard number-one singles, including "Listen to What the Man Said" and "Silly Love Songs", as well as eight top-ten singles. They achieved eight RIAA-certified platinum singles and six platinum albums in the US. In the UK, they achieved one number-one and twelve top-ten singles, as well as two number-one LPs.[113]

^ Tug of War was a number-one album in both the UK and the US.

^ Pipes of Peace peaked in the UK at number 4, spending 23 weeks in the charts. The LP reached number 15 in the US and is McCartney's most recently recorded RIAA certified platinum studio album as of 2012[update].[117]

^ "Spies Like Us" peaked in the UK at number 13 spending 10 weeks in the charts. The single reached number 7 in the US and is McCartney's most recently recorded US top-ten as of 2012.[122]

^ Press to Play reached number 8 in the UK, and number 30 in the US.[125]

- ^ In 1989, "Ferry Cross the Mersey" reached number 1 in the UK.
- ^ Flowers in the Dirt is McCartney's most recent UK number-one album as of 2012; it reached number 21 in the US.[130]
- ^ Tripping the Live Fantastic reached number 17 in the UK and number 26 in the US.
- ^ During the ten-month, 104-show Tripping the Live Fantastic tour, McCartney played as many as fourteen Beatles songs a night, comprising nearly half the performance.
- ^ Unplugged: The Official Bootleg reached number 7 in the UK and number 14 in the US.
- ^ Off the Ground reached number 5 in the UK and number 17 in the US.
- ^ Paul is Live reached number 34 in the UK and number 78 in the US.
- ^ For the New World Tour, Whitten was replaced by drummer Blair Cunningham. McCartney's 1993 tour of the US was the second highest grossing effort of the year in America, bringing in \$32.3 million from twenty-four shows.
- ^ Flaming Pie reached number 2 in the UK and the US. It also yielded McCartney's highest charting UK top-twenty hit song as of 2012[update], "Young Boy", which reached number 19.[153]
- ^ Run Devil Run reached number 12 in the UK and number 27 in the US.
- ^ Driving Rain reached number 46 in the UK and number 26 in the US.
- ^ Back in the U.S. reached number 8 in the US, and Back in the World reached number 5 in the UK.[165]
- ^ During the Driving World Tour McCartney performed twenty-three Beatles songs in a thirty-six song set, including an all-Beatles encore.
- ^ In June 2005, McCartney released the electronica album Twin Freaks, a collaborative project with bootleg producer and remixer Freelance Hellraiser consisting of remixed versions of songs from his solo career.
- ^ Chaos and Creation in the Backyard is McCartney's most recent top-ten album as of 2012[update]. It reached number 10 in the UK, and number 6 in the US. It was supported by a UK top-twenty hit single, his most recent as of 2012[update], "Fine Line", which failed to chart in the US, and "Jenny Wren", which reached number 22 in the UK.[174]
- ^ McCartney followed the release of Chaos and Creation in the Backyard with the 'US' Tour, the tenth top earning act of 2005 in the US, taking in over \$17 million in ticket sales for eight shows. During the opening performance of the tour, he played thirty-five songs, of which twenty-three were Beatles tracks.[175]
- ^ Ecce Cor Meum reached number 2 on the classical charts in both the UK and the US.
- ^ Memory Almost Full reached number 3 in the US and spending fifteen weeks in the charts. As of 2012[update], it remains McCartney's most recent top-five album.[178]
- ^ Electric Arguments reached number 67 on the Billboard 200 and number 1 on the Independent Albums chart.[180]
- ^ In November 2010, iTunes made available the official canon of thirteen Beatles studio albums, Past Masters and the 1962-1966 and 1967-1970 greatest-hits compilations, making the group among the last of the seminal classic rock artists to offer their music for sale on the digital marketplace.[186]
- ^ McCartney's band performed thirty-seven songs during the 8 May 2012, performance in Mexico City, twenty-three of which were Beatles tracks.[192]
- ^ As of 2012[update], Elvis Presley has achieved the most UK number-ones as a solo artist with eighteen.
- ^ "Hey Jude" was covered by several prominent artists, including Elvis Presley, Bing Crosby, Count Basie and Wilson Pickett.

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 ^ Spitz 2005, p. 95: "The Quarrymen played a spirited set of songs - half skiffle, half rock 'n roll".  
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 ^ Miles 1997, p. 74: McCartney: "Nobody wants to play bass, or nobody did in those days".; Gould 2007, p. 89: On McCartney playing bass when Sutcliffe was indisposed., Gould 2007, p. 94: "Sutcliffe gradually began to withdraw from active participation in the Beatles, ceding his role as the group's bassist to Paul McCartney".  
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 ^ For song authorship see: Harry 2002, p. 90: "Can't Buy Me Love", Harry 2002, p. 439: "I Saw Her Standing There"; Harry 2000a, pp. 561-562: "I Want to Hold Your Hand"; and MacDonald 2005, pp. 66-68: "I Saw Her Standing There", MacDonald 2005, pp. 83-85: "She Loves You", MacDonald 2005, pp. 99-103: "I Want to Hold Your Hand", MacDonald 2005, pp. 104-107: "Can't Buy Me Love", MacDonald 2005, pp. 171-172; For release dates, US and UK peak chart positions of the preceding songs see: Lewisohn 1992, pp. 350-351.  
 ^ Buk 1996, p. 51: Their first recording that involved only a single band member; Gould 2007, p. 278: The group's first recorded use of classical music elements in their music.  
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^ Gould 2007, p. 350: "neoclassical tour de force", Gould 2007, p. 402: "a true hybrid".

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#### External links

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Paul McCartney

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Persondata

Name

McCartney, Paul

Alternative names

Sir James Paul McCartney

Short description

English rock musician

Date of birth

18 June 1942

Place of birth

Liverpool, UK

Date of death

Place of death

The 1995 Japanese Grand Prix (formally the XXI Fuji Television Japanese Grand Prix) was a Formula One motor race held on October 29, 1995 at the Suzuka Circuit, Suzuka. It was the sixteenth and penultimate round of the 1995 Formula One season.[1] The race, contested over 53 laps, was won by Michael Schumacher for the Benetton team after he started from pole position. Mika Häkkinen finished second in a McLaren, and Johnny Herbert third in the other Benetton car.[2]

Jean Alesi, driving for Ferrari, started second alongside Schumacher. However, Alesi was forced to serve a 10-second stop-and-go penalty because his car moved forward before the start. Alesi climbed back up to second, before retiring on lap 25. Schumacher's rival in the Drivers' Championship, Damon Hill, started fourth amidst pressure from the British media after poor performances at previous races. Hill moved up to second because of Alesi's retirement, but spun off the circuit on lap 40.[3]

Schumacher's win was his ninth of the season, matching Nigel Mansell's record for victories in a season that was set in 1992.[4] Benetton were confirmed Constructors' Champions as Williams could not pass Benetton's points total in the one remaining race.[3]

[edit] Report

[edit] Background

Heading into the penultimate race of the season, Benetton driver Michael Schumacher had already won the season's Drivers' Championship, having clinched the title at the previous race, the Pacific Grand Prix. Schumacher led the championship with 92 points; Damon Hill was second with 59 points. A maximum of 20 points were available for the remaining two races, which meant that Hill could not catch Schumacher. Although the Drivers' Championship was decided, the Constructors' Championship was not. Benetton were leading on 123 points and Williams were second with 102 points heading into the 16th race, with a maximum of 32 points available.[5] In the week leading up to the race, Hill was criticised by the British media after poor performances in previous races; there was continued speculation that Williams were going to replace him with Heinz-Harald Frentzen or Gerhard Berger for the 1996 season.[6][7][8] Despite the rumours, Williams team boss Frank Williams gave Hill "an unequivocal vote of confidence" heading into the race.[9]

There were two driver changes heading into the race. Having been in one of the two Sauber cars since the fifth race of the season at Monaco, Jean-Christophe Boullion was released from the team and replaced by Karl Wendlinger. The Austrian was given another chance to prove himself after suffering an accident at the 1994 Monaco Grand Prix, which left him in a coma for weeks.[10] The second driver change was Mika Häkkinen's return to McLaren after missing the Pacific Grand Prix because of an operation for appendicitis.[11]

[edit] Practice and qualifying

Two practice sessions were held before the race; the first was held on Friday morning and the second on Saturday morning. Both sessions lasted 1 hour and 45 minutes with weather conditions dry throughout.[12] Schumacher was fastest in the first session, posting a time of 1:40.410, two-tenths of a second quicker than Häkkinen. The Williams and Ferrari cars occupied the remaining top six positions; Williams drivers Hill and David Coulthard third and fifth respectively. The Ferraris were fourth and sixth fastest; Jean Alesi ahead of Berger. Häkkinen lapped faster than Schumacher in the second practice session with a time of 1:40.389. Eddie Irvine took second place in the Jordan car, three-tenths of a second behind Häkkinen. Hill was third in the Williams, two-tenths behind Häkkinen, with Schumacher fourth behind Hill. The Ferraris were fifth and eighth; Alesi in front of Berger. Frentzen's Sauber and Coulthard's Williams split the Ferraris.[1] Despite both the Williams cars going off into the gravel, Hill and Coulthard made the top 10.[13]

"Nobody is more disappointed than myself and the team. We have to investigate why we were not competitive. I was surprised by the performance of the McLaren and even more impressed by Michael's [Schumacher] performance at the end of the session."

The qualifying session was split into two one-hour sessions; the first was

held on Friday afternoon with the second held on Saturday afternoon. The fastest time from either sessions counted towards their final grid position.[12] Schumacher clinched his tenth career pole position, in his Benetton B195, with a time of 1:38.023. He was joined on the front row by Alesi, who was eight-tenths of a second behind.[1][15] Schumacher was particularly pleased with the performance of his Benetton, saying that "I have rarely had such a good car [...] I think I can be confident for the race".[16] Alesi was satisfied about his performance, but worried about a mechanical problem which had caused him to crash on Friday, accusing the Ferrari team of withholding information from him.[16] Alesi was scheduled to leave Ferrari for Benetton in a swap with Schumacher at the end of the season, and the relationship between him and the team was becoming increasingly strained.[17] Häkkinen was third in the McLaren, with Hill fourth, a second slower than Schumacher. Despite Häkkinen's best qualifying effort of the season alongside his Belgium third place,[18] his team-mate, Mark Blundell, had a disappointing qualifying session. In the first part of qualifying, Blundell crashed into the wall, meaning he could not set a time as his car was too badly damaged. Blundell had his second crash of the weekend at the 130R corner in Saturday practice, which was more serious than the first. Following medical advice, Blundell did not participate in the second qualifying session. He was unable to set a time, leaving him at the back of the grid.[19] Aguri Suzuki crashed his Ligier during Saturday qualifying; he was unable to start the race since he was in a hospital with a broken rib.[3]

The track surface was damp for most of the race, which meant that lap times were slower than the previous days' qualifying sessions.[1] The drivers took to the track at 09:30 JST (GMT +10) for a 30-minute warmup session. Despite underperforming in qualifying, both Williams cars performed better in the wet weather warmup session; Hill had the fastest time of 2:00.025. Coulthard was third in the other Williams car; Schumacher split them in second position. Alesi completed the top four, eight-tenths of a second behind Hill.[1] Though 24 cars qualified for the race, only 22 took the start: Suzuki was unable to start because of his crash in qualifying and Roberto Moreno's Forti car suffered a gearbox problem.[9][20] For the first time since the Japanese Grand Prix was held at Suzuka in 1987, tickets for the race did not sell out, despite the fact that three Japanese drivers entered the race.[21]

The race started at 14:00 JST. All of the drivers opted to start on wet weather tyres as the track was damp from the morning rain.[3] Schumacher, from pole position on the grid, held onto the lead into the first corner. Alesi, who started alongside Schumacher, was judged to have jumped the start, and served a 10-second stop-and-go penalty on lap three,[3][15] from which he returned to the race in tenth place.[1] Alesi's team-mate Berger also jumped the start and received the same penalty. Gianni Morbidelli, near the back of the field in one of the Footwork cars, spun at the first corner on lap one after being hit from behind by Wendlinger's Sauber. Morbidelli stalled his car in the process, forcing him to retire from the race.[9] On lap seven, Alesi stopped at the pits to change to dry weather slick tyres, as the track was beginning to dry.[15][22] On returning to the race, he began to make his way through the field constantly recording fastest laps; the first of which was 1:54.416, five seconds faster than the remainder of the field.[22][23] Schumacher made a pit stop on lap 10 for slicks, handing the lead to Häkkinen for a lap before he too pitted. Alesi's progress was interrupted when he spun attempting to pass Pedro Lamy's Minardi for 15th place,[3][15] but he made his way up to second by lap 10, overtaking Hill around the outside in the final chicane to take the place. Alerted by Alesi's pace on the slick tyres, the other drivers came into the pits to change to slick tyres.[24]

The two Jordan cars collided on lap 15. Rubens Barrichello spun in the final chicane when he attempted to brake later than his team-mate Irvine. Barrichello hit a wall, which damaged his car's rear wing and caused him to retire from the race. Irvine was involved in another collision at the chicane on lap 20 when Frentzen hit him from behind. Irvine continued without damage, but Frentzen had



to pit for a new front wing.[24] At the front, Alesi was lapping faster than Schumacher, even though Schumacher was on dry tyres.[22] Alesi was only six seconds behind Schumacher when his Ferrari 412T2 suffered an apparent differential failure on lap 25.[3][15] It was later discovered that the problem was a driveshaft failure, possibly as a result of his earlier spin.[24] Schumacher pitted for a second time on lap 31, returning to the race in second place behind Hill. Schumacher set the fastest lap of the race on lap 33, and regained his lead on the next lap when Hill made his pit stop.[22] Behind them, Häkkinen and Coulthard were third and fourth respectively before their pit stops, but Coulthard pitted six laps later than Häkkinen and returned to the track in third place, one place ahead of the Finn.[25] Johnny Herbert was fifth in the second Benetton car after the second round of pit stops, with Irvine rounding out the point-scoring places in sixth.[1][26]

At this stage, the rain began to fall again, but only at the Spoon Curve end of the track. The Williams drivers were second and third until Hill ran off the track at Spoon Curve two laps after his pit stop. He damaged his front wing in the process and returned to the track in fourth.[22] Hill returned to the pits to let his pit crew replace the damaged wing. He rejoined fifth, but was then given a ten second stop-and-go penalty for speeding in the pitlane.[3] Coulthard made the same mistake as his team-mate by running through the gravel trap at the Spoon Curve but looked like he was going to escape with only minor damage. However, as he braked for 130R, the next corner, the gravel which had entered his sidepods flew out, causing him to lose control and get his car stuck in the gravel trap.[22] Hill was told by his team on the radio to speed up as he had not yet taken his stop-and-go penalty, but later that lap he spun off at Spoon Curve and retired from the race without having taken the penalty.[3] Blundell, Irvine and Frentzen also left the track at Spoon Curve but all finished the race.[22] With his closest challenger out, Schumacher won the race after 53 laps to secure his ninth victory of the season in a time of 1:36:52.930.[1][27] The win, along with Herbert's third place and the retirements of Hill and Coulthard, gave Benetton the 1995 Constructors' Championship.[3] Häkkinen finished second in his McLaren, 20 seconds behind Schumacher. Irvine was fourth in his Jordan with Olivier Panis fifth in his Ligier. Mika Salo took sixth place and the final point in his Tyrrell.[27] Despite starting last, Blundell finished in seventh, just 1.6 seconds behind Salo.[25] The delayed Frentzen, Luca Badoer, Wendlinger, Lamy and Taki Inoue completed the finishers.[1]

[edit] Post-race

"It's a really great feeling now, because I fulfilled the promises that I made to the team at the beginning of the season to get both titles [Drivers' and Constructors']."

This was Schumacher's last win for Benetton, as he moved to the Ferrari team for the 1996 season.[28] Herbert reiterated Schumacher's opinion by stating that Benetton did "a fantastic job".[25] Hill was disappointed about the race and the season as a whole; he said afterwards:

Just when you think that it couldn't get any worse, it does. There is no easy way out of this, you just have to keep pressing on. The easiest thing to do is to give up, and it would probably be less painful that way, but that is not an option. While we were in the race we were competitive and I was in with a shout, I suppose, all the time I was on the track. But things took a massive turn for the worse, I am afraid. I drove through the rain and the second time I spun off I think it was oil rather than rain. It is not a glorious end to the season but the ingredients are all there and there is no reason why we should

not get into the winning habit again.[25]

As a result of Hill not taking his 10-second stop-and-go penalty because of his retirement, Williams were fined \$10,000 by Formula One's governing body, the Fédération Internationale de l'Automobile (FIA).[25] In an interview with Motor Sport magazine in 2008, Hill said that the 1995 season, as a whole, "went down, mentally, and it all just got to me". He also said he believed that it was in 1995 that Frank Williams and Patrick Head decided to replace him for the 1997 season.[29]

1980 Formula One World Champion Alan Jones praised Alesi's performance, saying that it "will go down as one of the great drives in Grand Prix racing".[15] Alesi stated that if his driveshaft had not failed, he would "have fought for it, all the way to the end". Alesi added that he believed he did not jump the start, but admitted that "the car crept forwards by a few centimetres" because of the downhill slope of the grid.[24] In an interview with Autosport magazine in 2009, Alesi said that he went to see the race director before the race to see how he could avoid a penalty at the downhill start and that he was "totally fed up" with the penalty decision given.[23] Berger also questioned his penalty, claiming that his car did not move before the green light went on.[8]

[edit] Classification

[edit] Qualifying

[edit] Standings after the race

Note, only the top five positions are included for both sets of standings.

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Coordinates: 34°50′23″N 136°32′26″E﻿ / ﻿34.84306°N 136.54056°E﻿ / 34.84306; 136.54056

*Cryptoprocta spelea*, also known as the giant fossa,[4] is an extinct species of carnivore from Madagascar in the family Eupleridae, which is most closely related to the mongooses and includes all Malagasy carnivorans. It was first described in 1902, and in 1935 was recognized as a separate species from its closest relative, the living fossa (*Cryptoprocta ferox*). *C. spelea* is larger than the fossa, but otherwise similar. The two have not always been accepted as distinct species. When and how the larger form went extinct is unknown; there is some anecdotal evidence, including reports of very large fossas, that there is more than one surviving species.

The species is known from subfossil bones found in a variety of caves in northern, western, southern, and central Madagascar. In some sites, it occurs

with remains of *C. ferox*, but there is no evidence that the two lived at the same time. Living species of comparably-sized, related carnivores in other regions manage to coexist, suggesting that the same may have happened with both *C. spelea* and *C. ferox*. *C. spelea* would have been able to prey on larger animals than its smaller relative could have, including the recently extinct giant lemurs.

#### [edit] Taxonomy

In 1902, Guillaume Grandidier described subfossil carnivoran remains from two caves on Madagascar as a larger "variety" of the living fossa (*Cryptoprocta ferox*), *C. ferox* var. *spelea*. G. Petit, writing in 1935, considered *spelea* to represent a distinct species.[3] Charles Lambertson reviewed subfossil and living *Cryptoprocta* in 1939 and agreed with Petit in recognizing two species,[5] naming this species from a specimen found at Ankazoabo Cave near Itampolo. The specific name *spelea* means "cave" and was given because of the location of its discovery.[6] However, Lambertson apparently had at most three skeletons of the living fossa, not nearly enough to capture the range of variation in that species, and some later authors did not separate *C. spelea* and *C. ferox* as species.[7] Steven Goodman and colleagues, using larger samples, compiled another set of *Cryptoprocta* measurements that was published in a 2004 article. They found that some subfossil *Cryptoprocta* fell outside the range of variation of living *C. ferox*, and identified those as representing *C. spelea*. [8] Grandidier had not designated a type specimen for the species, and to maintain *C. spelea* as the name for the larger form of the fossa, Goodman and colleagues designated a specimen to serve as the type specimen (specifically, a neotype).[9]

Lamberton recognized a third species, *Cryptoprocta antamba*, on the basis of a mandible (lower jaw) with abnormally broad spacing between the condyloid processes at the back.[10] He also referred two femora (upper leg bones) and a tibia (lower leg bone) intermediate in size between *C. spelea* and *C. ferox* to this species.[11] The specific name refers to the "antamba", an animal allegedly from southern Madagascar described by *Antenne de Flacourt* in 1658 as a large, rare, leopard-like carnivore that eats men and calves and lives in remote mountainous areas; [12] it may have been the giant fossa. [13] Goodman and colleagues could not locate Lambertson's material of *Cryptoprocta antamba*, but suggested that it was based on an abnormal *C. spelea*. [14] Together, the fossa and *C. spelea* form the genus *Cryptoprocta* within the family Eupleridae, which also includes the other Malagasy carnivorans—the falanouc, the fanalokas, and the Galidiinae. DNA sequence studies suggest that the Eupleridae form a single natural (monophyletic) group and are most closely related to the mongooses of Eurasia and mainland Africa. [15]

#### [edit] Description

Although some morphological differences between the two fossa species have been described, [16] these may be allometric (growth-related), and in their 1986 Mammalian Species account of the fossa, Michael Mittern and Klaus Leonhardt wrote that the two were morphologically identical. [17] However, remains of *C. spelea* are larger than any living *C. ferox*. Goodman and colleagues found that skull measurements in specimens they identified as *C. spelea* were 1.07 to 1.32 times as large as in adult *C. ferox*, and postcranial measurements were 1.19 to 1.37 times as large. [8] The only specimen of *C. spelea* in which condylobasal length (a measure of total skull length) could be ascertained measured 153.4 mm (6.04 in), compared to a range of 114.5 to 133.3 mm (4.51 to 5.25 in) in adult *C. ferox*. Humerus (upper arm bone) length in twelve *C. spelea* is 122.7 to 146.8 mm (4.83 to 5.78 in), averaging 137.9 mm (5.43 in), compared to 108.5 to 127.5 mm (4.27 to 5.02 in), averaging 116.1 mm (4.57 in), in the extant fossa. [18] Body mass estimates for *C. spelea* range from 17 kg (37 lb) [19] to 20 kg (44 lb), [20] and it was among the largest carnivores of the island. [21] By comparison, adult *C. ferox* range from 5 kg (11 lb) to 10 kg (22 lb). [22]

#### [edit] Distribution, ecology, and extinction

*Cryptoprocta spelea* is the only extinct member of the order Carnivora known from Madagascar; [6] recently extinct Madagascan animals also include at least

17 species of lemurs, most of which are larger than the living forms,[14] as well as elephant birds and Malagasy hippopotamuses, among others.[23] Subfossil remains of the giant fossa have been found in Holocene cave sites[3] from the northern end of Madagascar along the west coast to the far south, and in the central highlands. Some sites have yielded both *C. spelea* and smaller remains referable to the living species, *C. ferox*; however, lack of robust stratigraphic knowledge and no available radiocarbon dating on subfossil *Cryptoprocta* bones makes it uncertain whether the two species lived in the same region at the same time.[24] The size ratio between the two species is within the range of ratios seen between similar-sized living cats and mongooses found in the same areas, suggesting that the two species may have been able to occur together.[2]

With its large size and massive jaws and teeth,[25] *C. spelea* was a formidable, "puma-like"[26] predator, and in addition to smaller lemurids, it may have eaten some of the big, now extinct subfossil lemurs that would have been too large for *C. ferox*. [27] No subfossil evidence has been found to definitively show that lemurs were its prey; this assumption is based on the diet of the smaller, extant species of fossa.[28] Other possible prey include tenrecs, smaller euplerids, and even young Malagasy hippopotamuses.[29] Its extinction may have changed predation dynamics on Madagascar.[30]

The IUCN Red List currently lists *C. spelea* as an extinct species; why and when it went extinct remains unknown.[1] However, local people on Madagascar often recognize two forms of fossa, a larger fossa mainty (or "black *Cryptoprocta*") and a smaller fossa mena (or "reddish *Cryptoprocta*").[31] There are also some anecdotal records of very large living fossas, such as a 2-m (7 ft), 30-kg (70 lb) fossa at Morondava. Goodman and colleagues suggested that further research may demonstrate that there is more than one species of fossa yet alive.[2]

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*Boletus frostii*, commonly known as Frost's bolete or the apple bolete, is a bolete fungus first described scientifically in 1874. A member of the Boletaceae family, the mushrooms produced by the fungus have tubes and pores instead of gills on the underside of their caps. *Boletus frostii* is distributed in the eastern United States from Maine to Georgia and Arizona, and south to Mexico and Costa Rica. A mycorrhizal species, its fruit bodies are typically found growing near hardwood trees, especially oak.

*Boletus frostii* mushrooms can be recognized by their dark red sticky caps, the red pores, the network-like pattern of the stem, and the bluing reaction to tissue injury. Another characteristic of young, moist fruit bodies is the amber-colored drops exuded on the pore surface. Although the mushrooms are considered edible, they are generally not recommended for consumption because of the risk of confusion with other poisonous red-pored, blue-bruising boletes. *B. frostii* may be distinguished from other superficially similar red-capped boletes by differences in distribution, associated tree species, bluing reaction, or morphology.

[edit] Taxonomy

The species was named by the Unitarian minister John Lewis Russell of Salem, Massachusetts, based on specimens found in Brattleboro, Vermont. He named the fungus after his friend, another amateur American mycologist, Charles Christopher Frost, who published a description of the species in his 1874

survey of the boletes of New England.[2][3] When the name of a species is contributed by an individual, but the name is formally published by another, the contributor's name can be cited, separated from the publishing author as apud; for this reason, the name and authority are written *Boletus Frostii* Russell apud Frost in some older literature.[4] Bernard Ogilvie Dodge made reference to *B. frostii* in 1950 during an address to the Mycological Society of America, in which he spoke about the role of the amateur in discovering new species: "They would have informed us all about the man Russell, who named a fine new bolete for his friend Frost, and about the man Frost, who named a fine new bolete for his friend Russell. *Boletus Frostii* and *Boletus Russellii* are mushrooms with character, even though they were described by amateurs." [5] However, in attempting to establish a lectotype specimen, mycologist Roy Halling examined both Russell's original material and his accompanying notes; he concluded that it was Frost who made the original species determinations, further suggesting "there is no evidence to show that Russell ever collected *B. frostii* or wrote a description of it." [6]

William Murrill in 1909 placed the species in the genus *Suillellus*, [7] while Sanshi Imai transferred it to *Tubiporus* in 1968; [1] both of these genera have since been folded into *Boletus*. [8] In 1945, Rolf Singer described a bolete he found in Florida; although he originally described it as a subspecies of *B. frostii*, [9] he later considered the differences between the taxa significant enough to warrant publishing *Boletus floridanus* as a unique species. [4]

*Boletus frostii* is commonly known as "Frost's bolete" [10] or the "apple bolete". In Mexico, its vernacular name is *panza agria*, which translates to "sour belly". [11]

#### [edit] Description

The shape of the cap of the young fruit body ranges from a half sphere to convex, later becoming broadly convex to flat or shallowly depressed, with a diameter of 5 to 15 cm (2.0 to 5.9 in). [12] The edge of the cap is curved inward, although as it ages it can uncurl and turn upward. In moist conditions, the cap surface is sticky as a result of its cuticle, which is made of gelatinized hyphae. If the fruit body has dried out after a rain, the cap is especially shiny, [4] sometimes appearing finely areolate (having a pattern of block-like areas similar to cracked, dried mud). [12] Young mushrooms have a whitish bloom on the cap surface. [13]

The color is bright red initially, but fades with age. The flesh is up to 2.5 cm (1.0 in) thick, and ranges in color from pallid to pale yellow to lemon yellow. [12] The flesh has a variable staining reaction in response to bruising, so some specimens may turn deep blue almost immediately, while others turn blue weakly and slowly. [4]

The tubes comprising the pore surface (the hymenium) are 9 to 15 mm deep, yellow to olivaceous yellow (mustard yellow), turning dingy blue when bruised. The pores are small (2 to 3 per mm), circular, and until old age a deep red color that eventually becomes paler. The pore surface is often beaded with yellowish droplets when young (a distinguishing characteristic), and readily stains blue when bruised. The stem is 4 to 12 cm (1.6 to 4.7 in) long, and 1 to 2.5 cm (0.4 to 1.0 in) thick at its apex. It is roughly equal in thickness throughout its length, though it may taper somewhat toward the top; some specimens may appear ventricose (swollen in the middle). [12] The stem surface is mostly red, or yellowish near the base; it is reticulate—characterized by ridges arranged in the form of a net-like pattern. [12] Mycelia, visible at the base of the stem, are yellowish white to light yellow. [4]

The spore print of *B. frostii* is olive brown. [12] The spores are thick walled, smooth, and spindle shaped, with dimensions of 11 to 15 by 4 to 5 µm. Longer spores up to 18 µm long may also be present. [12] The cap cuticle, or pileipellis, is made of a tangled layer of gelatinized hyphae that are 3 to 6 µm wide. [14] The spore-bearing cells, the basidia, are four spored and measure 26 to 35 by 10.5 to 11.5 µm. Cystidia are non-fertile cells interspersed among the basidia, and they are prevalent in the hymenial tissue of *B. frostii*. These hyaline (translucent) cells measure 30 to 53 long by 7.5 to 14 µm wide, and range in shape

from somewhat like a spindle (tapering at each end, but with one end typically rounded) to subampullaceousâ ~shaped somewhat like a swollen bottle.[4]

[edit] Edibility and nutritional composition

In 1910, Murrill wrote of this mushroom's edibility: "Usually viewed with suspicion because of its red hymenium, but its properties are not accurately known." [15] Since then, several authors have advised against consuming the species, due to its resemblance to other toxic red-capped boletes. [10][12][16] In his 100 Edible Mushrooms (2007), Michael Kuo notes that although the mushroom is apparently edible for some, it "affects others negatively". [17] Despite these warnings, *Boletus frostii* is edible, and David Arora mentions that it is commonly sold in rural markets in Mexico; [11] a 1997 study suggests that it is only consumed in rural areas in Quer  taro state. [18] Its taste and odor have been described as "pleasant" [10] or "sweet" [19] and somewhat like citrus, [13] although the cuticle of the cap may taste acidic. [12]

Chemical analysis of fresh fruit bodies collected in Mexico showed them to have the following composition: moisture 94.53%; ash 3.23   milligrams per gram of mushroom (mg/g); dietary fiber 30.24   mg/g; fat 3.68   mg/g; and protein 15.81   mg/g. The free fatty acid content of dried fruit bodies was 45   mg/g, slightly more than the common button mushroom (*Agaricus bisporus*), which had 35   mg/g. The majority of this total was oleic acid (19.5   mg/g), followed by linoleic acid (16.8   mg/g) and palmitic acid (16.9   mg/g). [18]

[edit] Similar species

Other red-capped boletes include the poisonous *B.   flammans* and *B.   rubroflammeus*; the former grows most commonly under conifers, the latter in association with hardwoods in eastern North America and southern Arizona. [11] Often confused with *B.   frostii* are *B.   permagnificus* and *B.   siculus*, but the latter two species are known only from Europe and always grow in association with oaks. [20][21] The fruit bodies of young specimens of *B.   kermesinus*, newly described from Japan in 2011, are similar in appearance to *B.   frostii*. In addition to its distribution, *B.   kermesinus* can be distinguished from *B.   frostii* by having flesh that does not bruise blue and a stem in which the reticulum is not as deep and coarse. [22] *B.   pseudofrostii*, found in Belize, produces smaller caps that are 1.7 to 2.0 cm (0.7 to 0.8 in) in diameter. [23] *Boletus russelli*, found in eastern North America, has a red to reddish-brown cap and reticulate stem, but its pore surface is yellow, and the fruit body does not bruise blue. [17]

*Boletus floridanus* differs from *B.   frostii* in having a lighter cap color and in the texture of the cap surface: it is tomentose (covered with dense, short, soft, matted hairs) or velutinous (like velvet), compared to the relatively smooth surface of *B.   frostii*. Singer notes that although the physical characteristics between the two taxa may be blurred and are hard to define, the area of origin can reliably distinguish them: *B.   floridanus* is found on shaded lawns and scrubland in open oak stands in non-tropical regions of Florida, typically on grassy or sandy soil, where it fruits between May and October. [4]

[edit] Ecology, habitat, and distribution

*Boletus frostii* is a mycorrhizal species, [24] meaning that the fungus forms associations with the roots of various species of trees. These associations are mutualistic, because the fungus absorbs mineral nutrients from the soil and channels these into the plant, while the plant provides the fungus with sugars, a product of photosynthesis. The characteristic feature of the mycorrhiza is the presence of a sheath of fungal tissue that encases the terminal, nutrient-absorbing rootlets of the host plant. The fungus forms an extensive underground network of hyphae that radiate outward from the surface of the root sheath, effectively increasing the surface area for nutrient absorption. The hyphae also invade between the root cortical cells to form a Hartig net. [25] Using pure culture techniques, *Boletus frostii* has been shown to form mycorrhizae with Virginia pine (*Pinus virginiana*), [24] while a field study confirms a similar association with the oak *Quercus laurina*. [26]

The fruit bodies grow solitarily, scattered, or in groups on the ground under hardwood trees; the fungus fruits in summer to early autumn. William Murrill



noted its preference for growing in "thin oak woods, where the light is sufficient to enable grass to grow",[7] and Alexander H. Smith mentioned its preference for growing in "thin, sandy soil under scrub oak." [3] In the United States, it is distributed from Maine south to Georgia, extending west to Tennessee, Michigan, and southern Arizona.[4][13] In Mexico, it is often found under Madrone.[11] It has also been collected in Costa Rica, where it associates with the oak species *Quercus copeyensis*, *Q. costaricensis*, *Q. rapurahuensis*, and *Q. seemanii*. [27] A 1980 publication tentatively suggested that the fungus was also present in Italy,[28] but the author later determined that the putative *B. frostii* was actually *Boletus sículus*. [21]

Fruit bodies can be parasitized by the mold-like fungus *Sepedonium ampullosporum*. [29] Infection results in necrosis of the mushroom tissue, and a yellow color caused by the formation of large amounts of pigmented aleurioconidia (single-celled conidia produced by extrusion from the conidiophores). [30]

[edit] See also

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[edit] External links

*Agaricus deserticola*, commonly known as the gasteroid agaricus, is a species of fungus in the Agaricaceae family. Found only in southwestern and western North America, *A.Â deserticola* is adapted for growth in dry or semi-arid habitats. The fruit bodies are secotioid, meaning the spores are not forcibly discharged, and the cap does not fully expand. Unlike other *Agaricus* species, *A.Â deserticola* does not develop true gills, but rather a convoluted and

networked system of spore-producing tissue called a gleba. When the partial veil breaks or pulls away from the stem or the cap splits radially, the blackish-brown gleba is exposed, which allows the spores to be dispersed.

The fruit bodies can reach heights of 18 cm (7.1 in) tall with caps that are up to 7.5 cm (3.0 in) wide. The tough woody stems are 1–2 cm (0.4–0.8 in) wide, thickening towards the base. Fruit bodies grow singly or scattered on the ground in fields, grasslands, or arid ecosystems. Other mushrooms with which *A. deserticola* might be confused include the desert fungus species *Podaxis pistillaris* and *Montagnea arenaria*. The edibility of *Agaricus deserticola* mushrooms is not known definitively.

Formerly named *Longula texensis* (among several other synonyms), the fungus was transferred to the genus *Agaricus* in 2004 after molecular analysis showed it to be evolutionary related to species in that genus. In 2010, its specific epithet was changed to *deserticola* after it was discovered that the name *Agaricus texensis* was illegitimate, having been previously published for a different species.

#### [edit] Taxonomic history

The species was first described scientifically as *Secotium texense* by Miles Joseph Berkeley and Moses Ashley Curtis in 1873, based on specimens sent to them from western Texas.[3] George Edward Massee transferred it to the genus *Gyrophragmium* in 1891, because of its resemblance to the species *Gyrophragmium delilei*, and because he felt that the structure of the volva as well as the internal morphology of the gleba excluded it from *Secotium*. [4] In 1916, William Murrill listed the species in *Gymnopus*, but did not explain the reason for the generic transfer.[5] In a 1943 publication, Sanford Zeller compared a number of similar secotioid genera: *Galeropsis*, *Gyrophragmium* and *Montagnea*. He concluded that the species did not fit in the limits set for the genus *Gyrophragmium* and so created the new genus *Longia* with *Longia texensis* as the type species. The generic name was to honor William Henry Long, an American mycologist noted for his work in describing *Gasteromycetes*. Zeller also mentioned two additional synonyms:[2] *Secotium decipiens* (Peck, 1895), [6] and *Podaxon strobilaceus* (Copeland, 1904).[7]

Two years later in 1945, Zeller pointed out that the use of the name *Longia* was untenable, as it had already been used for a genus of rusts described by Hans Sydow in 1921,[8] so he proposed the name *Longula* and introduced the new combination *Longula texensis* in addition to *L. texensis* var. *major*. [9] The species was known by this name for about 60 years, until a 2004 phylogenetic study revealed the taxon's close evolutionary relationship with *Agaricus*, [10][11] a possibility insinuated by Curtis Gates Lloyd a century before.[12] This resulted in a new name in that genus, but it soon came to light that the name *Agaricus texensis* had already been used, ironically enough, by Berkeley and Curtis themselves in 1853,[13] for a taxon now treated as a synonym of *Flammulina velutipes*. [14] Since this made the new *Agaricus texensis* an unusable homonym, Gabriel Moreno and colleagues published the new name *Agaricus deserticola* in 2010.[15] The mushroom is commonly known as the gasteroid *Agaricus*. [16]

#### [edit] Classification and phylogeny

The classification of *Agaricus deserticola* has been under debate since the taxon was first described. It was thought by some mycologists to be a member of the *Gasteromycetes*, a grouping of fungi in the basidiomycota that do not actively discharge their spores. The *Gasteromycetes* are now known to be an artificial assemblage of morphologically similar fungi without any unifying evolutionary relationship. When the species was known as a *Gyrophragmium*, Fischer thought it to be close to *Montagnites*, a genus he considered a member of the *Agaricaceae* family. [17] Conrad suggested a relationship with *Secotium*, which he believed to be close to *Agaricus*. [18] Curtis Gates Lloyd said of *Gyrophragmium*: "[it] has no place in the *Gasteromycetes*. Its relations are more close to the *Agarics*. It is the connecting link between the two passing on one hand through *Secotium* to the true *Gasteromycetes*." [12] Morse believed that *Gyrophragmium* and the secotioid genus *Endoptychum* formed a transition between

the Gasteromycetes and the Hymenomycetes (the gilled fungi).[19]

The species is now thought to have evolved from an *Agaricus* ancestor, and adapted for survival in dry habitats.[10][11] These adaptations include: a cap that does not expand (thus conserving moisture); dark-colored gills that do not forcibly eject spores (a mechanism known to depend on turgor pressure achievable only in sufficiently hydrated environments); and a partial veil that remains on the fruit body long after it has matured.[20] This form of growth is called secotioid development, and is typical of other desert-dwelling fungi like *Battarreia phalloides*, *Podaxis pistillaris*, and *Montagnea arenaria*. Molecular analysis based on the sequences of the partial large subunit of ribosomal DNA and of the internal transcribed spacers shows that *A. deserticola* is closely related to but distinct from *A. aridicola*. [10] A separate analysis showed *A. deserticola* to be closely related to *A. arvensis* and *A. abruptibulbus*. [21]

#### [edit] Description

The fruit body of *Agaricus deserticola* can grow up to 5 to 18 cm (2.0 to 7.1 in) in height. Fresh specimens are usually white, but will age to a pale tan; dried fruit bodies are light gray or tan mixed with some yellow.[22] The cap is 4 to 7.5 cm (1.6 to 3.0 in) in diameter, initially conic, later becoming convex to broadly convex as it matures.[23] The cap is composed of three distinct tissue layers: an outer volval layer, a middle cuticular layer (cutis), and an inner (tramal) layer which supports the gleba. The surface of the cap is white with yellow-brown to brown-tipped raised small scales; these scales result from the breakup of the volva and the cutis.[24]

Initially, the caps are covered by a peridium ~an outer covering layer of tissue. After the fruit body matures and begins to dry out, the lower part of the peridium begin to rip, usually starting from small longitudinal slits near where the peridium attaches to the top of the stem. However, the pattern of tearing is variable; in some instances the slits may appear higher up on the peridium, in others the peridium rips more irregularly.[12][22] The peridium may also rip in such a way that it appears as if there is a ring at the top of the stem. The torn peridium exposes the internal gleba. The gleba is divided into wavy plates or lamellae, some of which are fused together to form irregular chambers. The gleba is a drab brown to blackish-brown color, and it becomes tough and brittle as it dries out. The flesh is firm when young, white, and will stain light to bright yellow when it is bruised.[16]

The stem is cylindrical, 4 to 15 cm (1.6 to 5.9 in) long and 1 to 2 cm (0.4 to 0.8 in) thick. It is shaped like a narrow club, and the base may reach widths up to 4.5 cm (1.8 in). It is typically white, staining yellow to orange-yellow or pink when bruised, and becomes woody with age.[16][24] Mature specimens develop longitudinal grooves in maturity.[25] Numerous white rhizoids are present at the base of the stem; these root-like outgrowths of fungal mycelium help the mushroom attach to its substrate.[24] The apex of the stem extends into the gleba to form a columella that reaches the top of the cap. The internal gills are free from attachment to the stem,[2] but are attached full-length to the inside of the cap.[24] The partial veil is thick, white, and often sloughs off as the cap expands.[23]

A larger variety of the mushroom has been described by Zeller,[2] *A. deserticola* var. *major* (originally *Longula texensis* var. *major*), whose range overlaps that of the typical variety. Its caps are scalier than the typical variety, and range from 6 to 12 cm (2.4 to 4.7 in) or more in diameter, with a stem 10 to 25 cm (3.9 to 9.8 in) and up to 4.5 cm (1.8 in) thick.[16][24]

#### [edit] Microscopic characteristics

In deposit, such as with a spore print, the spores appear almost black, tinged with purple.[22] The spores are spherical in shape or nearly so, smooth, thick-walled, and lack a germ pore. They are nonamyloid (not absorbing iodine when stained with Melzer's reagent), black-brown, and have dimensions of 4.5 ^7.5 by 5.5 ^6.5 Åµm.[23] There is a prominent scar where the spore was once attached to the basidium (the spore-bearing cell) through the sterigma. The basidia are broadly club-shaped, and mostly four-spored, with long, slender

sterigmata. Unlike other *Agaricus* species, the spores of *A. deserticola* are not shot off, but are instead dispersed when they sift out of the dried, mature fruit bodies after the peridium breaks open.[2]

Schaeffer's chemical test is often used to help identify and differentiate *Agaricus* species. In this test, aniline plus nitric acid are applied to the surface of the fruit body, and if positive, a red or orange color forms.[26] *Agaricus deserticola* has a positive Schaeffer's reaction, similar to species in section *Arvensis* in the genus *Agaricus*. [10]

[edit] Similar species

*Montagnea arenaria*

*Podaxis pistillaris*

Species that resemble *A. deserticola* include the desert fungi *Montagnea arenaria* and *Podaxis pistillaris*. [20] *Montagnea arenaria* is a whitish stalked puffball with a hollow, woody stalk and a loose sac-like volva at the base of the stem. It is topped by a thin disc-like cap with blackish gill plates suspended around the margin. *Podaxis pistillaris* has a cylindrical to oval white to brownish cap with a paper-thin wall atop a slender stem. When mature, the cap contains powdery, dark brown spores. [16]

[edit] Edibility

The edibility of the fruit bodies of *Agaricus deserticola* is not known definitively, and there are conflicting opinions in the literature. One popular field guide to North American mushrooms suggests they are edible when they are young, and have a pleasant odor and mild taste. [23] However, other sources claim that the edibility is unknown, and consumption should be avoided. [20][27]

[edit] Fruit body development

In one early study of the mushroom's development, the fruit bodies appeared above the surface of the ground two or three days after rainfall or an irrigation, and required between five and eight days to mature. Slender and fragile rhizomorphs ~ dense masses of hyphae that form root-like structures ~ grow horizontally 2.5 to 5 cm (1.0 to 2.0 in) below the soil surface. Fruit bodies start as enlarged tips on the rhizomorphs, and manifest as numerous small, almost-spherical protuberances just beneath the surface of the soil. When the fruit bodies reach a diameter of about 4 to 6 mm (0.16 to 0.24 in), the stem and peridial regions begin to be distinguishable; the peridial region first appears as a small swelling at the apex of the much larger stem regions. [22]

The fruit bodies push upward through the soil when they are about 2 cm (0.8 in) tall. As growth progresses, the stem elongates and the peridium becomes more rounded, increasing in size until maturity. At about the time the peridium reaches 1 cm (0.4 in) or slightly more in diameter, the columella exerts an upward tension on the tissue of the partial veil, and it begins to pull away from the stem. Typically, the veil tissue is weakest near the attachment to the stem, rather than to the attachment at the edge of the peridium, and the veil separates from the stem. The lower edge of the peridium is further stretched as it is pulled upward and outward. Usually, the arid environment causes the gleba to dry out rapidly. If the veil tissue at the base of the stem is stronger than that attached to the edge of the peridium, the veil can rip so it remains attached to the stem as a ring. Scales begin to appear on the surface of the peridium of some specimens at about this time. [22]

[edit] Habitat and distribution

Like other *Agaricus* species, *A. deserticola* is saprobic ~ feeding off dead or decaying organic matter. The fruit bodies are found growing singly to sometimes more numerous, at low elevations, and typically in sandy soil. Its usual

habitats include dry lands, coastal sage scrub, and desert ecosystems.[23] It also grows in lawns and fields.[27] The range of the fungus is restricted to southwestern and western North America, where it fruits throughout the year, typically during or following cool, wet weather.[23] Zeller gives a range that includes as its eastern border central Texas, and extends westward to San Diego County, California and north to Josephine County, Oregon.[2] The mushroom used to be common in the San Francisco Bay area before land development reduced its preferred habitats.[16] *A. deserticola* has been collected in several states in northwestern Mexico, including Sonora,[28] Chihuahua,[15] and Baja California.[29]

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Saffron (pronounced /ˈsæfrɪn/ or /ˈsæfrɪˈn/)[1] is a spice derived from the flower of *Crocus sativus*, commonly known as the saffron crocus. *Crocus* is a genus in the family Iridaceae. Each saffron crocus grows to 20–30 cm (8–12 in) and bears up to four flowers, each with three vivid crimson stigmas, which are each the distal end of a carpel. Together with the styles, or stalks that connect the stigmas to their host plant, the dried stigmas are used mainly in various cuisines as a seasoning and colouring agent. Saffron, long among the world's most costly spices by weight, is native to Greece or Southwest Asia and was first cultivated in Greece. As a genetically monomorphic clone, it was slowly propagated throughout much of Eurasia and was later brought to parts of North Africa, North America, and Oceania.

The saffron crocus, unknown in the wild, likely descends from *Crocus cartwrightianus*, which originated in Crete; *C. thomasii* and *C. pallasii* are other possible precursors. The saffron crocus is a triploid that is "self-incompatible" and male sterile; it undergoes aberrant meiosis and is hence incapable of independent sexual reproduction— all propagation is by vegetative multiplication via manual "divide-and-set" of a starter clone or by interspecific hybridisation. If *C. sativus* is a mutant form of *C. cartwrightianus*, then it may have emerged via plant breeding, which would have

selected for elongated stigmas, in late Bronze-Age Crete.

Saffron's bitter taste and iodoform- or hay-like fragrance result from the chemicals picrocrocin and safranal. It also contains a carotenoid dye, crocin, which imparts a rich golden-yellow hue to dishes and textiles. Its recorded history is attested in a 7th-century BC Assyrian botanical treatise compiled under Ashurbanipal, and it has been traded and used for over four millennia. Iran now accounts for approximately 90 percent of the world production of saffron. Because each flower's anthers need to be collected by hand and there are only a few per flower, saffron is the most expensive spice in the world.[16][17]

[edit] Etymology

The ultimate origin of the English word saffron is, like that of the cultivated saffron clone itself, of somewhat uncertain origin. It immediately stems from the Latin word *safranum* via the 12th-century Old French term *safran*. *Safranum* derives from the Persian intercessor *zafarān*, or *za'ferān*. Ancient Parsi (now known as Farsi) which is the first language recorded as using this elegant material for cooking thousands of years ago.

[edit] Species

[edit] Description

The domesticated saffron crocus, *Crocus sativus*, is an autumn-flowering perennial plant unknown in the wild. Its progenitors are possibly the eastern Mediterranean autumn-flowering *Crocus cartwrightianus*, which is also known as "wild saffron" and originated in Greece. The saffron crocus likely resulted when *C. cartwrightianus* was subjected to extensive artificial selection by growers seeking longer stigmas. *C. thomasii* and *C. pallasii* are other possible sources.

It is a sterile triploid form, which means that three homologous sets of chromosomes compose each specimen's genetic complement; *C. sativus* bears eight chromosomal bodies per set, making for 24 in total. Being sterile, the purple flowers of *Crocus sativus* fail to produce viable seeds; reproduction hinges on human assistance: corms, underground bulb-like starch-storing organs, must be dug up, broken apart, and replanted. A corm survives for one season, producing via this vegetative division up to ten "cormlets" that can grow into new plants in the next season. The compact corms are small brown globules that can measure as large as 5 centimetres (2.0 in) in diameter, have a flat base, and are shrouded in a dense mat of parallel fibres; this coat is referred to as the "corm tunic". Corms also bear vertical fibres, thin and net-like, that grow up to 5 cm above the plant's neck.

The plant grows to a height of 20–30 cm (8–12 in), and sprouts 5–11 white and non-photosynthetic leafs known as cataphylls. They are membrane-like structures that cover and protect the crocus's 5–11 true leaves as they bud and develop. The latter are thin, straight, and blade-like green foliage leaves, which are 1–3 mm in diameter, either expand after the flowers have opened ("hysteranthous") or do so simultaneously with their blooming ("synanthous"). *C. sativus* cataphylls are suspected by some to manifest prior to blooming when the plant is irrigated relatively early in the growing season. Its floral axes, or flower-bearing structures, bear bracteoles, or specialised leaves that sprout from the flower stems; the latter are known as pedicels. After aestivating in spring, the plant sends up its true leaves, each up to 40 cm (16 in) in length. In autumn, purple buds appear. Only in October, after most other flowering plants have released their seeds, do its brilliantly hued flowers develop; they range from a light pastel shade of lilac to a darker and more striated mauve. The flowers possess a sweet, honey-like fragrance. Upon flowering, plants average less than 30 cm (12 in) in height. A three-pronged style emerges from each flower. Each prong terminates with a vivid crimson stigma 25–30 mm (0.98–1.2 in) in length.

[edit] Cultivation

*Crocus sativus* thrives in the Mediterranean maquis, an ecotype superficially resembling the North American chaparral, and similar climates where hot and dry summer breezes sweep semi-arid lands. It can nonetheless survive cold winters,



tolerating frosts as low as  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ) and short periods of snow cover. Irrigation is required if grown outside of moist environments such as Kashmir, where annual rainfall averages  $1,000\text{--}1,500\text{ mm}$  ( $39\text{--}59\text{ in}$ ); saffron-growing regions in Greece ( $500\text{ mm}$  or  $20\text{ in}$  annually) and Spain ( $400\text{ mm}$  or  $16\text{ in}$ ) are far drier than the main cultivating Iranian regions. What makes this possible is the timing of the local wet seasons; generous spring rains and drier summers are optimal. Rain immediately preceding flowering boosts saffron yields; rainy or cold weather during flowering promotes disease and reduces yields. Persistently damp and hot conditions harm the crops, and rabbits, rats, and birds cause damage by digging up corms. Nematodes, leaf rusts, and corm rot pose other threats. Yet *Bacillus subtilis* inoculation may provide some benefit to growers by speeding corm growth and increasing stigma biomass yield.

The plants fare poorly in shady conditions; they grow best in full sunlight. Fields that slope towards the sunlight are optimal (i.e., south-sloping in the Northern Hemisphere). Planting is mostly done in June in the Northern Hemisphere, where corms are lodged  $7\text{--}15\text{ cm}$  ( $2.8\text{--}5.9\text{ in}$ ) deep; its roots, stems, and leaves can develop between October and February. Planting depth and corm spacing, in concert with climate, are critical factors in determining yields. Mother corms planted deeper yield higher-quality saffron, though form fewer flower buds and daughter corms. Italian growers optimise thread yield by planting  $15\text{ cm}$  ( $5.9\text{ in}$ ) deep and in rows  $2\text{--}3\text{ cm}$  ( $0.79\text{--}1.2\text{ in}$ ) apart; depths of  $8\text{--}10\text{ cm}$  ( $3.1\text{--}3.9\text{ in}$ ) optimise flower and corm production. Greek, Moroccan, and Spanish growers employ distinct depths and spacings that suit their locales.

*C. sativus* prefers friable, loose, low-density, well-watered, and well-drained clay-calcareous soils with high organic content. Traditional raised beds promote good drainage. Soil organic content was historically boosted via application of some  $20\text{--}30\text{ tonnes}$  of manure per hectare. Afterwards, and with no further manure application, corms were planted. After a period of dormancy through the summer, the corms send up their narrow leaves and begin to bud in early autumn. Only in mid-autumn do they flower. Harvests are by necessity a speedy affair: after blossoming at dawn, flowers quickly wilt as the day passes. All plants bloom within a window of one or two weeks. Roughly 150 flowers together yield but  $1\text{ g}$  ( $0.035\text{ oz}$ ) of dry saffron threads; to produce  $12\text{ g}$  ( $0.42\text{ oz}$ ) of dried saffron (or  $72\text{ g}$  ( $2.5\text{ oz}$ ) moist and freshly harvested),  $1\text{ kg}$  ( $2.2\text{ lb}$ ) of flowers are needed;  $1\text{ lb}$  ( $0.45\text{ kg}$ ) yields  $0.2\text{ oz}$  ( $5.7\text{ g}$ ) of dried saffron. One freshly picked flower yields an average  $30\text{ mg}$  ( $0.0011\text{ oz}$ ) of fresh saffron or  $7\text{ mg}$  ( $0.00025\text{ oz}$ ) dried.

[edit] Chemistry

Saffron contains more than 150 volatile and aroma-yielding compounds. It also has many nonvolatile active components, many of which are carotenoids, including zeaxanthin, lycopene, and various  $\beta$ - and  $\beta^2$ -carotenes. However, saffron's golden yellow-orange colour is primarily the result of  $\beta$ -crocin. This crocin is trans-crocetin di-( $\beta^2$ -D-gentiobiosyl) ester; it bears the systematic (IUPAC) name 8,8-diapo-8,8-carotenoic acid. This means that the crocin underlying saffron's aroma is a digentiobiose ester of the carotenoid crocetin. Crocins themselves are a series of hydrophilic carotenoids that are either monoglycosyl or diglycosyl polyene esters of crocetin. Crocetin is a conjugated polyene dicarboxylic acid that is hydrophobic, and thus oil-soluble. When crocetin is esterified with two water-soluble gentiobioses, which are sugars, a product results that is itself water-soluble. The resultant  $\beta$ -crocin is a carotenoid pigment that may comprise more than 10% of dry saffron's mass. The two esterified gentiobioses make  $\beta$ -crocin ideal for colouring water-based and non-fatty foods such as rice dishes.

The bitter glucoside picrocrocin is responsible for saffron's flavour. Picrocrocin (chemical formula:  $\text{C}_{16}\text{H}_{26}\text{O}_7$ ; systematic name: 4-( $\beta^2$ -D-glucopyranosyloxy)-2,6,6-trimethylcyclohex-1-ene-1-carboxaldehyde) is a union of an aldehyde sub-element known as safranal (systematic name: 2,6,6-trimethylcyclohexa-1,3-diene-1-carboxaldehyde) and a carbohydrate. It has insecticidal and pesticidal properties, and may comprise up to 4% of dry saffron. Picrocrocin is a truncated version of the carotenoid zeaxanthin that

is produced via oxidative cleavage, and is the glycoside of the terpene aldehyde safranal. The reddish-coloured zeaxanthin is, incidentally, one of the carotenoids naturally present within the retina of the human eye.

When saffron is dried after its harvest, the heat, combined with enzymatic action, splits picrocrocin to yield D-glucose and a free safranal molecule. Safranal, a volatile oil, gives saffron much of its distinctive aroma.[31] Safranal is less bitter than picrocrocin and may comprise up to 70% of dry saffron's volatile fraction in some samples. A second element underlying saffron's aroma is 2-hydroxy-4,4,6-trimethyl-2,5-cyclohexadien-1-one, the scent of which has been described as "saffron, dried hay like". Chemists found this to be the most powerful contributor to saffron's fragrance despite its being present in a lesser quantity than safranal. Dry saffron is highly sensitive to fluctuating pH levels, and rapidly breaks down chemically in the presence of light and oxidizing agents. It must therefore be stored away in air-tight containers in order to minimise contact with atmospheric oxygen. Saffron is somewhat more resistant to heat.

[edit] Grades

Saffron is graded via laboratory measurement of crocin (colour), picrocrocin (taste), and safranal (fragrance) content. Determination of non-stigma content ("floral waste content") and other extraneous matter such as inorganic material ("ash") are also key. Grading standards are set by the International Organization for Standardization, a federation of national standards bodies. ISO 3632 deals exclusively with saffron and establishes four empirical colour intensity grades: IV (poorest), III, II, and I (finest quality). Samples are assigned grades by gauging the spice's crocin content, revealed by measurements of crocin-specific spectroscopic absorbance. Graders measure absorbances of 440-nm light by dry saffron samples. Higher absorbances imply greater crocin concentration, and thus a greater colourative intensity. These data are measured through spectrophotometry reports at certified testing laboratories worldwide. These colour grades proceed from grades with absorbances lower than 80 (for all category IV saffron) up to 190 or greater (for category I). The world's finest samples (the selected most red-maroon tips of stigmas picked from the finest flowers) receive absorbance scores in excess of 250. Market prices for saffron types follow directly from these ISO scores. However, many growers, traders, and consumers reject such lab test numbers. They prefer a more holistic method of sampling batches of thread for taste, aroma, pliability, and other traits in a fashion similar to that practised by practised wine tasters.

Despite such attempts at quality control and standardisation, an extensive history of saffron adulteration—particularly among the cheapest grades—continues into modern times. Adulteration was first documented in Europe's Middle Ages, when those found selling adulterated saffron were executed under the Safranschou code. Typical methods include mixing in extraneous substances like beets, pomegranate fibres, red-dyed silk fibres, or the saffron crocus's tasteless and odourless yellow stamens. Other methods included dousing saffron fibres with viscid substances like honey or vegetable oil. However, powdered saffron is more prone to adulteration, with turmeric, paprika, and other powders used as diluting fillers. Adulteration can also consist of selling mislabelled mixes of different saffron grades. Thus, in India, high-grade Kashmiri saffron is often sold and mixed with cheaper Iranian imports; these mixes are then marketed as pure Kashmiri saffron, a development that has cost Kashmiri growers much of their income.

[edit] Varieties

The various saffron crocus cultivars give rise to thread types that are often regionally distributed and characteristically distinct. Varieties from Spain, including the tradenames "Spanish Superior" and "Creme", are generally mellower in colour, flavour, and aroma; they are graded by government-imposed standards. Italian varieties are slightly more potent than Spanish; the most intense varieties tend to be Iranian. Various "boutique" crops are available from New Zealand, France, Switzerland, England, the United States, and other countries,

some of them organically grown. In the U.S., Pennsylvania Dutch saffronâ ~known for its "earthy" notesâ ~is marketed in small quantities.

Consumers may regard certain cultivars as "premium" quality. The "Aquila" saffron, or zafferano dell'Aquila, is defined by high safranal and crocin content, distinctive thread shape, unusually pungent aroma, and intense colour; it is grown exclusively on eight hectares in the Navelli Valley of Italy's Abruzzo region, near L'Aquila. It was first introduced to Italy by a Dominican monk from Inquisition-era Spain. But the biggest saffron cultivation in Italy is in San Gavino Monreale, Sardinia, where it is grown on 40 hectares, representing 60% of Italian production; it too has unusually high crocin, picrocrocin, and safranal content. Another is the "Mongra" or "Lacha" saffron of Kashmir (*Crocus sativus* 'Cashmirianus'), which is among the most difficult for consumers to obtain. Repeated droughts, blights, and crop failures in the Indian-controlled areas of Kashmir combine with an Indian export ban to contribute to its prohibitive overseas prices. Kashmiri saffron is recognisable by its dark maroon-purple hue; it is among the world's darkest, which hints at strong flavour, aroma, and colourative effect.

[edit] History

The documented history of saffron cultivation spans more than three millennia. The wild precursor of domesticated saffron crocus was *Crocus cartwrightianus*. Human cultivators bred wild specimens by selecting for unusually long stigmas; thus, a sterile mutant form of *C. cartwrightianus*, *C. sativus*, likely emerged in late Bronze Age Crete.

[edit] Eastern

Saffron was detailed in a 7th-century BC Assyrian botanical reference compiled under Ashurbanipal. Documentation of saffron's use over the span of 4,000 years in the treatment of some 90 illnesses has been uncovered. Saffron-based pigments have indeed been found in 50,000 year-old depictions of prehistoric places in northwest Iran. The Sumerians later used wild-growing saffron in their remedies and magical potions. Saffron was an article of long-distance trade before the Minoan palace culture's 2nd millennium BC peak. Ancient Persians cultivated Persian saffron (*Crocus sativus* 'Hausknechtii') in Derbena, Isfahan, and Khorasan by the 10th century BC. At such sites, saffron threads were woven into textiles, ritually offered to divinities, and used in dyes, perfumes, medicines, and body washes. Saffron threads would thus be scattered across beds and mixed into hot teas as a curative for bouts of melancholy. Non-Persians also feared the Persians' usage of saffron as a drugging agent and aphrodisiac. During his Asian campaigns, Alexander the Great used Persian saffron in his infusions, rice, and baths as a curative for battle wounds. Alexander's troops imitated the practice from the Persians and brought saffron-bathing to Greece.

Conflicting theories explain saffron's arrival in South Asia. Kashmiri and Chinese accounts date its arrival anywhere between 900â ~2500 years ago. Historians studying ancient Persian records date the arrival to sometime prior to 500 BC, attributing it to a Persian transplantation of saffron corms to stock new gardens and parks. Phoenicians then marketed Kashmiri saffron as a dye and a treatment for melancholy. Its use in foods and dyes subsequently spread throughout South Asia. Buddhist monks wear saffron-coloured robes; however, the robes are not dyed with costly saffron but turmeric, a less expensive dye, or jackfruit. Monks' robes are dyed the same color to show equality with each other, and turmeric or ochre were the cheapest, most readily available dyes. Gamboge is now used to dye the robes.

Some historians believe that saffron came to China with Mongol invaders from Persia. Yet saffron is mentioned in ancient Chinese medical texts, including the forty-volume pharmacopoeia titled *Shennong Bencaojing* (ç¥.è¾²æ -è ç¶^: "Shennong's Great Herbal", also known as *Pen Ts'ao* or *Pun Tsao*), a tome dating from 200â ~300 BC. Traditionally credited to the fabled Yan ("Fire") Emperor (ç å,") Shennong, it discusses 252 phytochemical-based medical treatments for various disorders. Nevertheless, around the 3rd century AD, the Chinese were referring to saffron as having a Kashmiri provenance. According to Chinese

herbalist Wan Zhen, "[t]he habitat of saffron is in Kashmir, where people grow it principally to offer it to the Buddha." Wan also reflected on how it was used in his time: "The flower withers after a few days, and then the saffron is obtained. It is valued for its uniform yellow colour. It can be used to aromatise wine."

[edit] Wider Near East and Western

The Minoans portrayed saffron in their palace frescoes by 1500â ~1600 BC; they hint at its possible use as a therapeutic drug. Ancient Greek legends told of sea voyages to Cilicia, where adventurers sought what they thought to be the world's most valued threads. Another legend tells of Crocus and Smilax, whereby Crocus is bewitched and transformed into the first saffron crocus. Ancient perfumers in Egypt, physicians in Gaza, townspeople in Rhodes, and the Greek hetaerae courtesans used saffron in their scented waters, perfumes and potpourris, mascaras and ointments, divine offerings, and medical treatments.

In late Hellenistic Egypt, Cleopatra used saffron in her baths so that lovemaking would be more pleasurable. Egyptian healers used saffron as a treatment for all varieties of gastrointestinal ailments. Saffron was also used as a fabric dye in such Levantine cities as Sidon and Tyre. Aulus Cornelius Celsus prescribes saffron in medicines for wounds, cough, colic, and scabies, and in the mithridatium. Such was the Romans' love of saffron that Roman colonists took it with them when they settled in southern Gaul, where it was extensively cultivated until Rome's fall. Competing theories state that saffron only returned to France with 8th-century AD Moors or with the Avignon papacy in the 14th century AD.

European saffron cultivation plummeted after the Roman Empire went into eclipse. As with France, the spread of Islamic civilization may have helped reintroduce the crop to Spain and Italy. The 14th-century Black Death caused demand for saffron-based medicaments to peak, and large quantities of threads had to be imported via Venetian and Genoan ships from southern and Mediterranean lands such as Rhodes; the theft of one such shipment by noblemen sparked the fourteen-week long "Saffron War". The conflict and resulting fear of rampant saffron piracy spurred corm cultivation in Basel; it thereby grew prosperous. The crop then spread to Nuremberg, where endemic and insalubrious adulteration brought on the Safranschou codeâ ~whereby culprits were variously fined, imprisoned, and executed. The corms soon spread throughout England, especially Norfolk and Suffolk. The Essex town of Saffron Walden, named for its new speciality crop, emerged as England's prime saffron growing and trading centre. However, an influx of more exotic spicesâ ~chocolate, coffee, tea, and vanillaâ ~from newly contacted Eastern and overseas countries caused European cultivation and usage of saffron to decline. Only in southern France, Italy, and Spain did the clone significantly endure.

Europeans introduced saffron to the Americas when immigrant members of the Schwenkfelder Church left Europe with a trunk containing its corms; church members had widely grown it in Europe. By 1730, the Pennsylvania Dutch were cultivating saffron throughout eastern Pennsylvania. Spanish colonies in the Caribbean bought large amounts of this new American saffron, and high demand ensured that saffron's list price on the Philadelphia commodities exchange was set equal to that of gold. The trade with the Caribbean later collapsed in the aftermath of the War of 1812, when many saffron-bearing merchant vessels were destroyed. Yet the Pennsylvania Dutch continued to grow lesser amounts of saffron for local trade and use in their cakes, noodles, and chicken or trout dishes. American saffron cultivation survived into modern times mainly in Lancaster County, Pennsylvania.

[edit] Trade and use

Almost all saffron grows in a belt bounded by the Mediterranean in the west and the rugged region encompassing Iran and Kashmir in the east. The other continents, except Antarctica, produce smaller amounts. Some 300Â t (300,000Â kg) of dried whole threads and powder are gleaned yearly, of which 50Â t (50,000Â kg) is top-grade "coupe" saffron. Iran answers for around 90â ~93% of global production and exports much of it. A few of Iran's drier eastern and

southeastern provinces, including Fars, Kerman, and those in the Khorasan region, glean the bulk of modern global production. In 2005, the second-ranked Greece produced 5.7 t (5,700.0 kg), while Morocco and Kashmir, tied for third rank, each produced 2.3 t (2,300.0 kg).

In recent years, Afghan cultivation has risen; in restive Kashmir it has declined. Azerbaijan, Morocco, and Italy are, in decreasing order, lesser producers. Prohibitively high labour costs and abundant Iranian imports mean that only select locales continue the tedious harvest in Austria, England, Germany, and Switzerland—among them the Swiss village of Mund, whose annual output is a few kilograms. Tasmania, China, Egypt, France, Israel, Mexico, New Zealand, Turkey (mainly around the town of Safranbolu), California, and Central Africa are microscale cultivators.

To glean 1 lb (450 g) of dry saffron requires the harvest of 50,000–75,000 flowers; a kilogram requires 110,000–170,000 flowers. Forty hours of labour are needed to pick 150,000 flowers. Stigmas are dried quickly upon extraction and (preferably) sealed in airtight containers. Saffron prices at wholesale and retail rates range from US\$500 to US\$5,000 per pound, or US\$1,100–11,000/kg, equivalent to £2,500–3,500 per pound or £5,500–7,500 per kilogram. The price in Canada recently rose to CAD 18,000 per kilogram. In Western countries, the average retail price in 1974 was \$1,000/£500–700 per pound, or US\$2,200/£1,100–1,550 per kilogram. In February, 2013, a retail bottle containing .06 ounces could be purchased for \$16.26 or the equivalent of \$4,336 per pound or as little as about \$2,000/pound in larger quantities. A pound contains between 70,000 and 200,000 threads. Vivid crimson coloring, slight moistness, elasticity, and lack of broken-off thread debris are all traits of fresh saffron. Saffron is the most expensive spice in the world.

Saffron's aroma is often described by connoisseurs as reminiscent of metallic honey with grassy or hay-like notes, while its taste has also been noted as hay-like and sweet. Saffron also contributes a luminous yellow-orange colouring to foods. Saffron is widely used in Indian, Persian, European, Arab, and Turkish cuisines. Confectioneries and liquors also often include saffron. Common saffron substitutes include safflower (*Carthamus tinctorius*, which is often sold as "Portuguese saffron" or "açafrão"), annatto, and turmeric (*Curcuma longa*). Saffron has also been used as a fabric dye, particularly in China and India, and in perfumery. It is used for religious purposes in India, and is widely used in cooking in many cuisines, ranging from the Milanese risotto of Italy to the bouillabaisse of France to the biryani with various meat accompaniments in South Asia.

Saffron has a long medicinal history as part of traditional healing; several modern research studies have hinted that the spice has possible anticarcinogenic (cancer-suppressing), anti-mutagenic (mutation-preventing), immunomodulating, and antioxidant-like properties.[83] Saffron stigmas, and even petals, may be helpful for depression.[85] Early studies show that saffron may protect the eyes from the direct effects of bright light and retinal stress apart from slowing down macular degeneration and retinitis pigmentosa. (Most saffron-related research refers to the stigmas, but this is often not made explicit in research papers.) Other controlled research studies have indicated that saffron may have many potential medicinal properties.[88]

[edit] See also

Topics related to saffron:

^ "Folate" refers only to the naturally occurring form of folic acid; the sample contains no folic acid per se.

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Strepsirrhini or Strepsirhini (i/Ē strĒ,psĒ Ē raĒʰniĒ/; STREP-sĒ -RY-nee) is a suborder of primates that includes the lemuriform primates, which consist of the lemurs of Madagascar, galagos ("bushbabies") and pottos from Africa, and the lorises from India and southeast Asia. Also belonging to the suborder are the extinct adapiform primates, a diverse and widespread group that thrived during the Eocene (56 to 34 million years ago [mya]) in Europe, North America, and Asia, but disappeared from most of the Northern Hemisphere as the climate

cooled. The last of the adapiforms died out at the end of the Miocene (~7 mya). Adapiforms are sometimes referred to as being "lemur-like", although the diversity of both lemurs and adapiforms do not support this comparison. The two leading taxonomic classifications for the suborder divide living strepsirrhine primates into either two superfamilies (Lemuroidea and Lorisioidea) within the infraorder Lemuriformes or two infraorders, Lemuriformes and Lorisiformes. The suborder represents a related group, and replaced the widely used and now obsolete suborder Prosimii ("prosimians"), which included strepsirrhines and tarsiers, a grouping based primarily on shared anatomical traits. Today, Strepsirrhini excludes the tarsiers, which are now grouped in the other major primate suborder, Haplorhini, along with the monkeys and apes (simians or anthropoids). Strepsirrhines are often inappropriately referred to as "living fossils" or "primitive primates". Instead, they have evolved for millions of years under natural selection, and have diversified to fill many ecological niches. Some of their traits may be ancestral to primates, while others are unique to strepsirrhines.

Strepsirrhines are defined by their wet nose or rhinarium. They also have a smaller brain than comparably sized simians, large olfactory lobes for smell, a vomeronasal organ to detect pheromones, and a bicornuate uterus with an epitheliochorial placenta. Their eyes contain a reflective layer to improve their night vision, and their eye sockets include a ring of bone around the eye, but they lack a wall of thin bone behind it. Strepsirrhine primates produce their own vitamin C, whereas haplorhine primates must obtain it from their diets. Lemuriform primates are characterized by a toothcomb, a specialized set of teeth in the front, lower part of the mouth mostly used for combing fur during grooming. Often, the toothcomb is incorrectly used to characterize all strepsirrhines. Instead, it is unique to lemuriforms and is not seen among adapiforms. Lemuriforms groom orally, and also possess a grooming claw on the second toe of each foot for scratching in areas that are inaccessible to the mouth and tongue. It is unclear whether adapiforms possessed grooming claws.

The taxonomy of strepsirrhines is controversial and has a complicated history. Confused taxonomic terminology and oversimplified anatomical comparisons have created misconceptions about primate and strepsirrhine phylogeny, illustrated by the media attention surrounding the single "Ida" fossil in 2009. Strepsirrhines diverged from the haplorhine primates near the beginning of the primate radiation between 55 and 90 mya. Older divergence dates are based on genetic analysis estimates, while younger dates are based on the scarce fossil record. Lemuriform primates may have evolved from either cercamoniines or sivaladapids, both of which were adapiforms that may have originated in Asia. They were once thought to have evolved from adapids, a more specialized and younger branch of adapiform primarily from Europe. Lemurs rafted to Madagascar between 47 and 54 mya, whereas the lorises split from the African galagos around 40 mya and later colonized Asia. Both living and extinct strepsirrhines are behaviorally diverse, although all are primarily arboreal (tree-dwelling). Most living lemuriforms are nocturnal, while most extinct adapiforms were diurnal. Both living and extinct groups primarily fed on fruit, leaves, and insects. Many of today's strepsirrhines are endangered due to habitat destruction, hunting for bushmeat, and live capture for the exotic pet trade.

[edit] Etymology

The taxonomic name Strepsirrhini derives from the Greek *στρεψις* (*strepsis* or "a turning [inward]") and *ῥίς* (*rhinos* or "nose"), which refers to the appearance of the sinuous (comma-shaped) nostrils on the rhinarium or wet nose. The name was first used by French naturalist Étienne Geoffroy Saint-Hilaire in 1812 as a subordinal rank comparable to Platyrrhini (New World monkeys) and Catarrhini (Old World monkeys). In his description, he mentioned "Les narines terminales et sinueuses" ("Nostrils terminal and winding").

When British zoologist Reginald Innes Pocock revived Strepsirrhini and defined Haplorhini in 1918, he omitted the second "r" from both ("Strepsirhini" and "Haplorhini" instead of "Strepsirrhini" and "Haplorrhini"), although he did not

remove the second "r" from Platyrrhini or Catarrhini, both of which were also named by A. Geoffroy in 1812. Following Pocock, many researchers continued to spell Strepsirrhini with a single "r" until primatologists Paulina Jenkins and Prue Napier pointed out the error in 1987.

[edit] Evolutionary history

Strepsirrhines include the extinct adapiforms and the lemuriform primates, which include lemurs and lorisoidea (lorises, pottos, and galagos). The lemuriforms, and particularly the lemurs of Madagascar, are often portrayed inappropriately as "living fossils" or as examples of "primitive", "basal", or "inferior" primates. These views have historically hindered the understanding of mammalian evolution and the evolution of strepsirrhine traits, such as their reliance on smell (olfaction), characteristics of their skeletal anatomy, and their brain size, which is relatively small compared simian primates. In the case of lemurs, natural selection has driven this isolated population of primates to diversify significantly and fill a rich variety of ecological niches, despite their smaller and less complex brains compared to simians.

The origin of the earliest primates, from which both the strepsirrhines and haplorhines (simians and tarsiers) evolved, is a mystery. Both their place of origin and the group from which they evolved are uncertain. Although the fossil record demonstrating their initial radiation across the Northern Hemisphere is very detailed, the fossil record from the tropics—where primates most likely evolved—is very poor, particularly around the time that primates and other major clades (groups consisting of an ancestor and all its descendants) of eutherian mammals were first appearing. Consequently, geneticists and primatologists have used genetic analyses to determine the relatedness between primate lineages and the amount of time since they diverged. Using this molecular clock, divergence dates for the major primate lineages have suggested that primates evolved more than 80–90 mya, nearly 40 million years before the first primates appear in the fossil record.

The early primates include both nocturnal and diurnal small-bodied species, and all were arboreal, with hands and feet specially adapted for maneuvering on small branches. Plesiadapiforms from the early Paleocene are sometimes considered "archaic primates" because their teeth resembled those of early primates, and because they possessed arboreal adaptations, such as a divergent hallux (big toe). Although plesiadapiforms were closely related to primates, they may represent a paraphyletic group from which primates may or may not have directly evolved, and some genera may have been more closely related to colugos, also known as dermopterans or "flying lemurs", which are thought to be closely related to primates.

The first true primates (euprimates) do not appear in the fossil record until the early Eocene (~55 mya), at which point they radiated across the Northern Hemisphere during a brief period of rapid global warming known as the Paleocene–Eocene Thermal Maximum. These first primates included Cantius, Donrussellia, Altanius, and Teilhardina on the northern continents, as well as the more questionable (and fragmentary) fossil Altiatlasius from Paleocene Africa. These earliest fossil primates are often divided into two groups, adapiforms (sometimes called adapids, or adapoids) and omomyiforms (or omomyids—suspected relatives of tarsiers). Both appeared suddenly in the fossil record without transitional forms to indicate ancestry, and both groups were rich in diversity and were widespread throughout the Eocene. Although few fossils of extant primate groups—lemuriforms, tarsiers, or simians—are known from the Early to Middle Eocene, evidence from genetics and newer fossil finds suggest they may have been present during this early adaptive radiation. The divergence between strepsirrhines, simians, and tarsiers likely followed almost immediately after primates first evolved.

[edit] Adapiform evolution

Adapiforms are extinct strepsirrhines that shared many anatomical similarities with lemuriforms. They are sometimes referred to as lemur-like primates, although the diversity of both lemurs and adapiforms do not support this analogy. Like living strepsirrhines, adapiforms were extremely diverse, with at

least 30 genera and 80 species known from the fossil record as of the early 2000s. They diversified across Laurasia during the Eocene, some reaching North America via a land bridge. They were among the most common mammals found in the fossil beds from that time. A few rare species have also been found in northern Africa. The most basal of the adapiforms include the genera *Cantius* from North America and Europe and *Donrussellia* from Europe. The latter bears the most ancestral traits, so it is often considered a sister group or stem group of the other adapiforms.

Adapiforms are often divided into three major groups:

Adapids were most commonly found in Europe, although the oldest specimens (*Adapoides* from middle Eocene China) indicate that they most likely evolved in Asia and immigrated. They died out in Europe during the Grande Coupure, part of a major extinction event at the end of the Eocene.

Notharctids, which most closely resembled some of Madagascar's lemurs, come from Europe and North America. The European branch is often referred to as cercamoniines. The North American branch thrived during the Eocene, but became rare and then died out during the Oligocene. Like the adapids, the European branch were extinct by the end of the Eocene.

Sivaladapids of southern and eastern Asia are best known from the Miocene, and the only adapiforms to survive past the Eocene/Oligocene boundary (~34 mya). Their relationship to the other adapiforms remains unclear. They had vanished by the end of the Miocene (~7 mya).

The relationship between adapiform and lemuriform primates has not been clearly demonstrated, so the position of adapiforms as a paraphyletic stem group is questionable. Both molecular clock data and new fossil finds suggest that the lemuriform divergence from the other primates and the subsequent lemur-lorisoid split both predate the appearance of adapiforms in the early Eocene. Yet new calibration methods may reconcile the discrepancies between the molecular clock and the fossil record, favoring more recent divergence dates. The fossil record suggests that the strepsirrhine adapiforms and the haplorhine omomyiforms had been evolving independently before the early Eocene, although their most basal members share enough dental similarities to suggest that they diverged during the Paleocene (65 to 55 mya).

[edit] Lemuriform evolution

Lemuriform origins are unclear and debated. American paleontologist Philip Gingerich proposed that lemuriform primates evolved from one of several genera of European adapids based on similarities between the front lower teeth of adapids and the toothcomb of extant lemuriforms; however, this view is not strongly supported due to a lack of clear transitional fossils. Instead, lemuriforms may be descended from a very early branch of Asian cercamoniines or sivaladapids that immigrated to northern Africa.

Until discoveries of three 40-million-year-old fossil lorisoids (*Karanisia*, *Saharagalago*, and *Wadilemur*) in the El Fayum deposits of Egypt between 1997 and 2005, the oldest known lemuriforms had come from the early Miocene (~20 mya) of Kenya and Uganda. These newer finds demonstrate that lemuriform primates were present during the middle Eocene in Afro-Arabia and that the lemuriform lineage and all other strepsirrhine taxa had diverged before then. *Djebelemur* from Tunisia dates to the late early or early middle Eocene (52 to 46 mya) and has been considered a cercamoniine, but also may have been a stem lemuriform. *Azibiids* from Algeria date to roughly the same time and may be a sister group of the *djebelemurids*. Together with *Plesiopithecus* from the late Eocene Egypt, the three may qualify as the stem lemuriforms from Africa.

Molecular clock estimates indicate that lemurs and the lorisoids diverged in Africa during the Paleocene, approximately 62 mya. Between 47 and 54 mya, lemurs dispersed to Madagascar by rafting. In isolation, the lemurs diversified and filled the niches often filled by monkeys and apes today. In Africa, the lorises and galagos diverged during the Eocene, approximately 40 mya. Unlike the lemurs in Madagascar, they have had to compete with monkeys and apes, as well as other mammals.

[edit] Taxonomic classification

Strepsirrhine primates were first grouped under the genus *Lemur* by Swedish taxonomist Carl Linnaeus in the 10th edition of *Systema Naturae* published in 1758. At the time, only three species were recognized, one of which (a colugo) is no longer recognized as a primate. In 1785, Dutch naturalist Pieter Boddaert divided the genus *Lemur* into two genera: *Prosimia* for the lemurs, colugos, and tarsiers and *Tardigradus* for the lorises. Ten years later, J. Geoffroy and Georges Cuvier grouped the tarsiers and galagos due to similarities in their hindlimb morphology, a view supported by German zoologist Johann Karl Wilhelm Illiger, who placed them in the family *Macrotarsi* while placing the lemurs and tarsiers in the family *Prosimia* (*Prosimii*) in 1811. The use of the tarsier-galago classification continued for many years until 1898, when Dutch zoologist Ambrosius Hubrecht demonstrated two different types of placentation (formation of a placenta) in the two groups.

English comparative anatomist William Henry Flower created the suborder *Lemuroidea* in 1883 to distinguish these primates from the simians, which were grouped under English biologist St. George Jackson Mivart's suborder *Anthropoidea* (=Simiiformes). According to Flower, the suborder *Lemuroidea* contained the families *Lemuridae* (lemurs, lorises, and galagos), *Chiromyidae* (aye-aye), and *Tarsiidae* (tarsiers). *Lemuroidea* was later replaced by Illiger's suborder *Prosimii*. Many years earlier, in 1812, J. Geoffroy first named the suborder *Strepsirrhini*, in which he included the tarsiers. This taxonomy went unnoticed until 1918, when Pocock compared the structure of the nose and reinstated the use of the suborder *Strepsirrhini*, while also moving the tarsiers and the simians into a new suborder, *Haplorhini*. It was not until 1953, when British anatomist William Charles Osman Hill wrote an entire volume on strepsirrhine anatomy, that Pocock's taxonomic suggestion became noticed and more widely used. Since then, primate taxonomy has shifted between *Strepsirrhini*-*Haplorhini* and *Prosimii*-*Anthropoidea* multiple times.

Most of the academic literature provides a basic framework for primate taxonomy, usually including several potential taxonomic schemes. Although most experts agree upon phylogeny, many disagree about nearly every level of primate classification.

[edit] Subordinal controversies

The most commonly recurring debate in primatology during the 1970s, 1980s, and early 2000s concerned the phylogenetic position of tarsiers compared to both simians and the other prosimians. Tarsiers are most often placed in either the suborder *Haplorhini* with the simians or in the suborder *Prosimii* with the strepsirrhines. *Prosimii* is one of the two traditional primate suborders and is based on evolutionary grades (groups united by anatomical traits) rather than phylogenetic clades, while the *Strepsirrhini*-*Haplorrhini* taxonomy was based on evolutionary relationships. Yet both systems persist because the *Prosimii*-*Anthropoidea* taxonomy is familiar and frequently seen in the research literature and textbooks.

Strepsirrhines are traditionally characterized by several symplesiomorphic (ancestral) traits not shared with the simians, particularly the rhinarium.[a] Other symplesiomorphies include long snouts, convoluted maxilloturbinals, relatively large olfactory bulbs, and smaller brains. The toothcomb is a synapomorphy (shared, derived trait) seen among lemuriforms, although it is frequently and incorrectly used to define the strepsirrhine clade.[b] Strepsirrhine primates are also united in possessing a epitheliochorial placenta. Unlike the tarsiers and simians, strepsirrhines are capable of producing their own vitamin C and do not need it supplied in their diet. Further genetic evidence for the relationship between tarsiers and simians as a haplorhine clade is the shared possession of three SINE markers.

Because of their historically mixed assemblages which included tarsiers and close relatives of primates, both *Prosimii* and *Strepsirrhini* have been considered wastebasket taxa for "lower primates". Regardless, the strepsirrhine and haplorrhine clades are generally accepted and viewed as the preferred taxonomic division. Yet, tarsiers still closely resemble both strepsirrhines and simians in different ways, and since the early split between

strepsirrhines, tarsiers, and simians is ancient and hard to resolve, a third taxonomic arrangement with three suborders is sometimes used: Prosimii, Tarsiiformes, and Anthropoidea. More often, the term "prosimian" is no longer used in official taxonomy, but is still used to illustrate the behavioral ecology of tarsiers relative to the other primates.

In addition to the controversy over tarsiers, the debate over the origins of simians once called the strepsirrhine clade into question. Arguments for an evolutionary link between adapiforms and simians made by paleontologists Gingerich, Elwyn Simons, Tab Rasmussen, and others could have potentially excluded adapiforms from Strepsirrhini. In 1975, Gingerich proposed a new suborder, Simiolemuriformes, to suggest that strepsirrhines are more closely related to simians than tarsiers. However, no clear relationship between the two had been demonstrated by the early 2000s. The idea reemerged briefly in 2009 during the media attention surrounding *Darwinius masillae* (dubbed "Ida"), a cercamoniine from Germany that was touted as a "missing link between humans and earlier primates" (simians and adapiforms). However, the cladistic analysis was flawed and the phylogenetic inferences and terminology were vague. Although the authors noted that *Darwinius* was not a "fossil lemur", they did emphasize the absence of a toothcomb, which adapiforms did not possess.

[edit] Infraordinal classification and clade terminology

Strepsirrhini phylogeny

â Adapiformes

stem lemuriforms

Â crown strepsirrhinesÂ

or lemuriforms

Â lemuroid cladeÂ

Daubentoniidae

other lemurs

Â lorisoid cladeÂ

Within Strepsirrhini, two common classifications include either two infraorders (Adapiformes and Lemuriformes) or three infraorders (Adapiformes, Lemuriformes, Lorisiformes). A less common taxonomy places the aye-aye (Daubentoniidae) in its own infraorder, Chiromyiformes. In some cases, plesiadapiforms are included within the order Primates, in which case Euprimates is sometimes treated as a suborder, with Strepsirrhini becoming an infraorder, and the Lemuriformes and others become parvorders. Regardless of the infraordinal taxonomy, Strepsirrhini is composed of three ranked superfamilies and 14 families, seven of which are extinct. Three of these extinct families included the recently extinct giant lemurs of Madagascar, many of which died out within the last 1,000 years following human arrival on the island.

When Strepsirrhini is divided into two infraorders, the clade containing all toothcombed primates can be called "lemuriforms". When it is divided into three infraorders, the term "lemuriforms" refers only to Madagascar's lemurs, and the toothcombed primates are referred to as either "crown strepsirrhines" or "extant strepsirrhines". Confusion of this specific terminology with the general term "strepsirrhine", along with oversimplified anatomical comparisons and vague phylogenetic inferences, can lead to misconceptions about primate phylogeny and misunderstandings about primates from the Eocene, as seen with the media coverage of *Darwinius*. Because the skeletons of adapiforms share strong similarities with those of lemurs and lorises, researchers have often referred to them as primitive strepsirrhines, lemur ancestors, or a sister group to the living strepsirrhines. They are included in Strepsirrhini, and are considered basal members of the clade. Although their status as true primates is not questioned, the questionable relationship between adapiforms and other living and fossil primates leads to multiple classifications within Strepsirrhini. Often, adapiforms are placed in their own infraorder due to anatomical differences with lemuriforms and their unclear relationship. When shared traits with lemuriforms (which may or may not be synapomorphic) are emphasized, they are sometimes reduced to families within the infraorder

Lemuriformes (or superfamily Lemuroidea).

The first fossil primate described was the adapiform *Adapis parisiensis* by French naturalist Georges Cuvier in 1821, who compared it to a hyrax ("le Daman"), then considered a member of a now obsolete group called pachyderms. It was not recognized as a primate until it was reevaluated in the early 1870s. Originally, adapiforms were all included under the family Adapidae, which was divided into two or three subfamilies: Adapinae, Notharctinae, and sometimes Sivaladapinae. All North American adapiforms were lumped under Notharctinae, while the Old World forms were usually assigned to Adapinae. Around the 1990s, two distinct groups of European "adapids" began to emerge, based on differences in the postcranial skeleton and the teeth. One of these two European forms was identified as cercamoniines, which were allied with the notharctids found mostly in North America, while the other group falls into the traditional adapid classification. The three major adapiform divisions are now typically regarded as three families within Adapiformes (Notharctidae, Adapidae and Sivaladapidae), but other divisions ranging from one to five families are used as well.

[edit] Anatomy and physiology

All lemuriforms possess a specialized dental structure called a toothcomb,[76] with the exception of the aye-aye, in which the structure has been modified into two continually growing (hypselodont) incisors (or canine teeth), similar to those of rodents. The toothcomb consists of either two or four procumbent lower incisors and procumbent lower canine teeth followed by a canine-shaped premolar. It is used to comb the fur during oral grooming. Shed hairs that accumulate between the teeth of the toothcomb are removed by the sublingua or "under-tongue". Lemuriforms also possess a grooming claw on the second digit of each foot for scratching.[76] Adapiforms did not possess a toothcomb. Instead, their lower incisors varied in orientationâ ~from somewhat procumbent to somewhat verticalâ ~and the lower canines were projected upwards and were often prominent. Adapiforms may have had a grooming claw, but there is little evidence of this.

Like all primates, strepsirrhine orbits (eye sockets) have a postorbital bar, a protective ring of bone created by a connection between the frontal and zygomatic bones. Both living and extinct strepsirrhines lack a thin wall of bone behind the eye, referred to as postorbital closure, which is only seen in haplorhine primates. Although the eyes of strepsirrhines point forward, giving stereoscopic vision, the orbits do not face fully forward. Among living strepsirrhines, most or all species are thought to possess a reflective layer behind the retina of the eye, called a tapetum lucidum, which improves vision in low light,[76] but they lack a fovea, which improves day vision. This differs from tarsiers, which lack a tapetum lucidum but possess a fovea.[83]

Strepsirrhine primates have a brain relatively comparable to or slightly larger in size than most mammals. Compared to simians, however, they have a relatively small brain-to-body size ratio. Strepsirrhines are also traditionally noted for their unfused mandibular symphysis (two halves of the lower jaw), however, fusion of the mandibular symphysis was common in adapiforms, notably Notharctus. Also, several extinct giant lemurs exhibited a fused mandibular symphysis.

Many nocturnal species have large, independently movable ears,[88] although there are significant differences in sizes and shapes of the ear between species. The structure of the middle and inner ear of strepsirrhines differs between the lemurs and lorisooids. In lemurs, the tympanic cavity, which surrounds the middle ear, is expanded. This leaves the ectotympanic ring, which supports the eardrum, free within the auditory bulla. This trait is also seen in adapiforms. In lorisooids, however, the tympanic cavity is smaller and the ectotympanic ring becomes attached to the edge of the auditory bulla. The tympanic cavity in lorisooids also has two accessory air spaces, which are not present in lemurs. Both lorisooids and cheirogaleid lemurs have replaced the internal carotid artery with an enlarged ascending pharyngeal artery. Strepsirrhines also possess distinctive features in their tarsus (ankle bones) that differentiate them from haplorhines, such as a sloping talo-fibular facet



(the face where the talus bone and fibula meet) and a difference in the location of the position of the flexor fibularis tendon on the talus. These differences give strepsirrhines the ability to make more complex rotations of the ankle and indicate that their feet are habitually inverted, or turned inward, an adaptation for grasping vertical supports.

Sexual dichromatism (different coloration patterns between males and females) can be seen in most brown lemur species, but otherwise lemurs show very little if any difference in body size or weight between sexes. This lack of sexual dimorphism is not characteristic of all strepsirrhines. Some adapiforms were sexually dimorphic, with males bearing a larger sagittal crest (a ridge of bone on the top of the skull to which jaw muscles attach) and canine teeth. Lorisoids exhibit some sexual dimorphism, but males are typically no more than 20 percent larger than females.

[edit] Rhinarium and olfaction

Strepsirrhines have a long snout that ends in a moist and touch-sensitive rhinarium, similar to that of dogs and many other mammals. The rhinarium is surrounded by vibrissae that are also sensitive to touch. Convoluted maxilloturbinals on the inside of their nose filter, warm, and moisten the incoming air, while olfactory receptors of the main olfactory system lining the ethmoturbinals detect airborne smells. The olfactory bulbs of lemurs are comparable in size to those of other arboreal mammals.

The surface of the rhinarium does not have any olfactory receptors, so it is not used for smell in terms of detecting volatile substances. Instead, it has sensitive touch receptors (Merkel cells). The rhinarium, upper lip, and gums are tightly connected by a fold of mucous membrane called the philtrum, which runs from the tip of the nose to the mouth. The upper lip is constrained by this connection and has fewer nerves to control movement, which leaves it less mobile than the upper lips of simians.[99] The philtrum creates a gap (diastema) between the roots of the first two upper incisors.

The strepsirrhine rhinarium can collect relatively non-volatile, fluid-based chemicals (traditionally categorized as pheromones) and transmit them to the vomeronasal organ (VNO), which is located below and in front of the nasal cavity, above the mouth. The VNO is an encased duct-like structure made of cartilage and is isolated from the air passing through the nasal cavity. The VNO is connected to the mouth through nasopalatine ducts (also known as the incisive foramen), which pass through the hard palate at the top, front of the mouth. Fluids traveling from the rhinarium to the mouth and then up the nasopalatine ducts to the VNO are detected, and information is relayed to the accessory olfactory bulb, which is relatively large in strepsirrhines. From the accessory olfactory bulb, information is sent to the amygdala, which handles emotions, and then to the hypothalamus, which handles basic body functions and metabolic processes. This neural pathway differs from that used by the main olfactory system.

All lemuriforms have a VNO, as do tarsiers and some New World monkeys.[108] Adapiforms exhibit the gap between the upper incisors, which indicates the presence of a VNO, but there is some disagreement over whether or not they possessed a rhinarium.

[edit] Reproductive physiology

Extant strepsirrhines have an epitheliochorial placenta, where the maternal blood does not come in direct contact with the fetal chorion like it does in the hemochorial placenta of haplorhines. The strepsirrhine uterus has two distinct chambers (bicornuate).[99] Despite having similar gestation periods to comparably sized haplorhines, fetal growth rates are generally slower in strepsirrhines, which results in newborn offspring that are as little as one-third the size of haplorhine newborns.[99] Extant strepsirrhines also have a lower basal metabolic rate, which elevates in females during gestation, putting greater demands on the mother.

Most primates have two mammary glands, but the number and positions vary between species within strepsirrhines. Lorises have two pairs, while others, like the ring-tailed lemur, have one pair on the chest (pectoral). The aye-aye

also has two mammary glands, but they are located near the groin (inguinal). In females, the clitoris is sometimes enlarged and pendulous, resembling the male penis, which can make gender identification difficult for human observers. The clitoris may also have a bony structure in it, similar to the baculum (penis bone) in males. Most male primates have a baculum, but it is typically larger in strepsirrhines and usually forked at the tip.

#### [edit] Behavior

Approximately three-quarters of all extant strepsirrhine species are nocturnal, sleeping in nests made from dead leaves or tree hollows during the day.[120] All of the lorisoidea from continental Africa and Asia are nocturnal, while the lemurs of Madagascar are more variable in their activity cycles. The aye-aye, mouse lemurs, woolly lemurs, and sportive lemurs are nocturnal, while ring-tailed lemurs and most of their kin, sifakas, and indri are diurnal. Yet some or all of the brown lemurs (*Eulemur*) are cathemeral, which means they may be active during the day or night, depending on factors such as temperature and predation.[121] Many extant strepsirrhines are well adapted for nocturnal activity due to their relatively large eyes; large, movable ears; sensitive tactile hairs; strong sense of smell; and the tapetum lucidum behind the retina.[88] Among the adapiforms, most are considered diurnal, with the exception of *Pronycticebus* and *Godinotia* from Middle Eocene Europe, both of which had large orbits that suggest nocturnality.

Reproduction in most strepsirrhine species tends to be seasonal, particularly in lemurs. Key factors that affect seasonal reproduction include the length of the wet season, subsequent food availability, and the maturation time of the species. Like other primates, strepsirrhines are relatively slow breeders compared to other mammals. Their gestation period and interbirth intervals are usually long, and the young develop slowly, just like in haplorhine primates.[99] Unlike simians, some strepsirrhines produce two or three offspring, although some produce only a single offspring. Those that produce multiple offspring tend to build nests for their young. These two traits are thought to be plesiomorphic (ancestral) for primates.[99] The young are precocial (relatively mature and mobile) at birth, but not as coordinated as ungulates (hoofed mammals). Infant care by the mother is relatively prolonged compared to many other mammals, and in some cases, the infants cling to the mother's fur with their hands and feet.[99]

Despite their relatively smaller brains compared to other primates, lemurs have demonstrated levels of technical intelligence in problem solving that are comparable to those of seen in simians. However, their social intelligence differs, often emphasizing within-group competition over cooperation, which may be due to adaptations for their unpredictable environment. Although lemurs have not been observed using objects as tools in the wild, they can be trained to use objects as tools in captivity and demonstrate a basic understanding about the functional properties of the objects they are using.

#### [edit] Social systems and communication

The nocturnal strepsirrhines have been traditionally described as "solitary", although this term is no longer favored by the researchers who study them. Many are considered "solitary foragers", but many exhibit complex and diverse social organization, often overlapping home ranges, initiating social contact at night, and sharing sleeping sites during the day. Even the mating systems are variable, as seen in woolly lemurs, which live in monogamous breeding pairs.[126] Because of this social diversity among these solitary but social primates, whose level of social interaction is comparable to that of diurnal simians, alternative classifications have been proposed to emphasize their gregarious, dispersed, or solitary nature.

Among extant strepsirrhines, only the diurnal and cathemeral lemurs have evolved to live in multi-male/multi-female groups, comparable to most living simians.[126] This social trait, seen in two extant lemur families (*Indriidae* and *Lemuridae*), is thought to have evolved independently. Group sizes are smaller in social lemurs than in simians, and despite the similarities, the community structures differ.[130] Female dominance, which is rare in simians,

is fairly common in lemurs. Strepsirrhines spend a considerable amount of time grooming each other (alogrooming). When lemuriform primates groom, they lick the fur and then comb it with their toothcomb. They also use their grooming claw to scratch places they cannot reach with their mouth.

Like New World monkeys, strepsirrhines rely on scent marking for much of their communication. This involves smearing secretions from epidermal scent glands on tree branches, along with urine and feces. In some cases, strepsirrhines may anoint themselves with urine (urine washing). Body postures and gestures may be used, although the long snout, non-mobile lips, and reduced facial enervation restrict the use of facial expressions in strepsirrhines. Short-range calls, long-range calls, and alarm calls are also used.[133] Nocturnal species are more constrained by the lack of light, so their communication systems differ from those of diurnal species, often using long-range calls to claim their territory.[134]

#### [edit] Locomotion

Living strepsirrhines are predominantly arboreal, with only the ring-tailed lemur spending considerable time on the ground. Most species move around quadrupedally (on four legs) in the trees, including five genera of smaller, nocturnal lemurs.[120] Galagos, indriids, sportive lemurs, and bamboo lemurs leap from vertical surfaces, and the indriids are highly specialized for vertical clinging and leaping.[120] Lorises are slow-moving, deliberate climbers.

Analyses of extinct adapiforms postcranial skeletons suggest a variety of locomotor behavior. The European adapids *Adapis*, *Palaeolemur*, and *Leptadapis* shared adaptations for slow climbing like the lorises, although they may have been quadrupedal runners like small New World monkeys. Both *Notharctus* and *Smilodectes* from North America and *Europolemur* from Europe exhibit limb proportions and joint surfaces comparable vertical clinging and leaping lemurs, but were not as specialized as indriids for vertical clinging, suggesting that they ran along branches and did not leap as much. *Notharctids* *Cantius* and *Pronycticebus* appear to have been agile arboreal quadrupeds, with adaptations comparable to the brown lemurs.

Primates primarily feed on fruits (including seeds), leaves (including flowers), and animal prey (arthropods, small vertebrates, and eggs). Diets vary markedly between strepsirrhine species. Like other leaf-eating (folivorous) primates, some strepsirrhines can digest cellulose and hemicellulose.[136] Some strepsirrhines, such as the galagos, slender lorises, and angwantibos are primarily insectivorous. Other species, such as fork-marked lemurs and needle-clawed bushbabies, specialize on tree gum, while indriids, sportive lemurs, and bamboo lemurs are folivores. Many strepsirrhines are frugivores (fruit eaters), and others, like the ring-tailed lemur and mouse lemurs, are omnivores, eating a mix of fruit, leaves, and animal matter.

Among the adapiforms, frugivory seems to have been the most common diet, particularly for medium-sized to large species, such as *Cantius*, *Pelycodus* and *Cercamonius*. Folivory was also common among the medium and large-sized adapiforms, including *Smilodectes*, *Notharctus*, *Adapis* and *Leptadapis*. Sharp cusps on the teeth of some of the smaller adapiforms, such as *Anchomomys* and *Donrussellia*, indicate that they were either partly or primarily insectivorous.

#### [edit] Distribution and habitat

Before their extinction, adapiform primates were primarily found across North America, Asia, and Europe, with a few species in Africa. They flourished during the Eocene when those regions were more tropical in nature, and they disappeared when the climate became cooler and drier. Today, the lemuriforms are confined in the tropics,[138] ranging between 28° S to 26° N latitude. Lorises are found both in equatorial Africa and Southeast Asia, while the galagos are limited to the forests and woodlands of sub-Saharan Africa. Lemurs are endemic to Madagascar, although much of their diversity and habitat has been lost due to recent human activity.

As with nearly all primates, strepsirrhines typically reside in tropical

rainforests. These habitats allow strepsirrhines and other primates to evolve diverse communities of sympatric species. In the eastern rainforests of Madagascar, as many as 11 or 12 species share the same forests, and prior to human arrival, some forests had nearly double that diversity.[138] Several species of lemur are found in drier, seasonal forests, including the spiny forest on the southern tip of the island, although the lemur communities in these regions are not as rich.[139]

[edit] Conservation

Like all other primates, strepsirrhines face an elevated risk of extinction due to human activity, particularly deforestation in tropical regions. Much of their habitat has been converted for human use, such as agriculture and pasture. The threats facing strepsirrhine primates fall into three main categories: habitat destruction, hunting (for bushmeat or traditional medicine), and live capture for export or local exotic pet trade. Although hunting is often prohibited, the laws protecting them are rarely enforced. In Madagascar, local taboos known as fady sometimes help protect lemur species, although some are still hunted for traditional medicine.[140]

In 2012, the International Union for Conservation of Nature (IUCN) announced that lemurs were the "most endangered mammals", due largely to elevated illegal logging and hunting following a political crisis in 2009.[141] In Southeast Asia, slow lorises are threatened by the exotic pet trade and traditional medicine, in addition to habitat destruction. Both lemurs and slow lorises are protected from commercial international trade under CITES Appendix I.[144]

^ Since they are thought to be close relatives of tarsiers, omomyiforms are classified as haplorhines. However, the spacing of the roots of their upper incisors suggests that they may have had a rhinarium, like the strepsirrhines. ^ Frequent mentions of a "strepsirrhine toothcomb" or references to Strepsirrhini as being "toothcombed primates" can be found in the literature. However, one group of strepsirrhines lacks the toothcomb the adapiforms. The toothcomb is therefore the primary hallmark of the lemuriforms, although at least one family only retains it in modified form.

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Comet Hale-<sup>ˆ</sup>Bopp (formally designated C/1995<sup>ˆ</sup> O1) was perhaps the most widely observed comet of the 20th century and one of the brightest seen for many decades. It was visible to the naked eye for a record 18<sup>ˆ</sup> months, twice as long as the previous record holder, the Great Comet of 1811.

Hale-<sup>ˆ</sup>Bopp was discovered on July 23, 1995, at a great distance from the Sun, raising expectations that the comet would brighten considerably by the time it passed close to Earth. Although predicting the brightness of comets with any degree of accuracy is very difficult, Hale-<sup>ˆ</sup>Bopp met or exceeded most predictions when it passed perihelion on April 1, 1997. The comet was dubbed the Great Comet of 1997.

[edit] Discovery

The comet was discovered on July 23, 1995 by two independent observers, Alan Hale and Thomas Bopp, both in the United States.[5]

Hale had spent many hundreds of hours searching for comets without success, and was tracking known comets from his driveway in New Mexico when he chanced upon Hale-<sup>ˆ</sup>Bopp just after midnight. The comet had an apparent magnitude of 10.5 and lay near the globular cluster M70 in the constellation of Sagittarius.[6] Hale first established that there was no other deep-sky object near M70, and then consulted a directory of known comets, finding that none were known to be in this area of the sky. Once he had established that the object was moving relative to the background stars, he emailed the Central Bureau for Astronomical Telegrams, the clearing house for astronomical discoveries.[7]

Bopp did not own a telescope. He was out with friends near Stanfield, Arizona observing star clusters and galaxies when he chanced across the comet while at the eyepiece of his friend's telescope. He realized he might have spotted something new when, like Hale, he checked his star maps to determine if any other deep-sky objects were known to be near M70, and found that there were none. He alerted the Central Bureau for Astronomical Telegrams through a Western Union telegram. Brian Marsden, who had run the bureau since 1968, laughed, "Nobody sends telegrams anymore. I mean, by the time that telegram got here, Alan Hale had already e-mailed us three times with updated coordinates." [8]

The following morning, it was confirmed that this was a new comet, and it was given the designation C/1995<sup>ˆ</sup> O1. The discovery was announced in International Astronomical Union circular 6187.[6][9]

The comet may have been observed by ancient Egyptians during the reign of pharaoh Pepi I (2332<sup>ˆ</sup> 2283 BC). In Pepi's pyramid in Saqqara is a text referring to an "nhh-star" as a companion of the pharaoh in the heavens, where "nhh" is the hieroglyph for long hair.[10]

[edit] Early observation

Hale-<sup>ˆ</sup>Bopp's orbital position was calculated as 7.2<sup>ˆ</sup> astronomical units (AU) from the Sun, placing it between Jupiter and Saturn and by far the greatest distance from Earth at which a comet had been discovered by amateurs.[11][12] Most comets at this distance are extremely faint, and show no discernible activity, but Hale-<sup>ˆ</sup>Bopp already had an observable coma.[6] An image taken at the Anglo-Australian Telescope in 1993 was found to show the then-unnoticed comet some 13<sup>ˆ</sup> AU from the Sun,[13] a distance at which most comets are essentially unobservable. (Halley's Comet was more than 100 times fainter at the same distance from the Sun.)[14] Analysis indicated later that its comet nucleus was 60<sup>ˆ</sup>±20<sup>ˆ</sup> kilometres in diameter, approximately six times the size of Halley.[1][15]

Its great distance and surprising activity indicated that comet Hale-<sup>ˆ</sup>Bopp might become very bright indeed when it reached perihelion in 1997. However, comet scientists were wary <sup>ˆ</sup> comets can be extremely unpredictable, and many have large outbursts at great distance only to diminish in brightness later. Comet Kohoutek in 1973 had been touted as a 'comet of the century' and turned out to be unspectacular.[7]

[edit] Perihelion

Haleâ ^Bopp became visible to the naked eye in May 1996, and although its rate of brightening slowed considerably during the latter half of that year,[16] scientists were still cautiously optimistic that it would become very bright. It was too closely aligned with the Sun to be observable during December 1996, but when it reappeared in January 1997 it was already bright enough to be seen by anyone who looked for it, even from large cities with light-polluted skies.[17]

The Internet was a growing phenomenon at the time, and numerous websites that tracked the comet's progress and provided daily images from around the world became extremely popular. The Internet played a large role in encouraging the unprecedented public interest in comet Haleâ ^Bopp.[18]

As the comet approached the Sun, it continued to brighten, shining at 2ndÂ magnitude in February, and showing a growing pair of tails, the blue gas tail pointing straight away from the Sun and the yellowish dust tail curving away along its orbit. On March 9, a solar eclipse in China, Mongolia and eastern Siberia allowed observers there to see the comet in the daytime.[19] Haleâ ^Bopp had its closest approach to Earth on March 22, 1997 at a distance of 1.315Â AU.[20]

As it passed perihelion on April 1, 1997 the comet developed into a spectacular sight. It shone brighter than any star in the sky except Sirius, and its dust tail stretched 40Â ^45 degrees across the sky.[21][22] The comet was visible well before the sky got fully dark each night, and while many great comets are very close to the Sun as they pass perihelion, comet Haleâ ^Bopp was visible all night to northern hemisphere observers.[23]

[edit] After perihelion

After its perihelion passage, the comet moved into the southern celestial hemisphere, and its show was over as far as most of the northern hemisphere was concerned. The comet was much less impressive to southern hemisphere observers than it had been in the northern hemisphere, but southerners were able to see the comet gradually fade from view during the second half of 1997. The last naked-eye observations were reported in December 1997, which meant that the comet had remained visible without aid for 569Â days, or about 18 and a half months.[16] The previous record had been set by the Great Comet of 1811, which was visible to the naked eye for about 9 months.[16]

The comet continued to fade as it receded, but is still being tracked by astronomers. In October 2007, 10 years after the perihelion and at distance of 25.7 AU from Sun, the comet was still active as indicated by the detection of the CO-driven coma.[24]Herschel Space Observatory images taken in 2010 suggest comet Haleâ ^Bopp is covered in a fresh frost layer.[25] Haleâ ^Bopp was again detected in December 2010 when it was 30.7AU from the Sun,[26] and again on 2012 Aug 7 when it was 33.2AU from the Sun.[27] Astronomers expect that the comet will remain observable with large telescopes until perhaps 2020, by which time it will be nearing 30thÂ magnitude.[28] By this time it will become very difficult to distinguish the comet from the large numbers of distant galaxies of similar brightness.

[edit] Orbital changes

The comet likely made its last perihelion 4,200 years ago.[29] Its orbit is almost perpendicular to the plane of the ecliptic, which ensures that close approaches to planets are rare. However, in April 1996 the comet passed within 0.77Â AU of Jupiter, close enough for its orbit to be affected by the planet's gravity.[29] The comet's orbit was shortened considerably to a period of roughly 2,533Â years,[1] and it will next return to the inner Solar System around the year 4385.[4] Its greatest distance from the Sun (aphelion) will be about 370Â AU,[1] reduced from about 525Â AU.[30][31]

Over many orbits, the cumulative effect of gravitational perturbations on comets with high orbital inclinations and small perihelion distances is generally to reduce the perihelion distance to very small values. Haleâ ^Bopp has about a 15% chance of eventually becoming a sungrazing comet through this process.[32]

It has been calculated that the previous visit by Haleâ ^Bopp occurred in July

2215 BC.[30] The comet may have presented a similar sight to people then, as the estimated closest approach to Earth was 1.4 AU, but no records of it have survived. Hale-Bopp may have had a near collision with Jupiter in early June 2215 BC, which probably caused a dramatic change in its orbit, and 2215 BC may have been its first passage through the inner Solar System.[30]

The estimated probability of impacting Earth in future passages through the inner Solar System is remote, about  $2.5 \times 10^{-9}$  per orbit.[33] However, given that the comet nucleus is around 60 km in diameter,[1] the consequences of such an impact would be apocalyptic. A calculation given by Weissman[33] conservatively estimates the diameter at 35 km; an estimated density of 0.6 g/cm<sup>3</sup> then gives a cometary mass of  $1.3 \times 10^{19}$  g. An impact velocity of 52.5 km/s yields an impact energy of  $1.9 \times 10^{32}$  ergs, or 4.4 x 10<sup>9</sup> megatons, about 44 times the estimated energy of the K-T impact event.

[edit] Scientific results

Comet Hale-Bopp was observed intensively by astronomers during its perihelion passage, and several important advances in cometary science resulted from these observations. The dust production rate of the comet was very high (up to  $2.0 \times 10^6$  kg/s),[34] which may have made the inner coma optically thick.[35] Based on the properties of the dust grains—high temperature, high albedo and strong 10  $\mu$ m silicate emission feature—the astronomers concluded the dust grains are smaller than observed in any other comet.[36]

Hale-Bopp showed the highest ever linear polarization detected for any comet. Such polarization is the result of solar radiation getting scattered by the dust particles in the coma of the comet and depends on the nature of the grains. It further confirms that the dust grains in the coma of comet Hale-Bopp were smaller than inferred in any other comet.[37]

[edit] Sodium tail

One of the most remarkable discoveries was that the comet had a third type of tail. In addition to the well-known gas and dust tails, Hale-Bopp also exhibited a faint sodium tail, only visible with powerful instruments with dedicated filters. Sodium emission had been previously observed in other comets, but had not been shown to come from a tail. Hale-Bopp's sodium tail consisted of neutral atoms (not ions), and extended to some 50 million kilometres in length.[38]

The source of the sodium appeared to be the inner coma, although not necessarily the nucleus. There are several possible mechanisms for generating a source of sodium atoms, including collisions between dust grains surrounding the nucleus, and 'sputtering' of sodium from dust grains by ultraviolet light. It is not yet established which mechanism is primarily responsible for creating Hale-Bopp's sodium tail, and the narrow[38] and diffuse[39] components of the tail may have different origins.[40]

While the comet's dust tail roughly followed the path of the comet's orbit and the gas tail pointed almost directly away from the Sun, the sodium tail appeared to lie between the two. This implies that the sodium atoms are driven away from the comet's head by radiation pressure.[38]

[edit] Deuterium abundance

The abundance of deuterium in comet Hale-Bopp in the form of heavy water was found to be about twice that of Earth's oceans. If Hale-Bopp's deuterium abundance is typical of all comets, this implies that although cometary impacts are thought to be the source of a significant amount of the water on Earth, they cannot be the only source.[41]

Deuterium was also detected in many other hydrogen compounds in the comet. The ratio of deuterium to normal hydrogen was found to vary from compound to compound, which astronomers believe suggests that cometary ices were formed in interstellar clouds, rather than in the solar nebula. Theoretical modelling of ice formation in interstellar clouds suggests that comet Hale-Bopp formed at temperatures of around 25–45 Kelvin.[41]

[edit] Organics

Spectroscopic observations of Hale-Bopp revealed the presence of many organic chemicals, several of which had never been detected in comets before. These

complex molecules may exist within the cometary nucleus, or might be synthesised by reactions in the comet.[42]

[edit] Detection of argon

Haleâ ^Bopp was the first comet where the noble gas argon was detected.[43] Noble gases are chemically inert and highly volatile, and since different noble elements have different sublimation temperatures, they can be used for probing the temperature histories of the cometary ices. Krypton has a sublimation temperature of  $16 \pm 20$  K and was found to be depleted more than 25 times relative to the solar abundance,[44] while argon with its higher sublimation temperature was enriched relative to the solar abundance.[43] Together these observations indicate that the interior of Haleâ ^Bopp has always been colder than  $35 \pm 40$  K, but has at some point been warmer than 20 K. Unless the solar nebula was much colder and richer in argon than generally believed, this suggests that the comet formed beyond Neptune in the Kuiper belt region and then migrated outward to the Oort cloud.[43]

[edit] Rotation

Comet Haleâ ^Bopp's activity and outgassing were not spread uniformly over its nucleus, but instead came from several specific jets. Observations of the material streaming away from these jets[45] allowed astronomers to measure the rotation period of the comet, which was found to be about 11 hours 46 minutes.[46]

[edit] Binary nucleus question

In 1997 a paper was published that hypothesised the existence of a binary nucleus to fully explain the observed pattern of comet Haleâ ^Bopp's dust emission observed in October 1995. The paper was based on theoretical analysis, and did not claim an observational detection of the proposed satellite nucleus, but estimated that it would have a diameter of about 30 km, with the main nucleus being about 70 km across, and would orbit in about three days at a distance of about 180 km.[47] This analysis was confirmed by observations in 1996 using Wide-Field Planetary Camera 2 of the Hubble Space Telescope which had taken images of the comet that revealed the satellite.[48]

Although observations using adaptive optics in late 1997 and early 1998 showed a double peak in the brightness of the nucleus,[49] controversy still exists over whether such observations can only be explained by a binary nucleus.[15] The discovery of the satellite was not confirmed by other observations.[50][51] Also, while comets have been observed to break up before,[52] no case has previously been found of a stable binary nucleus. Given the very small mass of this comet, the orbit of the binary nucleus would be easily disrupted by the gravity of the Sun and planets.

[edit] UFO claims

In November 1996 amateur astronomer Chuck Shramek of Houston, Texas took a CCD image of the comet, which showed a fuzzy, slightly elongated object nearby. When his computer sky-viewing program did not identify the star, Shramek called the Art Bell radio program Coast to Coast AM to announce that he had discovered a "Saturn-like object" following Haleâ ^Bopp. UFO enthusiasts, such as remote viewing proponent Courtney Brown, soon concluded that there was an alien spacecraft following the comet.[53]

Several astronomers, including Alan Hale,[54] claimed the object was simply an 8.5-magnitude star, SAO141894, which did not appear on Shramek's computer program because the user preferences were set incorrectly.[55] Later, Art Bell even claimed to have obtained an image of the object from an anonymous astrophysicist who was about to confirm its discovery. However, astronomers Olivier Hainaut and David J. Tholen of the University of Hawaii stated that the alleged photo was an altered copy of one of their own comet images.[56]

A few months later, in March 1997, the cult Heaven's Gate committed mass suicide with the intention of teleporting to a spaceship they believed was flying behind the comet.[57]

Nancy Lieder, a self-proclaimed contactee who claims to receive messages from aliens through an implant in her brain, stated that Haleâ ^Bopp was a fiction designed to distract the population from the coming arrival of "Nibiru" or

"Planet X", a giant planet whose close passage would disrupt the Earth's rotation, causing global cataclysm.[58] Although Lieder's original date for the apocalypse, May 2003, has now passed, the imminent arrival of Nibiru is still predicted by various conspiracy websites, most of whom tie it to the 2012 phenomenon.[59] This also passed.

[edit] Legacy

Its lengthy period of visibility and extensive coverage in the media meant that Hale-Bopp was probably the most-observed comet in history, making a far greater impact on the general public than the return of Halley's Comet in 1986, and certainly seen by a greater number of people than witnessed any of Halley's previous appearances. For instance, 69% of Americans had seen Hale-Bopp by April 9, 1997.[60]

Hale-Bopp was a record-breaking comet—the farthest comet from the Sun discovered by amateurs,[20] with the largest well-measured cometary nucleus known after 95P/Chiron,[15] and it was visible to the naked eye for twice as long as the previous record-holder.[16] It was also brighter than magnitude 0 for eight weeks, longer than any other recorded comet.[20]

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[edit] External links

Felice Beato (1832 â ^ 29 January 1909), also known as Felix Beato,[note 1] was an Italianâ ^British photographer. He was one of the first people to take photographs in East Asia and one of the first war photographers. He is noted for his genre works, portraits, and views and panoramas of the architecture and landscapes of Asia and the Mediterranean region. Beato's travels gave him the opportunity to create images of countries, people, and events that were unfamiliar and remote to most people in Europe and North America. His work provides images of such events as the Indian Rebellion of 1857 and the Second Opium War, and represents the first substantial oeuvre of photojournalism. He had an impact on other photographers, and his influence in Japan, where he taught and worked with numerous other photographers and artists, was particularly deep and lasting.

[edit] Origins and identity

A death certificate discovered in 2009 shows that Beato was born in Venice in 1832 and died on 29 January 1909 in Florence. The death certificate also indicates that he was a British subject and a bachelor.[3][note 2] It is likely that early in his life Beato and his family moved to Corfu, at the time part of the British protectorate of the Ionian Islands, and so Beato was a British subject.[3][4][note 3]



Because of the existence of a number of photographs signed "Felice Antonio Beato" and "Felice A. Beato", it was long assumed that there was one photographer who somehow photographed at the same time in places as distant as Egypt and Japan. In 1983 it was shown by Chantal Edel[6] that "Felice Antonio Beato" represented two brothers, Felice Beato and Antonio Beato, who sometimes worked together, sharing a signature. The confusion arising from the signatures continues to cause problems in identifying which of the two photographers was the creator of a given image.

[edit] Mediterranean, the Crimea and India

Little is certain about Felice Beato's early development as a photographer, though it is said that he bought his first and only lens in Paris in 1851.[7] He probably met the British photographer James Robertson in Malta in 1850 and accompanied him to Constantinople in 1851. Robertson had been an engraver at the Imperial Ottoman Mint since 1843 and had probably taken up photography in the 1840s.[8] In 1853 the two began photographing together and they formed a partnership called "Robertson & Beato" either in that year or in 1854, when Robertson opened a photographic studio in Pera, Constantinople. Robertson and Beato were joined by Beato's brother Antonio on photographic expeditions to Malta in 1854 or 1856 and to Greece and Jerusalem in 1857. A number of the firm's photographs produced in the 1850s are signed "Robertson, Beato and Co.", and it is believed that the "and Co." refers to Antonio.[9]

In late 1854 or early 1855 James Robertson married Beato's sister, Leonilda Maria Matilda Beato. They had three daughters, Catherine Grace (b. 1856), Edith Marcon Vergence (b. 1859), and Helen Beatruc (b. 1861).[7]

In 1855 Felice Beato and Robertson travelled to Balaklava, Crimea, where they took over reportage of the Crimean War following Roger Fenton's departure. In contrast to Fenton's depiction of the dignified aspects of war, Beato and Robertson showed the destruction.[10] They photographed the fall of Sevastopol in September 1855, producing about 60 images.[11]

In February 1858 Felice Beato arrived in Calcutta and began travelling throughout Northern India to document the aftermath of the Indian Rebellion of 1857.[12][note 4] During this time he produced possibly the first-ever photographic images of corpses.[14] It is believed that for at least one of his photographs taken at the palace of Sikandar Bagh in Lucknow he had the skeletal remains of Indian rebels disinterred or rearranged to heighten the photograph's dramatic impact[15] (see events at Taku Forts). He was also in the cities of Delhi, Cawnpore, Meerut, Benares, Amritsar, Agra, Simla, and Lahore.[16] Beato was joined in July 1858 by his brother Antonio, who later left India, probably for health reasons, in December 1859. Antonio ended up in Egypt in 1860, setting up a photographic studio in Thebes in 1862.[17]

In 1860 Felice Beato left the partnership of Robertson & Beato, though Robertson retained use of the name until 1867. Beato was sent from India to photograph the Anglo-French military expedition to China in the Second Opium War. He arrived in Hong Kong in March[18] and immediately began photographing the city and its surroundings as far as Canton.[19] Beato's photographs are some of the earliest taken in China.[20]

While in Hong Kong, Beato met Charles Wirgman, an artist and correspondent for the Illustrated London News. The two accompanied the Anglo-French forces travelling north to Talien Bay, then to Pehtang and the Taku Forts at the mouth of the Peiho, and on to Peking and Qingyi Yuan, the suburban Summer Palace.[19] For places on this route and later in Japan, Wirgman's (and others') illustrations for the Illustrated London News would often be derived from Beato's photographs.[note 5]

[edit] Taku Forts

Beato's photographs of the Second Opium War are the first to document a military campaign as it unfolded,[21] doing so through a sequence of dated and related images. His photographs of the Taku Forts represent this approach on a reduced scale, forming a narrative recreation of the battle. The sequence of images shows the approach to the forts, the effects of bombardments on the exterior walls and fortifications, and finally the devastation within the

forts, including the bodies of dead Chinese soldiers.[21] The photographs were not taken in this order, as the photographs of dead Chinese had to be taken firstâ ~before the bodies were removed; only then was Beato free to take the other views of the exterior and interior of the forts.[22]

Beato's images of the Chinese dead and his manner of producing them particularly reveal the ideological aspects of his photojournalism. Dr. David F. Rennie, a member of the expedition, noted in his campaign memoir, "I walked round the ramparts on the west side. They were thickly strewn with deadâ ~in the north-west angle thirteen were lying in one group around a gun. Signor Beato was here in great excitement, characterising the group as 'beautiful,' and begging that it might not be interfered with until perpetuated by his photographic apparatus, which was done a few minutes afterwards." [23]

[edit] Summer Palace

Just outside Peking, Beato took photographs at Qingyi Yuan (the Summer Palace), a private estate of the Emperor of China comprising palace pavilions, temples, a large artificial lake, and gardens. Some of these photographs, taken between 6 and 18 October 1860, are unique images of buildings that were plundered and looted by the Anglo-French forces beginning on 6 October. On 18 and 19 October the buildings were torched by the British First Division on the orders of Lord Elgin as a reprisal against the emperor for the torture and deaths of twenty members of an Allied diplomatic party. Bennett writes that "These [photographs] appear to be the earliest images of Peking so far discovered, and are of the utmost historical and cultural importance." [24]

Among the last photographs that Beato took in China at this time were portraits of Lord Elgin, in Peking to sign the Convention of Peking, and Prince Kung, who signed on behalf of the Xianfeng Emperor.[21]

Beato returned to England in October 1861, and during that winter he sold 400 of his photographs of India and China to Henry Hering, a London commercial portrait photographer.[25]

By 1863 Beato had moved to Yokohama, Japan, joining Charles Wirgman, with whom he had travelled from Bombay to Hong Kong.[26] The two formed and maintained a partnership called "Beato & Wirgman, Artists and Photographers" during the years 1864â ~1867,[27] one of the earliest[28] and most important[14] commercial studios in Japan. Wirgman again produced illustrations derived from Beato's photographs, while Beato photographed some of Wirgman's sketches and other works. (Beato's photographs were also used for engravings within AimÃ© Humbert's *Le Japon illustrÃ©* [29] and other works.) Beato's Japanese photographs include portraits, genre works, landscapes, cityscapes, and a series of photographs documenting the scenery and sites along the TÅ kaidÅ Road, the latter series recalling the ukiyo-e of Hiroshige and Hokusai. During this period, foreign access to (and within) the country was greatly restricted by the Shogunate. Accompanying ambassadorial delegations[30] and taking any other opportunities created by his personal popularity and close relationship with the British military, Beato reached areas of Japan where few westerners had ventured, and in addition to conventionally pleasing subjects sought sensational and macabre subject matter such as heads on display after decapitation.[31] His images are remarkable not only for their quality, but also for their rarity as photographic views of Edo period Japan.[32]

The greater part of Beato's work in Japan contrasted strongly with his earlier work in India and China, which "had underlined and even celebrated conflict and the triumph of British imperial might".[33] Aside from the Portrait of Prince Kung, any appearances of Chinese people in Beato's earlier work had been peripheral (minor, blurred, or both) or as corpses. With the exception of his work in September 1864 as an official photographer on the British military expedition to Shimonoseki,[26] Beato was eager to portray Japanese people, and did so uncondescendingly, even showing them as defiant in the face of the elevated status of westerners.[34]

Beato was very active while in Japan. In 1865 he produced a number of dated views of Nagasaki and its surroundings.[26] From 1866 he was often caricatured in *Japan Punch*, which was founded and edited by Wirgman.[35] In an October 1866

fire that destroyed much of Yokohama, Beato lost his studio and many, perhaps all, of his negatives.[26]

Although Beato was not the first photographer in Japan to sell albums of his works, he was probably the first to recognise their full commercial potential,[36] and by around 1870 their sale had become the mainstay of his business.[37] Although the customer would select the content of earlier albums, Beato moved toward albums of his own selection. It was probably Beato who introduced to photography in Japan the double concept of views and costumes/manners, an approach common in photography of the Mediterranean.[38] By 1868 Beato had readied two volumes of photographs, "Native Types", containing 100 portraits and genre works, and "Views of Japan", containing 98 landscapes and cityscapes.[39]

Many of the photographs in Beato's albums were hand-coloured, a technique that in his studio successfully applied the refined skills of Japanese watercolourists and woodblock printmakers to European photography.[32]

Since about the time of the ending of his partnership with Wirgman in 1869, Beato attempted to retire from the work of a photographer, instead attempting other ventures[1][32] and delegating photographic work to others within his own studio in Yokohama, "F. Beato & Co., Photographers",[40] which he ran with an assistant named H. Woollett and four Japanese photographers and four Japanese artists.[41] Kusakabe Kimbei was probably one of Beato's artist-assistants before becoming a photographer in his own right.[42] But these other ventures would fail, and Beato's photographic skills and personal popularity would ensure that he could successfully return to work as a photographer.[1]

Beato photographed with Ueno Hikoma,[43] and possibly taught photography to Raimund von Stillfried.[44]

In 1871 Beato served as official photographer with the United States naval expedition of Admiral Rodgers to Korea.[35] Although it is possible that an unidentified Frenchman photographed Korea during the 1866 invasion of Ganghwa Island,[45] Beato's photographs are the earliest of Korea whose provenance is clear.[46]

Beato's business ventures in Japan were numerous. He owned land[47] and several studios, was a property consultant, had a financial interest in the Grand Hotel of Yokohama,[35] and was a dealer in imported carpets and women's bags, among other things. He also appeared in court on several occasions, variously as plaintiff, defendant, and witness.[48] On 6 August 1873 Beato was appointed Consul General for Greece in Japan.[41]

In 1877 Beato sold most of his stock to the firm Stillfried & Andersen,[32] who then moved into his studio. In turn, Stillfried & Andersen sold the stock to Adolfo Farsari in 1885.[49] Following the sale to Stillfried & Andersen, Beato apparently retired for some years from photography, concentrating on his parallel career as a financial speculator and trader.[50] On 29 November 1884 he left Japan, ultimately landing in Port Said, Egypt.[51] It was reported in a Japanese newspaper that he had lost all his money on the Yokohama silver exchange.[52]

[edit] Later years

From 1884 to 1885 Beato was the official photographer of the expeditionary forces led by Baron (later Viscount) G.J. Wolseley to Khartoum, Sudan, in relief of General Charles Gordon.[52]

Briefly back in England in 1886, Beato lectured the London and Provincial Photographic Society on photographic techniques.[52] By 1888 he was photographing in Asia again, this time in Burma,[53] where from 1896 he operated a photographic studio (called "The Photographic Studio") as well as a furniture and curio business in Mandalay, with a branch office in Rangoon.[54] In 1899 he left F. & Beato Ltd (which would go into liquidation in 1907),[55] but he worked in "The Photographic Studio" until 1904 and may have continued work under his own or another name after that.[55] Although Beato was previously believed to have died in Rangoon or Mandalay in 1905 or 1906,[56] his death certificate, discovered in 2009, indicates that he died on 29 January 1909 in

Florence, Italy.

Whether acknowledged as his own work, sold as Stillfried & Andersen's, or encountered as anonymous engravings, Beato's work had a major impact:

For over fifty years into the early twentieth century, Beato's photographs of Asia constituted the standard imagery of travel diaries, illustrated newspapers, and other published accounts, and thus helped shape "Western" notions of several Asian societies.[57]

[edit] Photographic techniques

Photographs of the 19th century often now show the limitations of the technology used, yet Felice Beato managed to successfully work within and even transcend those limitations. He predominantly produced albumen silver prints from wet collodion glass-plate negatives.[58]

Beato pioneered and refined the techniques of hand-colouring photographs[30] and making panoramas.[59] He may have started hand-colouring photographs at the suggestion of Wirgman, or he may have seen the hand-coloured photographs made by partners Charles Parker and William Parke Andrew.[60] Whatever the inspiration, Beato's coloured landscapes are delicate and naturalistic and his coloured portraits, more strongly coloured than the landscapes, are appraised as excellent.[note 6] As well as providing views in colour, Beato worked to represent very large subjects in a way that gave a sense of their vastness. Throughout his career, Beato's work is marked by spectacular panoramas, which he produced by carefully making several contiguous exposures of a scene and then joining the resulting prints together, thereby re-creating the expansive view.[62] The complete version of his panorama of Pehtang comprises seven photographs joined together almost seamlessly for a total length of more than 2 metres (6 1/2 ft).[62]

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^ It appears that Felice was his original name. However, he tended to prefer Felix.[1] During his lifetime he was often referred to in print as "Signor Beato", and his surname was often misspelled ("Beat", "Beatto", etc).[2]

^ Recent scholarship had uncovered an application by Beato for a travel permit in 1858 that included information suggesting he was born in 1833 or 1834 on the island of Corfu.[4] Earlier sources had given his birth date as 1825 or ca. 1825, but these dates may have been confused references to the possible birth date of his brother, Antonio. However, the death certificate discovered in 2009 provides the first definitive evidence of Beato's dates and places of birth and death.

^ Beato has long been described as British, Italian, Corfiot Italian, and/or Greek. The movements of his family and of early nineteenth century history in the Adriatic mean that he can justifiably be described by all these terms. Corfu was on and off part of Venetian territory from 1386 until 1815, when the Treaty of Paris placed it and the other Ionian Islands under British protection. Corfu was ceded to Greece in 1864. A line of the Beato family is recorded as having moved to Corfu in the 17th century and was one of the noble Venetian families that ruled the island during the Republic of Venice.[5]

^ Gernsheim states that Beato and Robertson both travelled to India in 1857, but it is now generally accepted that Beato travelled there alone.[13]

^ For an anthology of the illustrations (as well as the texts, although in Japanese translation only) of the Illustrated London News' Japanese material, see Kanai.

^ Bennett quotes and summarises collector Henry Rosin's appraisal of Beato's hand-coloured photographs.[61]

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^ Clark, Fraser, and Osman, *passim*.

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 ^ a b Dobson, "'I been to keep up my position'", p. 31.  
 ^ Gray, p. 68.  
 ^ Zannier, Antonio e Felice Beato, n.p.  
 ^ a b Clark, Fraser, and Osman, p. 90.  
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 ^ Greenough, p. 21; Pare, "Roger Fenton", p. 226.  
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 ^ Harris, p. 23; Dehejia, p. 121; Masselos and Gupta, p. 1.  
 ^ Gernsheim, p. 96.  
 ^ a b Zannier, "Beato", p. 447.  
 ^ Gartlan, "Felice Beato", p. 128.  
 ^ Harris, p. 23; Clark, Fraser, and Osman, pp. 91â ^92.  
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 ^ Rosenblum, p. 124.  
 ^ a b c Lacoste, p. 10.  
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 ^ Himeno, p. 24.  
 ^ Gartlan, A Chronology of Baron Raimund von Stillfried-Ratenicz (1839â ^1911), p. 130.  
 ^ Choi and Park; Bennett, "Korea", p. 805.  
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 ^ a b c Clark, Fraser, and Osman, p. 112.  
 ^ Clark, Fraser, and Osman, p. 113.  
 ^ Clark, Fraser, and Osman, p. 114.  
 ^ a b Clark, Fraser, and Osman, pp. 114â ^115.  
 ^ Robinson, p. 41; Clark, Fraser, and Osman, p. 116; Zannier, "Beato", p. 446.  
 ^ Gartlan, "Felix Beato", p. 131.  
 ^ Lacoste, pp. 24â ^25.

- ^ Gartlan, "Felix Beato", p. 130.
- ^ Bennett, *Early Japanese Images*, p. 39.
- ^ Bennett, *Early Japanese Images*, p. 43; Robinson, p. 48.
- ^ a b Lacoste, pp. 8â ^9.

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Name

Beato, Felice

Alternative names

Beato, Felix; Beato, Felice Antonio (shared signature with brother)

Short description

British and Italian photography pioneer; Travel, panoramic and war photographer

Date of birth

1832

Place of birth

Venice, Italy

Date of death

29 January 1909

Place of death

Florence, Italy

Larrys Creek is a 22.9-mile-long (36.9 km)[6]tributary of the West Branch Susquehanna River in Lycoming County in the U.S. state of Pennsylvania. A part of the Chesapeake Bay drainage basin, its watershed drains 89.1 square miles (231 km<sup>2</sup>) in six townships and a borough. The creek flows south from the dissected Allegheny Plateau to the Ridge-and-valley Appalachians through sandstone, limestone, and shale from the Devonian, Mississippian, and Pennsylvanian periods.

The valley's first recorded inhabitants were the Susquehannocks, followed by the Lenape and other tribes.[7] The Great Shamokin Path crossed the creek near its mouth, where Larry Burt, the first Euro-American settler and the man who gave the creek its present name, also lived by 1769. In the 19th century, the creek and its watershed were a center for logging and related industries, including 53 sawmills, grist mills, leather tanneries, coal and iron mines. A 1903 newspaper article claimed "No other stream in the country had so many mills in so small a territory".[8] For transportation, a plank road ran along much of the creek for decades, and two "paper railroads" were planned, but never built.

As of 2006, the Larrys Creek watershed is 83.1% forest and 15.7% agricultural (a reforestation of land clear-cut in the 19th century). Nearly 9,000 acres (3,600 ha) of second-growth forest are protected public and private land for hunting and trout fishing, with more land protected in parts of Tiadaghton State Forest. Pollution from past industrial use is gone and Larrys Creek "has an exceptionally scenic, ultra-highwater, whitewater run" for canoeing.[9] Despite agricultural runoff and small amounts of acid mine drainage, water quality is quite good, and a water filtration plant on Larrys Creek supplies over 2500 customers.[10]

Larrys Creek is named for Larry Burt, the first European settler in the area, who lived near the mouth of the creek outside what is now the hamlet of Larrys Creek in Piatt Township. He traded with the indigenous peoples, and, according to a tradition reported by Meginness (1892), he had a Native American wife.[11] Larry Burt was already there when surveyors came through in 1769 (after the land was purchased by the colonial government of Pennsylvania on November 5, 1768 as part of the "New Purchase" in the first Treaty of Fort Stanwix), but disappeared sometime soon after, perhaps moving west with the Native Americans who left the area.[11]

Larrys Creek is the only major creek in Lycoming County for which a Native American name is unknown.[12] As of 2006, it is the only stream named "Larrys Creek" on USGS maps of the United States and in the USGS Geographic Names Information System.[2] The possessive apostrophe is not part of the official name of the creek, although records from the 19th century often spell it as "Larry's Creek" (as do some highway bridge signs today).

Today the creek has given its name to the hamlet at its mouth, as well as the village of "Larryville" further upstream. Before it became a borough, Salladasburg was also known as "Larrys Creek" (from the name of its post office). The "First Fork" and "Second Fork" of Larrys Creek are named in the



order in which they are encountered traveling upstream, with "Fork" here denoting a major tributary. "Lawshe Run", the major tributary of the Second Fork, is named for Robert Lawshe, who established a tannery in Salladasburg in 1848.[13] "Seeley Run", a minor tributary entering the creek at Larryville, is named for Mr. Seely, who built the first sawmill on Larrys Creek in 1796.[8] While the USGS uses "Seeley Run", it is still "Seely Run Road" that follows the stream. The First Fork, Canoe Run, Joes Run, and Wolf Run also have roads named for them.[3]

#### [edit] Course

Larrys Creek is the only major watershed in Lycoming County entirely within the county. Measured directly, Lycoming County is about 130 miles (210 km) northwest of Philadelphia and 165 miles (266 km) east-northeast of Pittsburgh.[14] It is 53.0 miles (85.3 km) from the mouth of Larrys Creek along the West Branch Susquehanna River to its confluence with the Susquehanna River at Northumberland, Pennsylvania.[15] The source of Larrys Creek is in northern Lycoming County in Cogan House Township, just south of the hamlet of Steam Valley, at an elevation of 1,740 feet (530 m)[2][16][17] It flows west-southwest through the village of Cogan House, and then under the Cogan House Covered Bridge.

The creek next heads due south through Pennsylvania State Game Lands Number 114. There it runs for about 3 miles (4.8 km) with only a trail or unimproved road beside it.[18] It passes through Mifflin Township for a short distance and heads southeast into Anthony Township, where it leaves the State Game Lands and passes a water filtration plant; there is a dam 8.5 feet (2.6 m) tall and 52.5 feet (16.0 m) wide here.[9][19] Further south, it receives Roaring Run (on the left bank). Roaring Run receives the only acid mine drainage in the watershed and enters Larrys Creek 10.4 miles (16.7 km) from the mouth.

Larrys Creek then heads southwest back into Mifflin Township, where it passes through the borough of Salladasburg, with Pennsylvania Route 973 running parallel to the creek from the township line to the borough. At Salladasburg, Larrys Creek receives its major tributary, the Second Fork of Larrys Creek, on the right bank 5.8 miles (9.3 km) from the mouth.

The Second Fork rises in Cogan House Township near the village of White Pine and runs south through the village of Brookside, then a few miles through Cummings Township, and last through Mifflin Township and Salladasburg. Lawshe Run is its major tributary. Pennsylvania Route 287 runs parallel to the Second Fork its whole length, and continues parallel to Larrys Creek from Salladasburg south to its terminus on U.S. Route 220 (near the creek's mouth).

Just south of Salladasburg, Larrys Creek receives the First Fork of Larrys Creek, 4.2 miles (6.8 km) from the mouth. The First Fork has its source in Cummings Township and flows south-southeast into Mifflin Township. 2.8 miles (4.5 km) from its mouth Larrys Creek receives Canoe Run. Both these tributaries enter on the right bank.

Larrys Creek then enters Piatt Township, flowing east around a ridge and through the village of Larryville where it receives Seeley Run on the left bank, 1.5 miles (2.4 km) from the mouth. It next flows back southwest, then south to the hamlet of Larrys Creek and finally into the West Branch Susquehanna River, 2.6 miles (4.2 km) east of the borough of Jersey Shore, at an elevation of 515 feet (157 m).[2][20] U.S. Route 220 and the Lycoming Valley Railroad cross the creek on separate bridges just north of its mouth.[3] The direct distance between the source and mouth is only 16.9 miles (27.2 km).[14] The difference in elevation between source and mouth, 1,225 feet (373 m), divided by the length of the creek, 22.9 miles (36.9 km), gives the average drop in elevation per unit length of creek or relief ratio of 53.5 feet per mile (10.1 m/km). The meander ratio is 1.08, so the creek is fairly straight in its bed.[1]

#### [edit] Discharge

From 1960 to 1979, the United States Geological Survey (USGS) operated one stream gauge on Larrys Creek at the village of Cogan House, for the uppermost 6.8 square miles (18 km<sup>2</sup>) of the watershed. The mean discharge measured at this

site from 1961 to 1978 was 10.8 cubic feet per second (0.306 m<sup>3</sup>/s), with a peak discharge of 1,130 cubic feet per second (32.0 m<sup>3</sup>/s) and peak gauge height of 5.29 feet (1.61 m), both on June 22, 1972 during Hurricane Agnes.[21] The USGS also estimated mean monthly and annual groundwater recharge at the Cogan House stream gauge. Using data from 1961 to 1977, the upper and lower annual recharge estimates were 18.1 to 14.5 inches (46 to 37 cm), and the greatest monthly recharge was in March, with 20.1% of the annual total.[22]

The USGS also measured discharge at the village of Larrys Creek, very near the creek's mouth, as part of water quality measurements on seven occasions between 1970 and 1975. The average discharge was 66.0 cubic feet per second (1.87 m<sup>3</sup>/s), and ranged from a high of 114 cubic feet per second (3.23 m<sup>3</sup>/s) to a low of 8.8 cubic feet per second (0.25 m<sup>3</sup>/s).[5] Lycoming County operates a stream gauge at Salladasburg as part of the county-wide flood warning system. It only measures the water height (not discharge) and had a peak gauge height of 8.0 feet (2.4 m), on September 18, 2004 during Hurricane Ivan.[23]

[edit] Geology

Larrys Creek is in a sandstone, limestone, and shale mountain region, with the source in the dissected Allegheny Plateau and the mouth in the Ridge-and-valley Appalachians.[1] The southern part of the Larrys Creek watershed has sedimentary surface rocks from the Devonian period, with a large area from the Mississippian period in the north of the watershed and a small Pennsylvanian period region within this area.[24] The Cogan House anticline runs north of and parallel to the upper part of the creek.[25] Iron ore within the watershed was mined south of Salladasburg and along Canoe Run in the 19th century; there are also deposits on Puterbaugh Mountain.[26]

Larrys Creek is in a narrow valley formed by mountains and hills, with steep to moderate slopes. The channel pattern is regular, with a dendritic drainage pattern.[1] After leaving its source, the creek turns to flow southwest along the northern edge of Green Mountain, turns south into the State Game Lands at Buckhorn Mountain, and flows south along the western edge of Coal Mountain. The only named peak on the west bank of Larrys Creek itself is Harris Point, where it leaves the dissected Allegheny Plateau.[27]

The Second Fork flows south along the eastern side of Henson Ridge, then east of Puterbaugh Mountain. The only named peak on the east bank of the Second Fork is Clapp Point, which marks the boundary of the dissected plateau and is southwest of Harris Point. The First Fork flows past the southwest edge of Little Round Top and then continues on the southwest side of Puterbaugh Mountain. Fishery Point is at the southern end of the Allegheny Plateau, just west of the First Fork.[28] The three features named Point are each part of the Allegheny Front, the edge of the Allegheny Plateau.[29]

The Larrys Creek watershed has two deposits of low volatile bituminous coal along Roaring Run[30] and a small, deep natural gas field.[31] A potentially large source of natural gas is the Marcellus Shale, which lies 1.5 to 2.0 miles (2.4 to 3.2 km) below the surface here and stretches from New York through Pennsylvania to Ohio and West Virginia. Estimates of the total natural gas in the black shale from the Devonian era range from 168 to 516 trillion cubic feet (4.76 to 14.6 trillion m<sup>3</sup>), with at least 10 percent considered recoverable.[32][33] In November 2007, drilling within the Larrys Creek watershed started in Mifflin Township, just west of Salladasburg, with a 1.5 miles (2.4 km) deep well.[34] A second well was drilled in Mifflin Township in December 2007,[35] and by February 2008 every well drilled in Lycoming County was producing natural gas.[36] The Marcellus Shale requires special techniques to fracture the rock and release the gas, including pumping sand and water into the well, and, in some cases, horizontal drilling.[37]

[edit] Watershed

The Larrys Creek watershed is entirely in Lycoming County and accounts for 7.17% of the county by area. It is the only major creek whose watershed is entirely in the county, and lies between the Pine Creek watershed (including Little Pine Creek) 5.2 miles (8.4 km) to the west and the Lycoming Creek watershed 11.9 miles (19.2 km) to the east (as measured on the river).[15]

The Larrys Creek watershed has a total population of 2,513 (as of 2000) and a total area of 89.1 square miles (231Â km<sup>2</sup>). Of that area, 74 square miles (190Â km<sup>2</sup>) are forested and 14 square miles (36Â km<sup>2</sup>) are given to agricultural uses.[4] Larrys Creek is the largest creek in Lycoming County without its own watershed association.[38]

#### [edit] Tributaries

The major smaller streams in the Larrys Creek watershed include the First and Second Forks, Roaring Run, Lawshe Run, and Canoe Run. The Second Fork is the largest tributary, with a watershed of 24.9 square miles (64Â km<sup>2</sup>) or 28.0% of the total watershed. The First Fork is next largest, with a watershed of 17.6 square miles (46Â km<sup>2</sup>) or 19.8% of the total. Roaring Run accounts for 5.7% of the total watershed with 5.1 square miles (13Â km<sup>2</sup>) and other tributaries are less than 5% of the total.[15]

Starting at the mouth, the tributaries of Larrys Creek are: Seeley Run, Canoe Run, First Fork Larrys Creek, Second Fork Larrys Creek, Mash Run, "Pond Hollow", "Spook Hollow", Roaring Run, "Cramer Hollow", "Pot Lick Hollow", "Match Pine Hollow", "Watt Hollow", Long Run, Wendell Run, Crayton Hollow Run, Wolf Run, Dibber Hollow Run, and Birch Run (unnamed streams in a named feature are given as the name of the feature in quotation marks).

#### [edit] Water quality, pollution, and filtration plant

The clear-cutting of forests in the 19th century adversely affected the ecology of the Larrys Creek watershed and its water quality.[39] Polluting industries on the creek and its tributaries during that period included coal and iron mines and tanneries.[13][26][40] As of 2006, water quality in Larrys Creek is quite good, although two small unnamed tributaries of Roaring Run do receive acid mine drainage from an abandoned coal mine.[41] Agricultural runoff is another source of pollution. Effluent limits for Larrys Creek in Mifflin Township for the 5-day test for carbonaceous biochemical oxygen demand (CBOD<sub>5</sub>) are 25Â mg/L, while fecal coliform bacteria count limits are 200 per 100Â mL in May through September, and 200 per 100Â mL in October through April.[42]

The mean annual precipitation for Larrys Creek is 40 to 42 inches (1,000 to 1,100 mm).[1] According to the Pennsylvania Fish and Boat Commission: "Pennsylvania receives the most acid deposition of any state in the nation because, in addition to being the third highest producer of the gases that cause acid deposition, we are also located downwind from the highest concentration of air pollution emitters." [43] The region's geology gives it a relatively low capacity to neutralize added acid. This makes the creek especially vulnerable to increased acidification from rain, which poses a threat to the long term health of the plants and animals in the creek.[43]

The Jersey Shore Area Joint Water Authority's water filtration plant is on Larrys Creek, near the border between Mifflin and Anthony Townships. The plant has been there since at least 1914 and provides water from the creek to 2,500 industrial and residential customers in the boroughs of Jersey Shore and Salladasburg, as well as Anthony, Mifflin, Nippenose, Piatt, and Porter Townships in southwestern Lycoming County, and Pine Creek Township in the southeastern part of neighboring Clinton County, Pennsylvania.[10]

#### [edit] Recreation

There are at least two camps along Larrys Creek. "Camp Kiwanis" has a main lodge, four cabins, picnic pavilion, and various recreational facilities on 50 acres (20Â ha) on Route 287, 1.0 mile (1.6Â km) south of Salladasburg in Mifflin Township.[44] It is operated as a service by the Williamsport Kiwanis and rented out for fire department training, Girl Scouts, weddings, church, and other groups. Further south along the creek in Piatt Township is the New Tribes Mission camp for preparing Christian missionaries for field work with indigenous peoples in remote parts of the world. The training at the camp lasts one year.[45][46]

Edward Gertler writes in *Keystone Canoeing* that Larrys Creek "has an exceptionally scenic, ultra-highwater, whitewater run that is really worthy of your attention".[9] Canoeing and kayaking on Larrys Creek are possible when the water is high enough (in Spring and after hard rain), with 8.0 miles (12.9Â km)

of Class 3 whitewater on the International Scale of River Difficulty from Township Road 786 south through the State Game Lands to Route 973, and 7.4 miles (11.9 km) of Class 1 to 2 whitewater south from PA 973 to U.S. 220.[9][47]

In addition to the 2,881 acres (1,166 ha) in State Game Lands No. 114,[48] opportunities for hunting and fishing are available in the areas of Tiadaghton State Forest in the western part of the watershed, along the First and Second Forks. In 2002, a Pennsylvania Department of Conservation and Natural Resources (DCNR) report on "State Forest Waters with Special Protection" rated the First Fork as a "High Quality-Cold Water Fishery".[49] A stretch of Larrys Creek from the water company filtration plant (near the border between Mifflin and Anthony Townships) to 1.0 mile (1.6 km) downstream of the confluence with the First Fork has been designated as approved trout waters by the Pennsylvania Fish and Boat Commission. This means the waters will be stocked with trout and may be fished during trout season.[50]

There are also private hunting and fishing clubs and cabins along Larrys Creek and its tributaries. The largest is the "Larrys Creek Fish and Game Club", incorporated August 1, 1906, which owns over 6,000 acres (2,400 ha) along Route 287 on the Second Fork. As of 2006, the club has 55 active and 15 honorary members (all male). The club promotes conservation and stocks its 7 miles (11 km) of trout stream with three to four thousand brook and brown trout each year.[51] The club's facilities include a trapshooting range and a helipad, to aid in medical evacuations from its remote location.[52]

Another large private club is the Ogontz Lodge on the First Fork, established by banker Jay Cooke about 1884 for fishing and hunting.[26][53] Cooke owned nearly the whole First Fork, 9.2 miles (14.8 km) long, with the main "Lodge" 1.2 miles (1.9 km) from the mouth, and a smaller "Upper Cabin" 5 miles (8.0 km) upstream of that.[54] Herbert Hoover found solitude at the Ogontz Lodge as a guest of Jay Cooke III three times: in June, 1918 (just before leaving for Europe as head of the American Food Administration), mid-May, 1928 (just before his selection as the Republican presidential candidate), and finally in late May, 1930 (as President of the United States).[55] Other notable guests at the Ogontz Lodge include Theodore Roosevelt, Jr. and Katharine Hepburn, and it is still in operation as of 2007.[54][56]

[edit] History

[edit] Early inhabitants

Two Clovis points found in the Salladasburg area in a "stream site" are the earliest evidence of human activity along Larrys Creek (circa 10,000 BCE).[57] The earliest recorded inhabitants of the Susquehanna River valley were the Iroquoian speaking Susquehannocks. Their name meant "people of the muddy river" in Algonquian. Decimated by diseases and warfare, they had died out, moved away, or been assimilated into other tribes by the early 18th century. The lands of the West Branch Susquehanna River Valley were then chiefly occupied by the Munsee phratry of the Lenape (or Delaware), and were under the nominal control of the Five (later Six) Nations of the Iroquois. The Great Shamokin Path crossed the creek at a ford near its mouth; however, no trails of the indigenous peoples are recorded as having followed Larrys Creek north.[58]

On November 5, 1768, the British acquired the "New Purchase" from the Iroquois in the Treaty of Fort Stanwix, opening what is now Lycoming County to settlement. However, the Line of Property (or Purchase Line) border defined by "Tiadaghton Creek" dividing colonial and Native American lands was disputed. The colonists claimed this was Pine Creek, the Iroquois and other tribes that it was Lycoming Creek. Larrys Creek was in the disputed territory between these, so the illegal settlers there were part of the "Fair Play Men" system of self-government, with their own Declaration of Independence from Britain on July 4, 1776.[7][59]

In the Revolutionary War, settlements throughout the Susquehanna valley were attacked by Loyalists and Native Americans allied with the British. After the Wyoming Valley battle and massacre in the summer of 1778 (near what is now Wilkes-Barre) and smaller local attacks, the "Big Runaway" occurred throughout

the West Branch Susquehanna valley. Settlers fled feared and actual attacks by the British and their allies. Homes and fields were abandoned, with livestock driven along and a few possessions floated on rafts on the river east to Muncy, then further south to Sunbury. The abandoned property was burnt by the attackers. Some settlers soon returned, only to flee again in the summer of 1779 in the "Little Runaway". Sullivan's Expedition helped stabilize the area and encouraged resettlement, which continued after the war.[60]

On April 13, 1795, Lycoming County was formed from Northumberland County, prompting further growth. In 1800, the "State Road" was the second major road built in the county and followed part of Larrys Creek in Cogan House Township as it ran from Newberry (the western part of Williamsport today) north to the Pennsylvania-New York state line near Painted Post, New York. Larrys Creek had a bridge near the mouth by 1806, the first of the major creeks in the county for which a bridge is mentioned.[61]

[edit] Lumber

Like all creeks in Lycoming County, Larrys Creek served as an area for settlers to establish homesteads and farms. As logging became a major industry in the mid-19th century, the creek was a source of power for sawmills and other mills. The first sawmill on the creek, in what is now Mifflin Township, was built in 1799. The relatively low flow of water in the creek did not allow rafts of logs to be floated downstream to the river and the lumber boom at Williamsport (as they were on Pine Creek to the west).[26]

This and the lack of logging railroads along the creek led to the development of many small sawmills: the Larrys Creek watershed once had 53 sawmills within 22 miles (35 km) of the mouth (as well as other industries of the time). No other stream in the country had so many sawmills in so small a territory. Twelve sawmills were on the Second Fork, six on the First Fork, one each on Canoe Run and Lawshe Run, and the rest were on Larrys Creek itself. Eight were structures rebuilt on the site of previous sawmills, and only four were steam powered (the rest were water powered). The earliest of these sawmills was built in 1796 (near Seeley Run), the last in 1902 (on Lawshe Run), and by 1903 just two mills were still standing and only one of those was operating.[8]

Lumbering removed the tree trunks, but left many flammable limbs, branches, and stumps behind. On May 2, 1872, a large forest fire destroyed the villages of Carter and Gould, 6 miles (9.7 km) north of Salladasburg on Larrys Creek in Mifflin Township.[26] There are large tracts of second growth forest and small lumber companies still operate in the watershed today.[62]

[edit] Paper railroads

Two "paper railroads" were proposed for Larrys Creek: the "Larry's Creek Railroad and Coal Company", incorporated June 24, 1839 to hold 2,000 acres (8.1 km<sup>2</sup>) and operate up to 7 miles (11 km) of railroad from the mouth of the creek north to the coal mines; and the "Jersey Shore, Pine Creek & State Line Railroad", incorporated on April 11, 1853 to run north from Jersey Shore up Pine Creek to Tioga or Long Run, and thence to the New York state line. Its charter was amended April 4, 1854 to run up Marsh Creek (then known as the Third Fork Pine Creek) and Crooked Creek to the Tioga Railroad, and again on March 26, 1856 to run up Little Pine Creek (then known as First Fork Pine Creek) to the Larrys Creek Plank Road and then up Blockhouse Creek to Blossburg. It was still an active corporation in 1865, but the charter of the "Jersey Shore, Pine Creek and Buffalo Railway" in 1870 (New York City-Reading interests) superseded it. Neither railroad was actually ever built.[63] The only railroad in the watershed crosses the creek just north of the mouth.

[edit] Plank road

In 1851 a plank road or puncheon was built along Larrys Creek from the village of Larrys Creek at the creek's mouth north to Salladasburg, then later along the Second Fork and on to the village of Brookside in Cogan House Township. It was later extended north to the village of White Pine and finally to the village of English Center in Pine Township (along the current course of Pennsylvania Route 287). A spur of the plank road along Larrys Creek into Anthony Township was also built, but it is not known how far it extended.[64]

(Landis claims it may have run nearly as far north as the covered bridge in Cogan House Township).[65] The plank road was a toll road run by "The Larrys Creek Plank Road Company", a corporation founded May 8, 1850. It served the sawmills, grist mills, mines, and leather tanneries along the creek. There was a connection to the railroad and the West Branch Division of the Pennsylvania Canal at the hamlet of Larrys Creek, as well as the West Branch Susquehanna River.

Hemlock logs were used to build the plank road. At that time, the tree's bark was a major source of tannin used to tan leather. The wood was not used much for lumber, so hundreds of thousands of stripped hemlock logs were normally left to rot. There were sawmills and experienced lumber workers available from the local timber industry.

The earth under the plank road was first graded, then ties (similar to those used for railroad tracks) were set into the ground. Next long narrow stringers (similar to rails on a railroad track) were nailed to the ties, with a distance between stringers of about 6 feet (1.8 m). The road surface consisted of planks about 8 feet (2.4 m) wide nailed to the stringers and was fairly smooth. The road had turnoffs (as it was not wide enough for horse drawn vehicles to pass each other). Toll houses were at regular intervals, with variable tolls for pedestrians, riders on horseback and various carts and wagons. No toll schedule has survived.

The plank road was operational for about 38 years when a major flood on June 1, 1889 washed out much of it. The flood also destroyed the canal at the creek's mouth. The same storm system caused the Johnstown Flood, which killed over 2200 people.[61] The Cogan House Covered Bridge was the only one on Larrys Creek to survive the flood, as a fallen tree formed a protective dam just upstream.[65] The 90 foot (27 m) long Burr arch truss bridge was built in 1877, listed on the National Register of Historic Places in 1980, rehabilitated in 1998, and is today one of just three left in the county.[66][67]

By then most of the original forests in the county had been clear-cut, so no cheap source of wood was available as before. While the road from Salladasburg south to the West Branch Susquehanna River was repaired and rebuilt, the rest was not. In 1900 the county courts recognized a petition to end tolls on this last portion of the road. The corporation was dissolved and the road and its maintenance passed to the county. As sections of plank road wore out they were replaced by graded dirt and gravel, so that it soon became a regular road. The plank road operated as a toll road for about 49 years.[64] Today only the "Plank Road" name survives, in a 0.6 miles (0.97 km) section of road that runs north from U.S. Route 220, parallel to Route 287.[3]

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[edit] External links

Grand Duchess Olga Alexandrovna of Russia (Russian: О.́льга́ Алекса́ндровна́ Рома́нова; Olga Alexandrovna Romanova) (13 June 1882 â <sup>^</sup> 24 November 1960) was the youngest child of Emperor Alexander III of Russia. Her older brother was Tsar Nicholas II.

She was raised at the Gatchina Palace outside Saint Petersburg. Olga's relationship with her mother, Empress Marie, the daughter of King Christian IX of Denmark, was strained and distant from childhood. In contrast, she and her father were close. He died when she was 12, and her brother Nicholas became emperor.

In 1901, she married Duke Peter Alexandrovich of Oldenburg, who was privately believed by family and friends to be homosexual. Their marriage of 15 years remained unconsummated, and Peter at first refused Olga's request for a divorce. The couple led separate lives and their marriage was eventually annulled by the Emperor in October 1916. The following month Olga married cavalry officer Nikolai Kulikovsky, with whom she had fallen in love several years before. During the First World War, the Grand Duchess served as an army nurse at the front and was awarded a medal for personal gallantry. At the downfall of the Romanovs in the Russian Revolution of 1917, she fled to the Crimea with her husband and children, where they lived under the threat of assassination. Her brother and his family were shot by revolutionaries.

Olga escaped revolutionary Russia with her second husband and their two sons in February 1920. They joined her mother, the Dowager Empress, in Denmark. In exile, Olga acted as companion and secretary to her mother, and was often sought out by Romanov impostors who claimed to be her dead relatives. She met Anna Anderson, the best-known impostor, in Berlin in 1925. After the Dowager Empress's death in 1928, Olga and her husband purchased a dairy farm in Ballerup, near Copenhagen. She led a simple life: raising her two sons, working on the farm and painting. During her lifetime, she painted over 2,000 works of

art, which provided extra income for both her family and the charitable causes she supported.

In 1948, feeling threatened by Joseph Stalin's regime, Olga emigrated with her immediate family to a farm in Ontario, Canada. With advancing age, Olga and her husband moved to a bungalow near Cooksville, Ontario. Colonel Kulikovsky died there in 1958. Two years later, as her health deteriorated, Olga moved with devoted friends to a small apartment in East Toronto. She died aged 78, seven months after her older sister, Xenia. At the end of her life and afterwards, Olga was widely labeled the last Grand Duchess of Imperial Russia.

[edit] Early life

Olga was the youngest daughter of Tsar Alexander III and his consort, Marie Feodorovna, formerly Princess Dagmar of Denmark. She was born in the purple, i.e. during her father's reign, on 13 June 1882 in the Peterhof Palace, west of Saint Petersburg. Her birth was announced by a traditional 101-gun salute from the ramparts of the Peter and Paul Fortress, and similar salutes throughout the Russian Empire.[1] Her mother, advised by her sister, Alexandra, Princess of Wales, placed Olga in the care of an English nanny, Elizabeth Franklin.[1]

The Russian imperial family was a frequent target for assassins, so for safety reasons the Grand Duchess was raised at the country palace of Gatchina, about 50 miles (80 km) west of Saint Petersburg. Olga and her siblings, however, were not accustomed to a lavish early lifestyle. Conditions in the nursery were modest, even Spartan.[2] They slept on hard camp beds, rose at dawn, washed in cold water, and ate a simple porridge for breakfast.[2]

Olga left Gatchina for the first time in the early fall of 1888 when the imperial family visited the Caucasus. On 29 October, their return train approached the small town of Borki at speed. Olga's parents and their four older children were eating lunch in the dining-car when the train lurched violently and came off the rails. The carriage was torn open; the heavy iron roof caved in, and the wheels and floor of the car were sliced off. The Tsar crawled out from beneath the crushed roof, and held it up with "a Herculean effort" so that the others could escape.[3] There were 21 fatalities. Empress Marie helped tend the wounded, and made makeshift bandages from her own clothes.[4] An official investigation found that the crash was an accident,[5] but it was widely assumed that two bombs had been planted on the line.[4]

The Grand Duchess and her siblings were taught at home by private tutors. Subjects included history, geography, Russian, English and French, as well as drawing and dancing.[6] Physical activities such as equestrianism were taught at an early age, and they became expert riders.[7] The family was deeply religious. Although Christmas and Easter were times of celebration and extravagance, Lent was strictly observedâ ~meat, dairy products and any form of entertainment were avoided.[8] Family holidays were taken in the summer at Peterhof and with Olga's grandparents in Denmark.[9]

Empress Marie was reserved and formal with Olga as a child, and their relationship remained a difficult one.[10] However, Olga, her father, and the youngest of her brothers, Michael, had a close relationship. Together, the three frequently went on hikes within the Gatchina forests, where the Tsar taught Olga and Michael woodsmanship.[11] Olga said of her father:

My father was everything to me. Immersed in work as he was, he always spared that daily half-hour.â ~once my father showed me a very old album full of most exciting pen and ink sketches of an imaginary city called Mopsopolis, inhabited by Mopses [pug dogs]. He showed it to me in secret, and I was thrilled to have him share his own childhood secrets with me.[12]

During 1894 Olga's father became increasingly ill, and the annual trip to Denmark was cancelled.[13] On 13 November 1894, he died at the age of 49. The emotional impact on Olga, aged only 12, was traumatic,[14] and her eldest brother, the new Tsar Nicholas II, was propelled into a role for which in Olga's later opinion he was ill-prepared.[15]

[edit] Court life

Olga was due to enter society in the summer of 1899, but after the death of her brother George at the age of 27, her first official public appearance was delayed by a year until 1900.[16] She hated the experience, and later told her official biographer Ian Vorres, "I felt as though I were an animal in a cage~exhibited to the public for the first time." [17] From 1901, Olga was appointed honorary Commander-in-Chief of the 12th Akhtyrsky Hussar Regiment of the Imperial Russian Army. The Akhtyrsky Hussars were famous for their victory over Napoleon Bonaparte at the Battle of Kulm in 1813, and wore a distinctive brown dolman.[18]

By 1900 Olga, age 18, was being escorted to the theatre and opera by a distant cousin, Duke Peter Alexandrovich of Oldenburg, a member of the Russian branch of the House of Oldenburg.[19] He was 14 years her senior and known for his passion for literature and gambling.[20] Peter asked for Olga's hand in marriage the following year, a proposal that took the grand duchess completely by surprise: "I was so taken aback that all I could say was 'thank you'," she later explained. [21]

Their engagement, announced in May 1901, was unexpected by family and friends, as Peter had shown no prior interest in women,[17] and members of society assumed he was homosexual.[22] At the age of 19, on 9 August 1901, Olga married 33-year-old Peter. After the celebration the newlyweds left for the Oldenburg palace on the Field of Mars. Olga spent her wedding night alone in tears, while her husband left for a gambling club returning the next morning.[23] Their marriage remained unconsummated,[24] and Olga suspected that Peter was pushed into proposing by his ambitious mother.[25] Biographer Patricia Phenix thought Olga may have accepted his proposal to gain independence from her own mother, the Dowager Empress Marie, or avoid marriage into a foreign court.[26] The couple initially lived with her in laws Duke Alexander Petrovich of Oldenburg and Eug nie Maximilianovna of Leuchtenberg. It was not an harmonious arrangement as Peter's parents, both well known for their philanthropic work, berated their only son for his laziness.[23] Eug nie, a close friend of Empress Marie, showered her daughter-in-law with gifts including a ruby tiara that had been a present to Jos phine de Beauharnais from Napoleon, but Olga took a dislike towards her mother in law.[23] A few weeks after the wedding, Olga and her husband traveled to Biarritz, France, where they boarded a yacht loaned to them by King Edward VII of Great Britain and sailed to Sorrento, Italy.[27]

On their return to Russia, they settled into a 200-room palace (the former Baryatinsky mansion) at 46 Sergievskaya Street (today Tchaikovskogo Street), Saint Petersburg.[28] The palace, a gift from Tsar Nicholas II to his sister, now houses the Saint Petersburg Chamber of Commerce and Industry. The grand duchess had her own studio to draw, but in their large palace, Olga and Peter had separate bedrooms at opposite ends of the building.[29] Unhappy in her marriage, Olga fell into bouts of depression that caused her to lose her hair, forcing her to wear a wig. It took two years for her hair to regrow.[30]

Near the Oldenburg's estate, Ramon in Voronezh province, Olga had her own villa, called "Olgino" after the local town.[31] She subsidized the village school out of her own pocket, and established a hospital.[32] Her daughter-in-law later wrote, "She tried to help every needy person as far as her strengths and means would permit." [32] At the hospital, she learned basic medical treatment and proper care from the local doctor.[33] She exemplified her strong Orthodox faith by creating religious icons, which she distributed to the charitable endeavours she supported.[32] At Ramon Olga and Peter enjoyed walking through the nearby woods and hunted wolves together.[34] He was kind and considerate towards her, but she longed for love, a normal marriage and children.[35]

In April 1903, she was introduced to a Blue Cuirassier Guards officer Nikolai Kulikovsky by her brother Michael during a royal military review at Pavlovsk Palace.[36] Olga and Kulikovsky began to see each other, and exchanged letters regularly. The same year, at the age of 22, she confronted her husband and asked for a divorce, which he refused with the qualification that he might reconsider after seven years.[37] Nevertheless, Oldenburg appointed Kulikovsky

as an aide-de-camp, and allowed him to live in the same residence as Oldenburg and the Grand Duchess on Sergievskaya street.[38] The relationship between Kulikovskiy and the Grand Duchess was not public,[39] but gossip about their romance spread through society.[40]

From 1904 to 1906, Duke Peter was appointed to a military post in Tsarskoye Selo, a complex of palaces just south of Saint Petersburg. In Tsarskoye Selo, the Grand Duchess grew close to her brother Nicholas and his family, who lived at the Alexander Palace near her own residence.[41] Olga prized her connection to the Tsar's four daughters.[42] From 1906 to 1914, Olga took her nieces to parties and engagements in Saint Petersburg, without their parents, every weekend throughout the winter.[42] She especially took a liking to the youngest of Nicholas's daughters, her god-daughter Anastasia, whom she called Shvipsik ("little one").[43] Through her brother and sister-in-law, Olga met Rasputin, a self-styled holy man who purported to have healing powers. Although she made no public criticisms of Rasputin's association with the imperial family, she was unconvinced of his supposed powers and privately disliked him.[44] As Olga grew close to her brother's family, her relationship with her other surviving brother, Michael, deteriorated. To her and Nicholas's horror, Michael eloped with his mistress, a twice-divorced commoner, and communication between Michael and the rest of the family was essentially cut off.[45]

Public unrest over the Russo-Japanese War and demands for political reform increased in the early years of the twentieth century. At Epiphany 1905, a band of revolutionaries fired live rounds at the Winter Palace from the Peter and Paul Fortress. Olga and the Dowager Empress were showered with glass splinters from a smashed window, but were unharmed.[46] Three weeks later, on "Bloody Sunday", at least 92 people were killed by Cossack troops during a demonstration,[47] and a month later Olga's uncle, Grand Duke Sergei Alexandrovich of Russia, was assassinated.[48] Uprisings occurred throughout the country, and parts of the navy mutinied.[49] Olga supported the appointment of the liberal Pyotr Stolypin as prime minister, and he embarked on a programme of gradual reform, but in 1911 he was assassinated.[50] The public unrest, Michael's elopement, and Olga's sham marriage placed her under strain, and in 1912, while visiting England with her mother, she suffered a nervous breakdown.[51] Tsarina Alexandra was also unwell with fatigue, concerned by the poor health of her hemophiliac son, Alexei.[52] Olga stood in for the Tsarina at public events, and accompanied her brother on a tour of the interior, while the Tsarina remained at home.[53]

[edit] War and revolution

On 1 August 1914, just before the start of World War I, Olga's regiment, the Akhtyrsky Hussars, appeared at an Imperial Review before her and the Tsar at Krasnoe Selo.[54] Kulikovskiy volunteered for service with the Hussars, who were stationed on the frontlines in Southwestern Russia.[18] With the Grand Duchess's prior medical knowledge from the village of Olgino, she started work as a nurse at an under-staffed Red Cross hospital in Rovno, near to where her own regiment was stationed.[55] During the war, she came under heavy Austrian fire while attending the regiment at the front. Nurses rarely worked so close to the frontlines and consequently she was awarded the Order of St. George by General Mannerheim, who later became President of Finland.[18] As the Russians lost ground to the Central Powers, Olga's hospital was moved eastwards to Kiev,[56] and Michael returned to Russia from exile abroad.[57]

In 1916, Tsar Nicholas II officially annulled the marriage between Duke Peter Alexandrovich and the Grand Duchess, allowing her to marry Colonel Kulikovskiy.[58] The service was performed on 16 November 1916 in the Kievo-Vasilievskaya Church on Triokhsviatitelskaya (Three Saints Street) in Kiev. The only guests were the Dowager Empress Marie, Olga's brother-in-law Grand Duke Alexander, four officers of the Akhtyrsky Regiment, and two of Olga's fellow nurses from the hospital in Kiev.[59]

During the war, internal tensions and economic deprivation in Russia continued to mount and revolutionary sympathies grew. After Tsar Nicholas II abdicated in early 1917, many members of the Romanov dynasty, including Nicholas and his



"probably the only indisputable fact in the whole story".[71] Anderson claimed that with the help of a man named Tchaikovsky she had escaped from revolutionary Russia via Bucharest, where she had given birth to his child. Olga thought the story "palpably false",[72] since Anderson made no attempt to approach Queen Marie of Romania, during her entire alleged time in Bucharest. Olga said:

If Mrs. Anderson had indeed been Anastasia, Queen Marie would have recognized her on the spot.Â ... Marie would never have been shocked at anything, and a niece of mine would have known it.Â ... There is not one tittle of genuine evidence in the story. The woman keeps away from the one relative who would have been the first to recognize her, understand her desperate plight, and sympathize with her.[72]

Anderson stated she was in Berlin to inform Princess Irene of Prussia (sister of Tsarina Alexandra and cousin of Tsar Nicholas II) of her survival. Olga commented, "[Princess Irene] was one of the most straightlaced women in her generation. My niece would have known that her condition would have indeed have shocked [her]."[72]

Olga met Anderson, who was being treated for tuberculosis, at a nursing home. Of the visit Olga later said:

My beloved Anastasia was fifteen when I saw her for the last time in the summer of 1916. She would have been twenty-four in 1925. I thought Mrs. Anderson looked much older than that. Of course, one had to make allowances for a very long illnessÂ ... All the same, my niece's features could not possibly have altered out of all recognition. The nose, the mouth, the eyes were all different.[73]Â ... As soon as I sat down by that bed in the Mommsen Nursing Home, I knew I was looking at a stranger.Â â | I had left Denmark with something of a hope in my heart. I left Berlin with all hope extinguished.[74]

In addition, Olga said she was dismayed that Anderson spoke only German and showed no sign of knowing either English or Russian, while Anastasia spoke both those languages fluently and was ignorant of German.[75] Nevertheless, Olga remained sympathetic towards Anderson, perhaps because she thought that she was ill rather than deliberately deceitful.[76] Olga later explained:

...Â she did not strike me as an out-and-out impostor. Her brusqueness warred against it. A cunning impostor would have done all she could to ingratiate herselfÂ ... But Mrs. Anderson's manner would have put anyone off. My own conviction is that it all started with some unscrupulous people who hoped they might lay their hands on at least a share of the fabulous and utterly non-existent Romanov fortuneÂ ... I had a feeling she was 'briefed,' as it were, but far from perfectly. The mistakes she made could not all be attributed to lapses of memory. For instance, she had a scar on one of her fingers and she kept telling everybody that it had been crushed because of a footman shutting the door of a landau too quickly. And at once I remembered the real incident. It was Marie, her elder sister, who got her hand hurt rather badly, and it did not happen in a carriage but on board the imperial train. Obviously someone, having heard something of the incident, had passed a garbled version of it to Mrs. Anderson.[74]

Conceivably, Olga was initially either open to the possibility that Anderson was Anastasia or unable to make up her mind.[77] Anderson's biographer and supporter Peter Kurth claimed that Olga wrote to the Danish ambassador, Herluf Zahle, at the end of October 1925: "My feeling is that she is not the one she believesâ ~but one can't say she is not as a fact".[78] However, within a month she had made up her mind. She wrote to a friend, "There is no resemblance, and she is undoubtedly not A."[79][80] Olga sent Anderson a scarf and five letters, which were used by Anderson's supporters to claim that Olga recognized Anderson



as Anastasia.[81] Olga later said she sent the gift and letters "out of pity",[82] and called the claims "a complete fabrication".[82] When Olga refused to recognize Anderson as Anastasia publicly and published a statement denying any resemblance in a Danish newspaper,[83] Anderson's supporters, Harriet von Rathlef and Gleb Botkin, claimed that Olga was acting on instructions received from her sister Xenia by telegram, which Olga denied in private letters and sworn testimony.[84][85] She told her official biographer, "I never received any such telegram." [82] The supposed telegram was never produced by Anderson's supporters, and it has never been found among any of the papers relating to the case.[86] Xenia said,

[Anderson's supporters] told the most terrible lies about my sister and me. . . I was supposed to have sent Olga a telegram saying, 'On no account recognize Anastasia.' That was a fantasy. I never sent any telegrams, or gave my sister any advice about her visit to Berlin. We were all apprehensive about the wisdom of her going, but only because we feared it would be used for propaganda purposes by the claimant's supporters. . . My sister Olga felt sorry for that poor woman. She was kind to her, and because of her kindness of heart, her opinions and motives have been misrepresented.[87]

[edit] Danish residency and exodus

The Dowager Empress died on 13 October 1928 at Hvidovre. Her estate was sold and Olga purchased Knudsminde, a farm in Ballerup about 15 miles (24 km) from Copenhagen, with her portion of the proceeds.[88] They kept horses, in which Colonel Kulikovsky was especially interested, along with Jersey cows, pigs, chickens, geese, dogs and cats.[89] For transport they had a small car and a sledge.[89] Tikhon and Guri (age thirteen and eleven, respectively when they moved to Knudsminde) grew up on the farm. Olga ran the household with the help of her elderly, faithful lady's maid Emilia Tenso ("Mimka"), who had come along with her from Russia. The grand duchess lived with simplicity working in the fields, doing household chores and painting.&lt;refname=H58/&gt;

Her farm-estate became a center for the Russian monarchist community in Denmark and many Russian emigrants visited.[90] She maintained a high level of correspondence with the Russian émigré community and former members of the Russian imperial army.[67] In the 1930s, the family took annual holidays at Sofiero Castle, Sweden, with Crown Prince Gustaf of Sweden and his wife, Louise.[91] Olga began to sell her own paintings of Russian and Danish scenes, with exhibition auctions in Copenhagen, London, Paris, and Berlin. Some of the proceeds were donated to the charities she supported.[67]

Neutral Denmark was invaded by Nazi Germany on 9 April 1940, and was occupied for the remainder of World War II. Food shortages, communication restrictions, and transportation closures followed. As Olga's sons, Tikhon and Guri, served as officers in the Danish Army, they were interned as prisoners of war, but their imprisonment in a Copenhagen hotel lasted less than two months.[92] Tikhon was imprisoned for a further month in 1943 after being arrested on charges of espionage.[93] Other Russian émigrés, keen to fight against the Soviets, enlisted in the German forces. Despite her sons' internment and her mother's Danish origins, Olga was implicated in her compatriots' collusion with German forces, as she continued to meet and extend help to Russian émigrés fighting against communism.[94] On 4 May 1945, German forces in Denmark surrendered to the British. When economic and social conditions for Russian exiles failed to improve, General Pyotr Krasnov wrote to the Grand Duchess, detailing the wretched conditions affecting Russian immigrants in Denmark.[95] She in turn asked Prince Axel of Denmark to help them, but her request was refused.[96]

The Soviet Union wrote to the Danish government accusing Olga and a Danish Catholic bishop of conspiracy against the Soviet government.[97] With the end of World War II, Soviet troops came close to the Danish border, and the surviving Romanovs in Denmark grew fearful of an assassination or kidnapping attempt.[98] Olga decided to move her family across the Atlantic to the

relative safety of rural Canada.[99]

[edit] Emigration to Canada

In May 1948, the Kulikovskys traveled to London by Danish troopship. They were housed in a grace and favour apartment at Hampton Court Palace while arrangements were made for their journey to Canada as agricultural immigrants.[100] On 2 June 1948, Olga, Kulikovsky, Tikhon and his Danish-born wife Agnete, Guli and his Danish-born wife Ruth, Guli and Ruth's two children, Xenia and Leonid, and Olga's devoted companion and former maid Emilia Tenso ("Mimka") departed Liverpool on board the Empress of Canada.[101] After a rough crossing, the ship docked at Halifax, Nova Scotia.[102] The family proceeded to Toronto, where they lived until they purchased a 200-acre (0.81Â km2) farm in Halton County, Ontario, near Campbellville.[103]

By 1952, the farm had become a burden to Olga and her husband. They were both elderly; their sons had moved away; labor was hard to come by; the Colonel suffered increasing ill-health, and some of Olga's remaining jewelry was stolen.[104] The farm was sold, and Olga, her husband and her former maid, Mimka, moved to a smaller 5-room house at 2130 Camilla Road, Cooksville, Ontario, a suburb of Toronto now amalgamated into the city of Mississauga.[105] Mimka suffered a stroke that left her an invalid, and Olga nursed her until Mimka's death on 24 January 1954.[106]

Neighbors and visitors to the region, including foreign and royal dignitaries, took interest in Olga, and visited her small home, which was also a magnet for Romanov impostors whom Olga and her family considered a menace.[107] Welcome visitors included Princess Marina, Duchess of Kent, in 1954,[108] and Louis Mountbatten and his wife Edwina, in August 1959.[109] In June 1959, Queen Elizabeth II and Prince Philip visited Toronto and invited the Grand Duchess for lunch on board the Royal Yacht, Britannia.[110]

By 1958, Olga's husband was virtually paralyzed, and Olga sold some of her remaining jewelry in an attempt to raise funds.[111] Following her husband's death in 1958, she became increasingly infirm until hospitalized in April 1960 at Toronto General Hospital.[112] She was not informed[113] or was not aware[114] that her elder sister, Xenia, died in London that month. Unable to care for herself, Olga went to stay with Russian Ã©migrÃ© friends, Konstantin and Sinaida Martemianoff, in an apartment above a beauty salon in Gerrard Street East, Toronto.[115] On 21 November 1960, she slipped into a coma, and she died on 24 November, at the age of 78.[116]

She was interred next to her husband in York Cemetery, Toronto, on 30 November 1960, after a funeral service at Christ the Saviour Cathedral, Toronto. Officers of the Akhtyrsky Hussars and the Blue Cuirassiers stood guard in the small Russian church, which overflowed with mourners.[117] Although she lived simply, bought cheap clothes, and did her own shopping and gardening, her estate was valued at more than 200,000 Canadian dollars (about 1.5 million Canadian dollars as of 2010[118]) and was mostly held as stock and bonds.[119] Her material possessions were appraised at 350 Canadian dollars in total, which biographer Patricia Phenix considered an underestimate.[120]

[edit] Legacy

Olga began drawing and painting at a young age. She told her official biographer Ian Vorres:

Even during my geography and arithmetic lessons, I was allowed to sit with a pencil in my hand. I could listen much better when I was drawing corn or wild flowers.[121]

She painted throughout her life, on paper, canvas and ceramic, and her output is estimated at over 2,000 pieces.[122] Her usual medium was scenery and landscape, but she also painted portraits and still lifes. Vorres wrote,

Her paintings, vivid and sensitive, are immersed in the subdued light of her beloved Russia. Besides her numerous landscapes and flower pictures that reveal her inherent love for nature, she often also dwells on scenes from simple daily

lifeÂ ... executed with a sensitive eye for composition, expression and detail. Her work exudes peace, serenity and a spirit of love that mirror her own character, in total contrast to the suffering she experienced through most of her life.[122]

Her daughter-in-law wrote,

Being a deeply religious person, the Grand Duchess perceived the beauty of nature as being divinely inspired creation. Prayer and attending church provided her with the strength not only to overcome the new difficulties befallen her, but also to continue with her drawing. These feelings of gratefulness to God pervaded not only the icons created by the Grand Duchess, but also her portraits and still life paintings.[95]

Her paintings were a profitable source of income.[123] According to her daughter-in-law, Olga preferred to exhibit in Denmark to avoid the commercialism of the North American market.[124] The Russian Relief Programme, which was founded by Tikhon and his third wife Olga in honour of the Grand Duchess,[125] exhibited a selection of her work at the residence of the Russian ambassador in Washington in 2001, in Moscow in 2002, in Ekaterinburg in 2004, in Saint Petersburg and Moscow in 2005, in Tyumen and Surgut in 2006, at the Tretyakov Gallery in Moscow and Saint Michael's Castle in Saint Petersburg in 2007,[126] and at Vladimir Arsenyev Museum in Vladivostok in 2013.[127] Pieces by Olga are included in the collections of Queen Elizabeth II, Prince Philip, Duke of Edinburgh, King Harald of Norway, and private collections in North America and Europe.[122]Ballerup Museum in Pederstrup, Denmark, has around 100 of her works.[128]

<http://trud-ost.ru/?p=173196>

[edit] Ancestry

[edit] Notes and sources

- ^ a b Vorres, p. 3
- ^ a b Phenix, pp. 8â ^10; Vorres, p. 4
- ^ Vorres, p. 11
- ^ a b Vorres, p. 12
- ^ Phenix, p. 20
- ^ Vorres, pp. 18â ^20
- ^ Phenix, pp. 12â ^13; Vorres, pp. 26â ^27
- ^ Vorres, p. 30
- ^ Phenix, pp. 11, 24; Vorres, pp. 33â ^41
- ^ Phenix, p. 8; Vorres, p. 25
- ^ Vorres, p. 24
- ^ Vorres, pp. 9â ^11
- ^ Vorres, pp. 48â ^52
- ^ Phenix, pp. 30â ^31; Vorres, pp. 54, 57
- ^ Vorres, p. 55
- ^ Phenix, p. 45; Vorres, pp. 72â ^74
- ^ a b Vorres, p. 74
- ^ a b c d Kulikovsky-Romanoff, p. 4
- ^ Belyakova, p. 86
- ^ Belyakova, p. 84
- ^ Vorres, p. 75
- ^ Phenix, p. 52
- ^ a b c Belyakova, p. 88
- ^ Olga said: "I shared his roof for nearly fifteen years, and never once we were husband and wife" (Vorres, p. 76); see also Massie, p. 171
- ^ Vorres, pp. 75, 78
- ^ Phenix, p. 46
- ^ Belyakova, p. 89
- ^ Vorres, p. 81

^ Belyakova, p. 89  
 ^ Belyakova, p. 88  
 ^ Vorres, pp. 78â ^79  
 ^ a b c Kulikovsky-Romanoff, p. 3  
 ^ Vorres, p. 79  
 ^ Belyakova, p. 91  
 ^ Belyakova, p. 89  
 ^ Crawford and Crawford, p. 51; Phenix, p. 62; Vorres, pp. 94â ^95  
 ^ Phenix, p. 63; Vorres, p. 95  
 ^ Crawford and Crawford, p. 52; Phenix, p. 73; Vorres, pp. 94â ^95  
 ^ Vorres, pp. 95â ^96  
 ^ A Cuirassier's Memoirs by Vladimir Trubetskoy, quoted in Phenix, p. 73  
 ^ Vorres, pp. 97â ^99, 101  
 ^ a b Massie, p. 171; Vorres, pp. 102â ^103  
 ^ Phenix, p. 144; Vorres, pp. 98â ^99  
 ^ Phenix, pp. 73â ^83; Vorres, pp. 127â ^139  
 ^ Phenix, pp. 85â ^88; Vorres, pp. 108â ^109  
 ^ Phenix, p. 68; Vorres, p. 111  
 ^ Phenix, p. 69; Vorres, p. 111  
 ^ Phenix, p. 69; Vorres, p. 112  
 ^ Vorres, p. 113  
 ^ Vorres, pp. 117â ^119  
 ^ Phenix, p. 89; Vorres, pp. 121â ^122  
 ^ Vorres, p. 122  
 ^ Vorres, p. 123  
 ^ Vorres, p. 125  
 ^ Phenix, pp. 91â ^92; Vorres, p. 141  
 ^ Phenix, p. 93; Vorres, p. 143  
 ^ Phenix, p. 101  
 ^ Phenix, p. 103  
 ^ Grand Duke Alexander's Memoirs, Once A Grand Duke, p. 273, quoted in Phenix, p. 104  
 ^ Phenix, pp. 115â ^117; Vorres, pp. 149â ^150  
 ^ Phenix, p. 118  
 ^ Phenix, pp. 122â ^123; Vorres, pp. 155â ^156  
 ^ Phenix, pp. 123â ^125; Vorres, pp. 156â ^157  
 ^ e.g. Letter from King George V to Victoria, Marchioness of Milford Haven, 2 September 1918, quoted in Hough, p. 326  
 ^ Phenix, p. 128; Vorres, p. 159  
 ^ Phenix, p. 129  
 ^ a b c d Kulikovsky-Romanoff, p. 5  
 ^ Phenix, p. 132  
 ^ Vorres, pp. 167â ^171  
 ^ a b BeÃche, p. 116  
 ^ Olga quoted in Vorres, p. 173  
 ^ a b c Olga quoted in Vorres, p. 175  
 ^ Olga quoted in Massie, p. 174 and Vorres, p. 174  
 ^ a b Olga quoted in Vorres, p. 176  
 ^ "My nieces knew no German at all. Mrs. Anderson did not seem to understand a word of Russian or English, the two languages all the four sisters had spoken since babyhood.": Olga quoted in Vorres, p. 174  
 ^ Klier and Mingay, p. 156; Vorres, p. 176  
 ^ Klier and Mingay, p. 102; Massie, p. 174; Phenix, p. 155  
 ^ Letter from Olga to Herluf Zahle, 31 October 1925, quoted in Kurth, p. 119, but with a proviso that the original letter has never been seen  
 ^ Letter from Olga to Colonel Anatoly Mordvinov, 4 December 1925, Oberlandesgericht Archive, Hamburg, quoted in Kurth, p. 120  
 ^ Olga wrote in a letter to Tatiana Melnik, 30 October 1926, Botkin Archive, quoted in Kurth, p. 144; and a letter dated 13 September 1926 quoted in von Nidda, pp. 197â ^198: "However hard we tried to recognize this patient as my

niece Tatiana or Anastasia, we all came away quite convinced of the reverse." In a letter from Olga to Princess Irene, 22 December 1926, quoted in von Nidda, p. 168, she wrote, "I had to go to Berlin last autumn to see the poor girl said to be our dear little niece. Well, there is no resemblance at all, and it is obviously not AnastasiaÂ ... It was pitiful to watch this poor creature trying to prove she was Anastasia. She showed her feet, a finger with a scar and other marks which she said were bound to be recognized at once. But it was Maria who had a crushed finger, and someone must have told her this. For four years this poor creature's head was stuffed with all these storiesÂ ... It has been claimed, however, that we all recognized her and were then given instructions by Mama to deny that she was Anastasia. That is a complete lie. I believe this whole story is an attempt at blackmail."

^ Klier and Mingay, p. 102; Vorres, p. 177

^ a b c Olga quoted in Vorres, p. 177

^ National Tidende, 16 January 1926, quoted in Klier and Mingay, p. 102 and Phenix, p. 155

^ "I can swear to God that I did not receive before or during my visit to Berlin, either a telegram or a letter from my sister Xenia advising that I should not acknowledge the stranger.": Sworn testimony of Grand Duchess Olga, Staatsarchiv Hamburg, File 1991 74 0 297/57 Volume 7, pp. 1297â ^1315, quoted in Phenix, p. 238

^ "They state that we all recognized her and that we then received an order from Mama to say that she is not Anastasia. This is a great lie!": Letter from Olga to Princess Irene, quoted in Klier and Mingay, p. 149

^ Phenix, p. 238

^ Xenia to Michael Thornton, quoted in a letter from Thornton to Patricia Phenix, January 10, 1998, quoted in Phenix, pp. 237â ^238

^ Phenix, p. 168; Vorres, p. 185

^ a b Hall, p. 58

^ Phenix, p. 170

^ Vorres, p. 186

^ Phenix, p. 174

^ Phenix, p. 176

^ Phenix, p. 176; Vorres, p. 187

^ a b Kulikovsky-Romanoff, p. 6

^ Phenix, p. 178

^ Phenix, p. 179

^ Phenix, pp. 179â ^180; Vorres, pp. 187â ^188

^ Mr. J. S. P. Armstrong, Agent General for Ontario, quoted in Vorres, p. 191

^ Vorres, pp. 188, 190

^ Vorres, p. 193

^ Vorres, p. 196

^ Vorres, pp. 196â ^198

^ Vorres, pp. 207â ^208

^ Phenix, pp. 205â ^206; Vorres, p. 209

^ Phenix, p. 207; Vorres, p. 210

^ Vorres, pp. 200â ^205

^ Phenix, p. 214; Vorres, p. 211

^ Vorres, p. 221

^ Phenix, pp. 238â ^239; Vorres, p. 207

^ Vorres, p. 219

^ Phenix, pp. 240â ^242; Vorres, p. 224

^ Vorres, p. 225

^ Phenix, p. 242

^ Phenix, p. 243; Vorres, p. 226

^ Vorres, p. 227

^ Phenix, pp. 246â ^247; Vorres, pp. 228â ^230

^ CPI inflation calculator, Bank of Canada, retrieved 2 November 2010

^ Phenix, p. 249

^ Phenix, p. 250

- ^ Vorres, p. 26
- ^ a b c Vorres, Ian (2000) "After the Splendor... The Art of the Last Romanov Grand Duchess of Russia", Smithsonian Institution, retrieved 9 March 2010
- ^ Grand Duchess Olga, quoted in Kulikovsky-Romanoff, p. 7
- ^ Kulikovsky-Romanoff, p. 8
- ^ Phenix, p. 1
- ^ "Majestic Artist: 125th birth anniversary of Grand Duchess Olga Alexandrovna", Russian State Museum, retrieved 9 March 2010
- ^ Official website of the Primorye State United Museum named after Vladimir Arsenyev (in Russian)
- ^ Ballerup Museum, retrieved 9 March 2010

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[edit] External links

- 1st generation
- 2nd generation
- 3rd generation
- 4th generation
- Grand Duchess Anna Petrovna
- 5th generation
- 6th generation
- 7th generation
- 8th generation
- 9th generation
- 10th generation
- \* title granted by Grand Duke Cyril Vladimirovich
- \*\* title granted by Grand Duke Vladimir Cyrillovich

House with Chimaeras or Gorodetsky House (Ukrainian: Д`Н Д`Д,Д`Д`Д° Д· Н Д,Д`ДµН Д°Д`Д,, Будынок з кхимерами; Russian: Д`Д`Д` Н Н Д,Д`ДµН Д°Д`Д,, Dom s khimerami) is an Art Nouveau building located in the historic Lypky neighborhood of Kiev, the capital of Ukraine. Situated across the street from the President of Ukraine's

office at No. 10, Bankova Street, the building has been used as a presidential residence for official and diplomatic ceremonies since 2005.[1][2] The street in front of the building is closed off to all automobile traffic, and is now a patrolled pedestrian zone due to its near proximity to the Presidential Administration building.

Architect Vladislav Gorodetsky originally constructed the House with Chimaeras for use as his own upmarket apartment building during the period of 1901â ^1902. However, as the years went by, Gorodetsky eventually had to sell the building due to financial troubles, after which it changed ownership numerous times before finally being occupied by an official Communist Party polyclinic until the early 2000s.[3] When the building was vacated, its interior and exterior decor were fully reconstructed and restored according to Gorodetsky's original plans.[4]

The building derives its popular name from the ornate decorations depicting exotic animals and hunting scenes, which were sculpted by Italian architect Emilio Sala since Gorodetsky was an avid hunter.[5] The name does not refer to the chimaera of mythology, but to an architectural style known as chimaera decoration in which animal figures are applied as decorative elements to a building. Gorodetsky's unique architectural style earned him praise as the Antoni GaudÃ- of Kiev.[4][6]

[edit] History

[edit] Construction and early history

The House with Chimaeras was designed by the architect Vladislav Gorodetsky in 1901â ^1902.[4] Gorodetsky was born in 1863 into a prosperous Polish szlachta family in the Podillia region.[5] After finishing the Imperial Academy of Arts in Saint Petersburg in 1890, he moved to Kiev, where he lived for almost 30 years.[5] At the time of the building's construction, Gorodetsky had already established himself as a prominent Kiev architect, having designed and constructed together with his close friend and partner engineer Anton Strauss many city buildings, from the St. Nicholas Roman Catholic Cathedral to the Karaim Kenesa and what today is the National Art Museum of Ukraine. Besides architecture, Gorodetsky was also interested in big-game hunting,[5] which explains why his building features many animals.

Gorodetsky financed the house's construction with borrowed money,[4][7] with the intent for it to be an apartment building.[8][9] Each floor formed a single apartment, connected by an elevator and stairs.[nb 1] Gorodetsky himself occupied the fourth floor of the building, measuring at about 380Â m2 (4,100Â sqÂ ft).[8][nb 2]

Gorodetsky bought the first lot of land on February 1, 1901, with construction work commencing on March 18 of that year. Construction of the exterior walls was finished by August 21, and the roof installed and all masonry work was completed on September 13.[8][9] Due to the economic hardships within the Russian Empire, the completion of the building was delayed. In May 1903, only one apartment on the lowest level and Gorodetsky's own apartment were occupied.[8] The total cost of the land and construction amounted to 133,000 rubles.[nb 3] In total, 1,550Â m2 (16,700Â sqÂ ft) of land were used for construction of the building and cost a total of 15,640 rubles.[7] The projected annual profit from the rentals was 7,200 rubles. A cowshed was located on the premises due to Gorodetsky's insistence on fresh in-house milk,[4][9] though it was specifically placed in a way that the smell of the cows would not disturb the tenants. On a lot adjacent to the building, a miniature alpine garden (approx. 320Â m2/3,400Â sqÂ ft) and a fountain were built.

Due to financial mismanagement which included his Safari hunting hobby,[4] in July 1912, Gorodetsky pledged the building as a collateral against a loan taken from Kiev Mutual Credit Association.[3] When Gorodetsky defaulted on the loan, the building was auctioned off in 1913,[3] and became the property of the engineer Daniel Balakhovsky,[4] the son of a Kiev trader,[7] who was also the Chairman of the Board of Directors of Blahodatinskoe sugar factory,[7] and a French Ñ onsular agent in Kiev.[10] In 1916, the house belonged to the Blahodatinskoe sugar factory.[3] In 1918, the building's ownership changed

again, to Samuel Nemets.[3] In 1921, after the Bolsheviks gained control of Kiev, several of the departments of the Kiev Military District took offices in the House with Chimaeras.

[edit] Ownership 1921â ~2002

After the period of unrest following the Russian Revolution of 1917, the building was nationalized and later converted for communal living.[11] Each apartment was occupied by about nine to ten families.[8] During the Second World War (1941â ~1943), the building was abandoned. Due to exposure to the harsh elements during the war, the building suffered significant damage to its structure.[8] After the war, the building was briefly used as a residence for evacuated actors from the Ivan Franko Theater;[7] however, the Central Committee of the Communist Party of the Ukrainian Soviet Socialist Republic took ownership of the building and later transformed it into the Polyclinic (clinic) No. 1 for their elite.[8] The polyclinic used the building up until the end of the 20th century. During that time, the building almost split in half. One part sagged 22Â cm (9Â in), and a major vertical crack formed, having a width of about 40Â cm (16Â in).[8] Some of the building's architectural details had either been chipped away, or had cracked.

The building's restoration work was scheduled for 2002, however the operators of the polyclinic were reluctant to leave, having occupied the building for over 40 years. In order to force the occupants out of the building, the workers boarded up all of the windows and threatened to do the same to the doors if the polyclinic did not vacate the premises. Only the president's involvement in the matter forced the polyclinic to move out completely.[4]

[edit] Reconstruction and official use

During the time of the restoration, conducted by UkrNIIProektRestavratsiya and headed by Natalia Kosenko,[12] the workers unearthed the whole lower floor, which had been filled in during Soviet times to strengthen the building's foundation.[4] Restoration of the elaborate decor of the interior had to be fully redone. In the courtyard, the restorers placed an artificial lake, fountains, and a miniature gardenâ ~all of which had been in Gorodetsky's original plans.[4]

The building was opened as a filial "Masterpieces of Ukrainian Art" of the National Museum of Arts in November 2004.[13] It was expected that the building would serve a dual purpose as a museum and as the presidential meeting place for state visitors. In April 2005, the Kiev City Council submitted a bill[14] for 104 million hryvnias (approx. US \$20 million) to the Ukrainian Government for reconstruction and restoration of the House with Chimaeras.[15] The Council also allowed the Ukrainian government to construct a new square (closing off all automobile traffic) in front of the building for use in official ceremonies.[15]

Since May 2005, the building has been an official presidential residence, used for official and diplomatic ceremonies.[1][2] The House with Chimaeras was used as a meeting place between Ukrainian President Viktor Yushchenko and Russian President Vladimir Putin, when the latter visited Kiev on December 22, 2006.[16] Included in the building are rooms for negotiations, tÃte-ÃtÃte talks, the signing of official documents, as well as a special room for the press.[11]

[edit] Architecture

Volodymyr Yasiievych[17]

The House of Vladislav Gorodetsky can only be compared with the works of Antoni GaudÃ-, especially the famous Casa MilÃ in Barcelona, Spain, despite being constructed a couple of years later (1905â ~1910).

The building was designed in the Art Nouveau style, which was at that time a relatively new style and featured flowing, curvilinear designs often incorporating floral and other plant-inspired motifs. Gorodetsky featured such motifs in the building's exterior decor in the forms of mythical creatures and big-game animals. His work on the House with Chimaeras has earned him the nickname of the GaudÃ- of Kiev.[4][6]

Due to the steep slope on which the building is situated, it had to be



specially designed out of concrete to fit into its foundations correctly. From the front, the building appears to have only three floors. However, from the rear, all of its six floors can be seen.[18] One part of the building's foundation was made of concrete piles, and the other as a continuous foundation. Usually, these two approaches do not mix well but Gorodetsky somehow succeeded in overcoming this technical problem.

The Italian sculptor Emilio Sala was responsible for both the internal and external sculptural decorations, such as mermaids, dolphins, and frogs on the roof of the building, sinking ships and hunting trophies on the exterior walls, and exuberant interior decorations, such as grand stairways and chandeliers depicting huge catfish strangled in the stems of lotus flowers. The exterior sculptures created by Sala were made out of cement. Production of the cement was by the «For» company of which Gorodetsky was the co-director.[19] Cement was used exclusively as the primary building material by the request of the company's head director, Richter.[20] At the time of the building's construction, cement was not popular as a building material, so its use was employed as publicity for both the house and the building material.[19]

Elaborate cement decorations, featuring deer and rhinoceroses. It features interesting carvings, like this elephant-head gargoyle. One of the many figurines seen around the building.

[edit] Floor plan

The House with Chimaeras was designed in such a way that the tenants would occupy the whole floor, each floor had all the necessary household rooms ranging from private kitchens to small powder rooms. The open floor plan and extra rooms featured throughout the building are characteristic of the houses of the wealthy of the early 20th century.[18] In total, the building has an area of 3,309.5 m<sup>2</sup> (35,623.16 sq ft).[12]

On the lowest level of the building, which is located deep in the hill, were two stables, two rooms for coachmen, a shared laundry, and two separate apartments. Each of the two apartments consisted of a foyer, a kitchen, one bathroom, and a storage room. The first of these apartments had two residential rooms, and the second three rooms.[nb 4] Each floor above the lowest level was designed to house a single apartment only.

The apartment on the second floor consisted of six residential rooms in addition to a foyer, kitchen, buffet, three servant's rooms, a bathroom, two toilets, and two storage rooms. There were also four wine cellars on the same level.[nb 5] The cellars belonged to the apartments on the upper levels. On the third floor, the apartment consisted of eight residential rooms, a foyer, a kitchen, dish washing room, two rooms for servants, a bathroom, and two toilets.[nb 6] This apartment was placed slightly lower than the level of Bankova Street, from the front entrance.

The grandest apartment, which belonged to Gorodetsky, consisted of a study, a great room and a living room, a dining room, a boudoir, a bedroom, a children's room, a room for a governess, a guest room, three rooms for servants, a kitchen, dishwashing room, bathroom, two toilets, and two storage rooms.[8] On the floor above was an apartment similar in size and design to Gorodetsky's apartment.[nb 7] The apartment on the top floor had one less room; to make up for this, there was a connecting terrace which provided a panoramic view of the city.[8][nb 8]

[edit] Legends

Throughout the years, the unusual nature of the House with Chimaeras has given rise to a number of stories occasionally repeated in guide-books or newspapers, which are however either untrue or lacking any verifiable source.[21]

According to the first legend, Vladislav Gorodetsky's daughter had committed suicide jumping into Dnieper River either because of some unfortunate love affair or because of a family feud.[nb 9] As a result, Gorodetsky went slightly mad and built this gloomy house in his daughter's memory.[22]

A second legend has it that Gorodetsky made a bet with some other architects,

including the architect Alexander Skobelev, who had tried to prove that was impossible to build a house on such terrain, because the site (near the Ivan Franko Theater) overhangs a swamp (Kozâ ye boloto). The Construction Committee of Kiev had prohibited construction of any structures on this particular lot, but eventually the construction of the building allowed Gorodetsky to win the bet.[22]

According to the third legend, Gorodetsky had cursed the house when forced to leave it in 1913 (due to his inability to repay his creditors); all of the house's tenants would be either unhappy or would meet some sort of financial misfortune. There is a story that all the businesses who rented a portion of the building either went bankrupt, had their funds stolen or were disbanded.[4]

[edit] In media

Russian science fiction writer Vladimir Vasilyev featured the House with Chimaeras in his 2003 novel, *Black Palmira's Face*, where the building served as the headquarters for the fictional Day Watch organization in the city of Kiev.[23]

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Notes

- ^ The only exception to this was that the lowest floor of the building contained two separate apartments.
- ^ His apartment is apt. No. 3, the main floor, if looking from the level of the Bankova Street.
- ^ This price is as of 1903. Government Archive of the City of Kiev - Fond No. 143, Series 2, File No. 520, Item No. 9. In the late 19th and early 20th century, one thousand Russian rubles were worth about 24.89 gold troy ounces, or roughly one million Russian rubles as of 2011 (Malakov 1999).
- ^ The annual rental in 1903 was 540 and 420 rubles, accordingly (Malakov 1999).
- ^ The price for this apartment was 1,200 rubles in 1903 (Malakov 1999).
- ^ The initial annual rent for the apartment was 2,000 rubles (Malakov 1999).
- ^ Both of these apartments were rented out for 3,500 rubles annually in 1903 (Malakov 1999).
- ^ The rental cost for this dwelling was 2,750 rubles annually. For comparison, an average salary for a librarian was about 50 rubles per year (Ivanenko 2004).
- ^ It was actually previous owners' (Professor Mering) daughter who drowned (Ivanenko 2004).

Footnotes

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[edit] External links

Augustine of Canterbury (circa first third of the 6th centuryÂ â ^ probably 26 May 604) was a Benedictine monk who became the first Archbishop of Canterbury in the year 597. He is considered the "Apostle to the English" and a founder of the English Church.[3]

Augustine was the prior of a monastery in Rome when Pope Gregory the Great chose him in 595 to lead a mission, usually known as the Gregorian mission, to Britain to Christianize King Æ thelberht and his Kingdom of Kent from their native Anglo-Saxon paganism. Kent was probably chosen because Æ thelberht had married a Christian princess, Bertha, daughter of Charibert I the King of Paris, who was expected to exert some influence over her husband. Before reaching Kent the missionaries had considered turning back but Gregory urged them on, and in 597 Augustine landed on the Isle of Thanet and proceeded to Æ thelberht's main town of Canterbury.

King Æ thelberht converted to Christianity and allowed the missionaries to

preach freely, giving them land to found a monastery outside the city walls. Augustine was consecrated as a bishop and converted many of the king's subjects, including thousands during a mass baptism on Christmas Day in 597. Pope Gregory sent more missionaries in 601, along with encouraging letters and gifts for the churches, although attempts to persuade the native Celtic bishops to submit to Augustine's authority failed. Roman bishops were established at London and Rochester in 604, and a school was founded to train Anglo-Saxon priests and missionaries. Augustine also arranged the consecration of his successor, Laurence of Canterbury. The archbishop probably died in 604 and was soon revered as a saint.

[edit] Background to the mission

After the withdrawal of the Roman legions from the province of Britannia in 410, the people of the province were left to defend themselves against the attacks of the Saxons. Before the withdrawal Britannia converted to Christianity and produced the ascetic Pelagius.[4][5] Britain sent three bishops to the Council of Arles in 314, and a Gaulish bishop went to the island in 396 to help settle disciplinary matters.[6] Material remains testify to a growing presence of Christians, at least until around 360.[7] After the legions left, pagan tribes settled the southern parts of the island while western Britain, beyond the Anglo-Saxon kingdoms, remained Christian. This native British Church developed in isolation from Rome under the influence of missionaries from Ireland[4][5] and was centred on monasteries instead of bishoprics. Other distinguishing characteristics were its calculation of the date of Easter and the style of the tonsure haircut that clerics wore.[5][8] Evidence for the survival of Christianity in the eastern part of Britain during this time includes the survival of the cult of Saint Alban and the occurrence in place names of *eccles*, derived from the Latin *ecclesia*, meaning "church".[9] There is no evidence that these native Christians tried to convert the Anglo-Saxons.[10][11] The invasions destroyed most remnants of Roman civilization in the areas held by the Saxons and related tribes, including the economic and religious structures.[12]

It was against this background that Pope Gregory I decided to send a mission, often called the Gregorian mission, to convert the Anglo-Saxons to Christianity in 595.[13][14] The Kingdom of Kent was ruled by Æthelberht, who married a Christian princess named Bertha before 588,[15] and perhaps earlier than 560.[16] Bertha was the daughter of Charibert I, one of the Merovingian kings of the Franks. As one of the conditions of her marriage she brought a bishop named Liudhard with her to Kent.[17] Together in Canterbury, they restored a church that dated to Roman times[18]—possibly the current St Martin's Church, Canterbury. Æthelberht was a pagan at this point but allowed his wife freedom of worship. One biographer of Bertha states that under his wife's influence, Æthelberht asked Pope Gregory to send missionaries.[17] The historian Ian Wood feels that the initiative came from the Kentish court as well as the queen.[19] Other historians, however, believe that Gregory initiated the mission, although the exact reasons remain unclear. Bede, an 8th-century monk who wrote a history of the English church, recorded a famous story in which Gregory saw fair-haired Saxon slaves from Britain in the Roman slave market and was inspired to try to convert their people.[b][21] More practical matters, such as the acquisition of new provinces acknowledging the primacy of the papacy, and a desire to influence the emerging power of the Kentish kingdom under Æthelberht, were probably involved.[18] The mission may have been an outgrowth of the missionary efforts against the Lombards.[22]

Aside from Æthelberht's granting of freedom of worship to his wife, the choice of Kent was probably dictated by a number of other factors. Kent was the dominant power in south-eastern Britain. Since the eclipse of King Ceawlin of Wessex in 592, Æthelberht was the leading Anglo-Saxon ruler; Bede refers to Æthelberht as having *imperium* (overlordship) south of the River Humber. Trade between the Franks and Æthelberht's kingdom was well established, and the language barrier between the two regions was apparently only a minor obstacle, as the interpreters for the mission came from the Franks. Lastly, Kent's

proximity to the Franks allowed support from a Christian area.[23] There is some evidence, including Gregory's letters to Frankish kings in support of the mission, that some of the Franks felt that they had a claim to overlordship over some of the southern British kingdoms at this time. The presence of a Frankish bishop could also have lent credence to claims of overlordship, if Liudhard was felt to be acting as a representative of the Frankish church and not merely as a spiritual advisor to the queen. Frankish influence was not merely political; archaeological remains attest to a cultural influence as well.[24]

In 595, Gregory chose Augustine, who was the prior of the Abbey of St Andrew's in Rome, to head the mission to Kent.[13] The pope selected monks to accompany Augustine and sought support from the Frankish royalty and clergy in a series of letters, of which some copies survive in Rome. He wrote to King Theuderic II of Burgundy and to King Theudebert II of Austrasia, as well as their grandmother Brunhild, seeking aid for the mission. Gregory thanked King Chlothar II of Neustria for aiding Augustine. Besides hospitality, the Frankish bishops and kings provided interpreters and Frankish priests to accompany the mission.[25] By soliciting help from the Frankish kings and bishops, Gregory helped to assure a friendly reception for Augustine in Kent, as Aethelbert was unlikely to mistreat a mission which visibly had the support of his wife's relatives and people.[26] Moreover, the Franks appreciated the chance to participate in mission that would extend their influence in Kent. Chlothar, in particular, needed a friendly realm across the Channel to help guard his kingdom's flanks against his fellow Frankish kings.[27]

Sources make no mention of why Pope Gregory chose a monk to head the mission. Pope Gregory once wrote to Aethelberht complimenting Augustine's knowledge of the Bible, so Augustine was evidently well educated. Other qualifications included administrative ability, for Gregory was the abbot of St Andrews as well as being pope, which left the day-to-day running of the abbey to Augustine, the prior.[28]

[edit] Arrival and first efforts

Augustine was accompanied by Laurence of Canterbury, his eventual successor to the archbishopric, and a group of about 40 companions, some of whom were monks.[15] Soon after leaving Rome, the missionaries halted, daunted by the nature of the task before them. They sent Augustine back to Rome to request papal permission to return. Gregory refused and sent Augustine back with letters encouraging the missionaries to persevere.[29] In 597, Augustine and his companions landed in Kent.[15] They achieved some initial success soon after their arrival:[22][28] Aethelberht permitted the missionaries to settle and preach in his capital of Canterbury where they used the church of St Martin's for services.[30] Neither Bede nor Gregory mentions the date of Aethelberht's conversion,[31] but it probably took place in 597.[30][c] In the early medieval period, large scale conversions required the ruler's conversion first, and Augustine is recorded as making large numbers of converts within a year of his arrival in Kent.[30] Also, by 601, Gregory was writing to both Aethelberht and Bertha, calling the king his son and referring to his baptism.[d] A late medieval tradition, recorded by the 15th-century chronicler Thomas Elmham, gives the date of the king's conversion as Whit Sunday, or 2 June 597; there is no reason to doubt this date, although there is no other evidence for it.[30] Against a date in 597 is a letter of Gregory's to Patriarch Eulogius of Alexandria in June 598, which mentions the number of converts made by Augustine, but does not mention any baptism of the king. However, it is clear that by 601 the king had been converted.[32] His baptism likely took place at Canterbury.[33]

Augustine established his episcopal see at Canterbury.[22] It is not clear when and where Augustine was consecrated as a bishop. Bede, writing about a century later, states that Augustine was consecrated by the Frankish Archbishop Aethelric of Arles after the conversion of Aethelberht. Contemporary letters from Pope Gregory, however, refer to Augustine as a bishop before he arrived in England. A letter of Gregory's from September 597 calls Augustine a bishop, and

one ten months later says that Augustine had been consecrated on Gregory's command by bishops of the German lands.[34] The historian R. A. Markus discusses the various theories of when and where Augustine was consecrated, and suggests that he was consecrated before arriving in England, but argues that the evidence does not permit deciding exactly where this took place.[35]

Soon after his arrival, Augustine founded the monastery of Saints Peter and Paul, which later became St Augustine's Abbey,[22] on land donated by the king.[36] This foundation has often been claimed as the first Benedictine abbey outside Italy, and that by founding it Augustine introduced the Rule of St. Benedict into England, but there is no evidence that the abbey followed the Benedictine Rule at the time of its foundation.[37] In a letter Gregory wrote to the patriarch of Alexandria in 598, he claimed that more than 10,000 Christians had been baptised; the number may be exaggerated but there is no reason to doubt that a mass conversion took place.[15][28] However, there were probably some Christians already in Kent before Augustine arrived, remnants of the Christians who lived in Britain in the later Roman Empire.[11] Little literary traces remain of them, however.[38] One other effect of the king's conversion by Augustine's mission was that the Frankish influence on the southern kingdoms of Britain was decreased.[39]

After these conversions, Augustine sent Laurence back to Rome with a report of his success along with questions about the mission.[40] Bede records the letter and Gregory's replies in chapter 27 of his *Historia ecclesiastica gentis Anglorum*, this section of the History is usually known as the *Libellus responsionum*. [41][42] Augustine asked for Gregory's advice on a number of issues, including how to organise the church, the punishment for church robbers, guidance on who was allowed to marry whom, and the consecration of bishops. Other topics were relations between the churches of Britain and Gaul, childbirth and baptism, and when it was lawful for people to receive communion and for a priest to celebrate mass.[42]

Further missionaries were sent from Rome in 601. They brought a pallium for Augustine and a present of sacred vessels, vestments, relics, and books.[e] The pallium was the symbol of metropolitan status, and signified that Augustine was now an archbishop unambiguously associated with the Holy See. Along with the pallium, a letter from Gregory directed the new archbishop to ordain 12 suffragan bishops as soon as possible and to send a bishop to York. Gregory's plan was that there would be two metropolitans, one at York and one at London, with 12 suffragan bishops under each archbishop. As part of this plan, Augustine was expected to transfer his archiepiscopal see to London from Canterbury. The move from Canterbury to London never happened; no contemporary sources give the reason,[47] but it was probably because London was not part of Æthelberht's domains. Instead, London was part of the kingdom of Essex, ruled by Æthelberht's nephew Saeberht of Essex, who converted to Christianity in 604.[18][48] The historian S. Brechter has suggested that the metropolitan see was indeed moved to London, and that it was only with the abandonment of London as a see after the death of Æthelberht that Canterbury became the archiepiscopal see. This theory contradicts Bede's version of events, however.[49]

[edit] Additional work

In 604, Augustine founded two more bishoprics in Britain. Two men who had come to Britain with him in 601 were consecrated, Mellitus as Bishop of London and Justus as Bishop of Rochester.[18][50][51] Bede relates that Augustine, with the help of the king, "recovered" a church built by Roman Christians in Canterbury.[52][f] It is not clear if Bede meant that Augustine rebuilt the church or that Augustine merely reconsecrated a building that had been used for pagan worship. Archaeological evidence seems to support the latter interpretation; in 1973 the remains of an aisled building dating from the Romano-British period were uncovered just south of the present Canterbury Cathedral.[52] The historian Ian Wood argues that the existence of the *Libellus* points to more contact between Augustine and the native Christians because the topics covered in the work are not restricted to conversion from paganism, but

also dealt with relations between differing styles of Christianity.[55]

Augustine failed to extend his authority to the Christians in Wales and Dumnonia to the west. Gregory had decreed that these Christians should submit to Augustine and that their bishops should obey him,[56] apparently believing that more of the Roman governmental and ecclesiastical organization survived in the Britain than was actually the case.[57] According to the narrative of Bede, the Britons in these regions viewed Augustine with uncertainty, and their suspicion was compounded by a diplomatic misjudgement on Augustine's part.[58] In 603, Augustine and Æthelberht summoned the British bishops to a meeting south of the Severn. These guests retired early to confer with their people,[59] who, according to Bede, advised them to judge Augustine based upon the respect he displayed at their next meeting. When Augustine failed to rise from his seat on the entrance of the British bishops,[60] they refused to recognise him as their archbishop.[59][61] There were, however, deep differences between Augustine and the British church that perhaps played a more significant role in preventing an agreement. At issue were the tonsure, the observance of Easter, and practical and deep-rooted differences in approach to asceticism, missionary endeavours, and how the church itself was organised.[58] Some historians believe that Augustine had no real understanding of the history and traditions of the British church, damaging his relations with their bishops.[61] Also, there were political dimensions involved, as Augustine's efforts were sponsored by the Kentish king, and at this period the Wessex and Mercian kingdoms were expanding to the west, into areas held by the Britons.[62]

[edit] Further success

Easier to implement were Rome's mandates concerning pagan temples and celebrations. Temples were to be consecrated for Christian use,[63] and feasts, if possible, moved to days celebrating Christian martyrs. One religious site was revealed to be a shrine of a local St Sixtus, whose worshippers were unaware of details of the martyr's life or death. They may have been native Christians, but Augustine did not treat them as such. When Gregory was informed, he told Augustine to stop the cult and use the shrine for the Roman St Sixtus.[64]

Gregory legislated on the behaviour of the laity and the clergy. He placed the new mission directly under papal authority and made it clear that English bishops would have no authority over Frankish counterparts nor vice versa. Other directives dealt with the training of native clergy and the missionaries' conduct.[65]

The King's School, Canterbury claims Augustine as its founder, which would make it the world's oldest existing school, but the first documentary records of the school date from the 16th century.[66] Augustine did establish a school, and soon after his death Canterbury was able to send teachers out to support the East Anglian mission.[67] Augustine received liturgical books from the pope, but their exact contents are unknown. They may have been some of the new mass books that were being written at this time. The exact liturgy that Augustine introduced to England remains unknown, but it would have been a form of the Latin language liturgy in use at Rome.[68]

[edit] Death and legacy

Before his death, Augustine consecrated Laurence as his successor to the archbishopric, probably to ensure an orderly transfer of office.[69] Although at the time of Augustine's death, 26 May 604,[22] the mission barely extended beyond Kent, his undertaking introduced a more active missionary style into the British Isles. Despite the earlier presence of Christians in Ireland and Wales, no efforts had been made to try to convert the Saxon invaders. Augustine was sent to convert the descendants of those invaders, and eventually became the decisive influence in Christianity in the British Isles.[58][70] Much of his success came about because of Augustine's close relationship with Æthelberht, which gave the archbishop time to establish himself.[71] Augustine's example also influenced the great missionary efforts of the Anglo-Saxon Church.[72][73] Augustine's body was originally buried in the portico of what is now St

Augustine's, Canterbury,[36] but it was later exhumed and placed in a tomb within the abbey church, which became a place of pilgrimage and veneration. After the Norman Conquest the cult of St Augustine was actively promoted.[22] After the Conquest, his shrine in St Augustine's Abbey held a central position in one of the axial chapels, flanked by the shrines of his successors Laurence and Mellitus.[74] King Henry I of England granted St. Augustine's Abbey a six day fair around the date on which Augustine's relics were translated to his new shrine, from 8 September through 13 September.[75]

A life of Augustine was written by Goscelin around 1090, but this life portrays Augustine in a different light than Bede's account. Goscelin's account has little new historical content, mainly being filled with miracles and imagined speeches.[76] Building on this account, later medieval writers continued to add new miracles and stories to Augustine's life, often quite fanciful.[77] These authors included William of Malmesbury, who claimed that Augustine founded Cerne Abbey,[78] the author (generally believed to be John Brompton) of a late medieval chronicle containing invented letters from Augustine,[79] and a number of medieval writers who included Augustine in their romances.[80] Another problem with investigating Augustine's saintly cult is the confusion resulting because most medieval liturgical documents mentioning Augustine do not distinguish between Augustine of Canterbury and Augustine of Hippo, a fourth century saint. Medieval Scandinavian liturgies feature Augustine of Canterbury quite often, however.[81] During the English Reformation, Augustine's shrine was destroyed and his relics were lost.

The Augustine's shrine was re-established in March 2012 at the church of St. Augustine in Ramsgate, Kent, very close to the mission's landing site.[82][83] St Augustine's Cross, a Celtic cross erected in 1884, marks the spot in Ebbsfleet, Thanet, East Kent, where Augustine is said to have landed,[84] although historian Alan Kay told the BBC in 2005 that Augustine actually landed somewhere between Stonar and Sandwich. According to Kay, Ebbsfleet was not on the coast in the sixth century, and that the story of Augustine's landing there was started in 1884 by a Victorian aristocrat who needed a publicity stunt to draw people to his newly opened tea rooms.[85]

[edit] See also

^ The name is in the halo, in a later hand. The figure is identified as a saint, rather than Christ, by his clerical tonsure.[1] The view that it represents Gregory is set out by Douglas Michaels in a recent article.[2]

^ Supposedly Gregory inquired about who the slaves were. He was told they were Angles from the island of Great Britain. Gregory replied that they were not Angles, but Angels.[20]

^ However, Bede's chronology may be a bit off, as he gives the king's death as occurring in February 616, and says the king died 21 years after his conversion, which would date the conversion to 595. This would be before Augustine's mission, and directly contradicts Bede's statement that the king's conversion was due to Augustine's mission.[16] However, as Gregory in his letter of 601 to the king and queen strongly implies that the queen was unable to effect the conversion of her husband, the problem of the dating is likely a chronological error on Bede's part.[32]

^ The letter, as translated in Brooks' Early History of the Church of Canterbury, p. 8, says "preserve the grace he had received". Grace in this context meant the grace of baptism.

^ What happened to these items in later years is unknown. Thomas Elmham, a 15th century chronicler at Canterbury, gave a number of theories of how most of these objects were lost, including being hidden and never recovered during the Danish attacks in the 9th and 10th centuries, hidden and lost after the Norman Conquest of England in 1066 or used for the ransom of King Richard I of England in the 1190s.[43] The surviving St Augustine Gospels, (Corpus Christi College, Cambridge manuscript (MS) 286) which is a 6th-century Italian illuminated Gospel Book, may be one of the works sent to Augustine. Traditionally, it has been associated with the Gregorian mission.[44] Another possible survivor is a



copy of the Rule of St Benedict, now MS Oxford Bodleian Hatton 48.[45] Yet another possible survival is a Gospel, in an Italian hand, and closely related to the Augustine Gospels, now MS Oxford Bodleian Auctarium D.2.14, which shows evidence of being held in Anglo-Saxon hands during the right time frame. Lastly, a fragment of a work by Gregory the Great, now held by the British Library as part of MS Cotton Titus C may have arrived with the missionaries.[46] ^ The actual Latin is from Chapter 33, Book 1 of Bede, and an online version is here. The sentence in question is "AT Augustinus, ubi in regia ciuitate sedem episcopalem, ut praediximus, accepit, recuperauit in ea, regio fultus adminiculo, ecclesiam, quam inibi antiquo Romanorum fidelium opere factam fuisse didicerat, et eam in nomine sancti Saluatoris Dei et Domini nostri Iesu Christi sacrauit, atque ibidem sibi habitationem statuit et cunctis successoribus suis." [53] The Latin word recuperauit could be translated either "repaired" or "recovered". Sherley-Price translates the sentence as "Having been granted his episcopal see in the royal capital, as already recorded, Augustine proceeded with the king's help to repair a church he was informed had been built long ago by Roman Christians." [54]

#### [edit] Citations

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- ^ Dales "Apostle of the English" L'ereditÃ spirituale di Gregorio Magno tra Occidente e Oriente p. 299
- ^ Delaney Dictionary of Saints pp. 67â ^68
- ^ a b Hindley Brief History of the Anglo-Saxons pp. 3â ^9
- ^ a b c Mayr-Harting The Coming of Christianity pp. 78â ^93
- ^ Frend "Roman Britain" Cross Goes North pp. 80â ^81
- ^ Frend "Roman Britain" Cross Goes North pp. 82â ^86
- ^ Yorke Conversion of Britain pp. 115â ^118 discusses the issue of the "Celtic Church" and what exactly it was.
- ^ Yorke Conversion of Britain p. 121
- ^ Stenton Anglo-Saxon England p. 102
- ^ a b Mayr-Harting The Coming of Christianity pp. 32â ^33
- ^ Kirby Earliest English Kings p. 23
- ^ a b Stenton Anglo-Saxon England pp. 104â ^105
- ^ Jones "Gregorian Mission" Speculum
- ^ a b c d Stenton Anglo-Saxon England pp. 105â ^106
- ^ a b Kirby Earliest English Kings pp. 24â ^25
- ^ a b Nelson "Bertha (b. c.565, d. in or after 601)" Oxford Dictionary of National Biography
- ^ a b c d Hindley Brief History of the Anglo-Saxons pp. 33â ^36
- ^ Wood "Mission of Augustine of Canterbury" Speculum pp. 9â ^10
- ^ Bede History of the English Church and People pp. 99â ^100
- ^ Mayr-Harting The Coming of Christianity pp. 57â ^59
- ^ a b c d e f Mayr-Harting "Augustine [St Augustine] (d. 604)" Oxford Dictionary of National Biography
- ^ Brooks Early History of the Church of Canterbury pp. 6â ^7
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- ^ a b c Fletcher The Barbarian Conversion pp. 116â ^117
- ^ Blair An Introduction to Anglo-Saxon England pp. 116â ^117
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- ^ a b Kirby Earliest English Kings p. 28
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- ^ a b Blair Church in Anglo-Saxon Society pp. 61â ^62
- ^ Lawrence Medieval Monasticism p. 55
- ^ Frend "Roman Britain" Cross Goes North p. 79
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- ^ Stenton Anglo-Saxon England p. 106
- ^ Lapidge "Laurentius" Blackwell Encyclopaedia of Anglo-Saxon England
- ^ a b Bede A History of the English Church pp. 71â ^83
- ^ Dodwell Anglo-Saxon Art p. 10
- ^ Dodwell Anglo-Saxon Art pp. 96 and 276 footnote 66
- ^ Colgrave "Introduction" Earliest Life of Gregory the Great pp. 27â ^28
- ^ Lapidge Anglo-Saxon Library pp. 24â ^25
- ^ Brooks Early History of the Church of Canterbury pp. 9â ^11
- ^ Fletcher The Barbarian Conversion p. 453
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- ^ Hayward "St Justus" Blackwell Encyclopaedia of Anglo-Saxon England pp. 267â ^268
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- ^ Yorke Conversion of Britain p. 118
- ^ a b c Stenton Anglo-Saxon England pp. 110â ^111
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- ^ a b Mayr-Harting Coming of Christianity pp. 72â ^73
- ^ Yorke Conversion of Britain p. 119
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- ^ Collins Early Medieval Europe p. 185
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- ^ Nilson Cathedral Shrines p. 67
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- ^ Gameson and Gameson "From Augustine to Parker" Anglo-Saxons pp. 17â ^20
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[edit] External links

Persondata

Name

Augustine of Canterbury

Alternative names

Saint Augustine of Canterbury

Short description

Christian saint; first Archbishop of Canterbury

Date of birth

first third of the sixth century

Place of birth  
Rome, Italy  
Date of death  
26 May 604  
Place of death  
Canterbury, Kent, England

William Gibson

Portrait of Gibson in Paris during a promotional interview for the French release of *Spook Country* on March 17, 2008

Born

William Ford Gibson(1948-03-17) March 17, 1948 (age 64)Conway, South CarolinaUnited States

Occupation

Novelist

Citizenship

United States, Canada

Period

1977â ^

Genres

Speculative fiction

Literary movement

Cyberpunk, steampunk, postcyberpunk

Notable work(s)

*Neuromancer* (novel, 1984)

Notable award(s)

Nebula, Hugo, Philip K. Dick, Ditmar, Seiun, Prix Aurora

Influences

Alfred Bester,[1]Jorge Luis Borges,[2]William S. Burroughs,[3]Joseph Cornell,[4]David Cronenberg,[5]Samuel R. Delany,[1]Thomas M. Disch,[6]Manny Farber,[7]Dashiell Hammett,[8]Howard Hawks,[9]Ursula K. Le Guin,[10]Sogo Ishii,[11]Thomas Pynchon,[2]Lou Reed,[8]Joanna Russ,[10]Robert Stone[8]  
williamgibsonbooks.com

William Ford Gibson (born March 17, 1948) is an American-Canadian speculative fiction novelist who has been called the "noir prophet" of the cyberpunk subgenre.[16] Gibson coined the term "cyberspace" in his short story "Burning Chrome" (1982) and later popularized the concept in his debut novel, *Neuromancer* (1984). In envisaging cyberspace, Gibson created an iconography for the information age before the ubiquity of the Internet in the 1990s.[17] He is also credited with predicting the rise of reality television and with establishing the conceptual foundations for the rapid growth of virtual environments such as video games and the World Wide Web.

Having changed residence frequently with his family as a child, Gibson became a shy, ungainly teenager who often read science fiction. After spending his adolescence at a private boarding school in Arizona, Gibson evaded the draft during the Vietnam War by emigrating to Canada in 1968, where he became immersed in the counterculture and after settling in Vancouver eventually became a full-time writer. He retains dual citizenship.[18] Gibson's early works are bleak, noir near-future stories about the effect of cybernetics and computer networks on humansâ ~a "combination of lowlife and high tech".[19] The short stories were published in popular science fiction magazines. The themes, settings and characters developed in these stories culminated in his first novel, *Neuromancer*, which garnered critical and commercial success, virtually initiating the cyberpunk literary genre.

Although much of Gibson's reputation has remained associated with *Neuromancer*, his work has continued to evolve. After expanding on *Neuromancer* with two more novels to complete the dystopic *Sprawl* trilogy, Gibson became an important author of another science fiction sub-genreâ ~steampunkâ ~with the 1990 alternate history novel *The Difference Engine*, written with Bruce Sterling. In the 1990s, he composed the *Bridge* trilogy of novels, which focused on sociological

observations of near-future urban environments and late capitalism. His most recent novelsâPattern Recognition (2003), Spook Country (2007) and Zero History (2010)âare set in a contemporary world and have put his work onto mainstream bestseller lists for the first time.

Gibson is one of the best-known North American science fiction writers, featured by The Guardian in 1999 as "probably the most important novelist of the past two decades". Gibson has written more than twenty short stories and ten critically acclaimed novels (one in collaboration), and has contributed articles to several major publications and collaborated extensively with performance artists, filmmakers and musicians. His thought has been cited as an influence on science fiction authors, design, academia, cyberculture, and technology.

Contents

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- 2 Literary career
- 3 Collaborations, adaptations, and miscellanea
- 4 Influence and recognition
- 5 Selected bibliography
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[edit] Early life

[edit] Childhood, itinerance, and adolescence

William Ford Gibson was born in the coastal city of Conway, South Carolina, and spent most of his childhood in Wytheville, Virginia, a small town in the Appalachians where his parents had been born and raised.[20][21] His family moved frequently during Gibson's youth owing to his father's position as manager of a large construction company.[22] In Norfolk, Virginia, Gibson attended Pines Elementary School, where the teachers' lack of encouragement for him to read was a cause of dismay for his parents.[23] While Gibson was still a young child,[I] a little over a year into his stay at Pines Elementary,[23] his father choked to death in a restaurant while on a business trip.[20] His mother, unable to tell William the bad news, had someone else inform him of the death.[24]Tom Maddox has commented that Gibson "grew up in an America as disturbing and surreal as anything J. G. Ballard ever dreamed".[25]

Loss is not without its curious advantages for the artist. Major traumatic breaks are pretty common in the biographies of artists I respect.

A few days after the death, Gibson's mother returned them from their home in Norfolk to Wytheville.[21][26] Gibson later described Wytheville as "a place where modernity had arrived to some extent but was deeply distrusted" and credits the beginnings of his relationship with science fiction, his "native literary culture", [26] with the subsequent feeling of abrupt exile.[20] At the age of 12, Gibson "wanted nothing more than to be a science fiction writer".[27] He spent a few unproductive years at basketball-obsessed George Wythe High School, a time spent largely in his room listening to records and reading books.[23] At 13, unbeknownst to his mother, he purchased an anthology of Beat writing, thereby gaining exposure to the writings of Allen Ginsberg, Jack Kerouac, and William S. Burroughs; the lattermost had a particularly pronounced effect, greatly altering Gibson's notions of the possibilities of science fiction literature.[3][8]

A shy, ungainly teenager, Gibson grew up in a monoculture he found "highly problematic", [27] consciously rejected religion and took refuge in reading science fiction as well as writers such as Burroughs and Henry Miller.[18][26] Becoming frustrated with his poor academic performance, Gibson's mother threatened to send him to a boarding school; to her surprise, he reacted enthusiastically.[23] Unable to afford his preferred choice of Southern California, his then "chronically anxious and depressive" mother, who had

remained in Wytheville since the death of her husband, sent him to Southern Arizona School for Boys in Tucson, Arizona.[20][21][26] He resented the structure of the private boarding school, but was in retrospect grateful for its forcing him to engage socially.[23] He took the SAT (Scholastic Aptitude Test) exams, scoring five out of 150 in mathematics and 148 out of 150 in the written section, to the consternation of his teachers.[23]

[edit] Draft-dodging, exile, and counterculture

After his mother's death when he was eighteen,[23] Gibson left school without graduating and became very isolated for a long time, traveling to California and Europe and immersing himself in the counterculture.[18][21][26] In 1967, he elected to move to Canada in order "to avoid the Vietnam war draft".[20][26] At his draft hearing, he honestly informed interviewers that his intention in life was to sample every mind-altering substance in existence.[29] Gibson has observed that he "did not literally evade the draft, as they never bothered drafting me";[20] after the hearing he went home and purchased a bus ticket to Toronto, and left a week or two later.[26] In the biographical documentary *No Maps for These Territories* (2000) Gibson said that his decision was motivated less by conscientious objection than by a desire to "sleep with hippie chicks" and indulge in hashish.[26] He elaborated on the topic in a 2008 interview:

When I was started out as a writer I took credit for draft evasion where I shouldn't have. I washed up in Canada with some vague idea of evading the draft but then I was never drafted so I never had to make the call. I don't know what I would have done if I'd really been drafted. I wasn't a tightly wrapped package at that time. If somebody had drafted me I might have wept and gone. I wouldn't have liked it of course.

â ~William Gibson, interview with io9, June 10, 2008.[30]

After weeks of nominal homelessness, Gibson was hired as the manager of Toronto's first head shop, a retailer of drug paraphernalia.[31] He found the city's "migr" community of American draft dodgers unbearable owing to the prevalence of clinical depression, suicide and hardcore substance abuse.[26] He appeared, during the Summer of Love of 1967, in a CBC newsreel item about hippie subculture in Yorkville, Toronto,[32] for which he was paid \$500 â ^ the equivalent of 20 weeks rent â ^ which financed his later travels.[33] Aside from a "brief, riot-torn spell" in the District of Columbia, Gibson spent the rest of the 1960s in Toronto, where he met Vancouverite Deborah Jean Thompson,[34] with whom he subsequently traveled to Europe.[20] Gibson has recounted that they concentrated their travels on European nations with fascist regimes and favourable exchange rates, including spending time on a Greek archipelago and in Istanbul in 1970,[35] as they "couldn't afford to stay anywhere that had anything remotely like hard currency".[36]

The couple married and settled in Vancouver, British Columbia in 1972, with Gibson looking after their first child while they lived off his wife's teaching salary. During the 1970s, Gibson made a substantial part of his living from scouring Salvation Army thrift stores for underpriced artifacts he would then up-market to specialist dealers.[35] Realizing that it was easier to sustain high college grades, and thus qualify for generous student financial aid, than to work,[8] he enrolled at the University of British Columbia (UBC), earning "a desultory bachelor's degree in English"[20] in 1977.[37] Through studying English literature, he was exposed to a wider range of fiction than he would have read otherwise; something he credits with giving him ideas inaccessible from within the culture of science fiction, including an awareness of postmodernity.[10] It was at UBC that he attended his first course on science fiction, taught by Susan Wood, at the end of which he was encouraged to write his first short story, "Fragments of a Hologram Rose".[22]

[edit] Post-graduation, early writing, and the evolution of cyberpunk

After considering pursuing a master's degree on the topic of hard science fiction novels as fascist literature,[8] Gibson discontinued writing in the year that followed graduation and, as one critic put it, expanded his

collection of punk records.[38] During this period he worked at various jobs, including a three-year stint as teaching assistant on a film history course at his alma mater.[22] Impatient at much of what he saw at a science fiction convention in Vancouver in 1980 or 1981, Gibson found a kindred spirit in fellow panelist, punk musician and author John Shirley.[39] The two became immediate and lifelong friends. Shirley persuaded Gibson to sell his early short stories and to take writing seriously.[38][39]

In 1977, facing first-time parenthood and an absolute lack of enthusiasm for anything like "career," I found myself dusting off my twelve-year-old's interest in science fiction. Simultaneously, weird noises were being heard from New York and London. I took Punk to be the detonation of some slow-fused projectile buried deep in society's flank a decade earlier, and I took it to be, somehow, a sign. And I began, then, to write.

â ~William Gibson, "Since 1948".[20]

Through Shirley, Gibson came into contact with science fiction authors Bruce Sterling and Lewis Shiner; reading Gibson's work, they realised that it was, as Sterling put it, "breakthrough material" and that they needed to "put down our preconceptions and pick up on this guy from Vancouver; this [was] the way forward." [26][40] Gibson met Sterling at a science fiction convention in Denver, Colorado in the autumn of 1981, where he read "Burning Chrome" to an audience of four people, and later stated that Sterling "completely got it".[26]

In October 1982, Gibson traveled to Austin, Texas for ArmadilloCon, at which he appeared with Shirley, Sterling and Shiner on a panel called "Behind the Mirrorshades: A Look at Punk SF", where Shiner noted "the sense of a movement solidified".[40] After a weekend discussing rock and roll, MTV, Japan, fashion, drugs and politics, Gibson left the cadre for Vancouver, declaring half-jokingly that "a new axis has been formed." [40] Sterling, Shiner, Shirley and Gibson, along with Rudy Rucker, went on to form the core of the radical cyberpunk literary movement.[41]

[edit] Literary career

[edit] Early short fiction

Gibson's early writings are generally near-future stories about the influences of cybernetics and cyberspace (computer-simulated reality) technology on the human race! His themes of hi-tech shanty towns, recorded or broadcast stimulus (later to be developed into the "sim-stim" package featured so heavily in Neuromancer), and dystopic intermingling of technology and humanity, are already evident in his first published short story, "Fragments of a Hologram Rose" (1977).[8] The latter thematic obsession was described by his friend and fellow author, Bruce Sterling, in the introduction of Gibson's short story collection Burning Chrome, as "Gibson's classic one-two combination of lowlife and high tech." [19]

In the early 1980s, Gibson's stories appeared in Omni and Universe 11, wherein his fiction developed a bleak, film noir feel. He consciously distanced himself as far as possible from the mainstream of science fiction (towards which he felt "an aesthetic revulsion", expressed in "The Gernsback Continuum"), to the extent that his highest goal was to become "a minor cult figure, a sort of lesser Ballard." [8] When Sterling started to distribute the stories, he found that "people were just genuinely baffled... I mean they literally could not parse the guy's paragraphs... the imaginative tropes he was inventing were just beyond peoples' grasp." [26]

While Larry McCaffery has commented that these early short stories displayed flashes of Gibson's ability, science fiction critic Darko Suvin has identified them as "undoubtedly [cyberpunk's] best works", constituting the "furthest horizon" of the genre.[39] The themes which Gibson developed in the stories, the Sprawl setting of "Burning Chrome" and the character of Molly Millions from "Johnny Mnemonic" ultimately culminated in his first novel, Neuromancer.[39]

[edit] Neuromancer



The sky above the port was the color of television, tuned to a dead channel.

Neuromancer was commissioned by Terry Carr for the third series of Ace Science Fiction Specials, which was intended to exclusively feature debut novels. Given a year to complete the work,[42] Gibson undertook the actual writing out of "blind animal terror" at the obligation to write an entire novel—a feat which he felt he was "four or five years away from".[8] After viewing the first 20 minutes of landmark cyberpunk film Blade Runner (1982) which was released when Gibson had written a third of the novel, he "figured [Neuromancer] was sunk, done for. Everyone would assume I'd copied my visual texture from this astonishingly fine-looking film." [43] He re-wrote the first two-thirds of the book twelve times, feared losing the reader's attention and was convinced that he would be "permanently shamed" following its publication; yet what resulted was a major imaginative leap forward for a first-time novelist.[8]

Neuromancer's release was not greeted with fanfare, but it hit a cultural nerve,[44] quickly becoming an underground word-of-mouth hit.[39] It became the first novel to win the "triple crown"[8] of science fiction awards (the Nebula, the Hugo, and Philip K. Dick Award for paperback original), eventually selling more than 6.5 million copies worldwide.[45]

Lawrence Person in his "Notes Toward a Postcyberpunk Manifesto" (1998) identified Neuromancer as "the archetypal cyberpunk work", [46] and in 2005, Time included it in their list of the 100 best English-language novels written since 1923, opining that "[t]here is no way to overstate how radical [Neuromancer] was when it first appeared." [47] Literary critic Larry McCaffery described the concept of the matrix in Neuromancer as a place where "data dance with human consciousness... human memory is literalized and mechanized... multi-national information systems mutate and breed into startling new structures whose beauty and complexity are unimaginable, mystical, and above all nonhuman." [8] Gibson later commented on himself as an author circa Neuromancer that "I'd buy him a drink, but I don't know if I'd loan him any money," and referred to the novel as "an adolescent's book". [26] The success of Neuromancer was to affect the 35-year-old Gibson's emergence from obscurity. [48]

[edit] The Sprawl trilogy, The Difference Engine, and the Bridge trilogy  
Although much of Gibson's reputation has remained rooted in Neuromancer, his work continued to evolve conceptually and stylistically. [49] Despite adding the final sentence of Neuromancer, "He never saw Molly again", at the last minute in a deliberate attempt to prevent himself from ever writing a sequel, he did precisely that with Count Zero (1986), a character-focused work set in the Sprawl alluded to in its predecessor. [50] He next intended to write an unrelated postmodern space opera, titled The Log of the Mustang Sally, but reneged on the contract with Arbor House after a falling out over the dustjacket art of their hardcover of Count Zero. [51] Abandoning The Log of the Mustang Sally, Gibson instead wrote Mona Lisa Overdrive (1988), which in the words of Larry McCaffery "turned off the lights" on cyberpunk literature. [8] [39] It was a culmination of his previous two novels, set in the same universe with shared characters, thereby completing the Sprawl trilogy. The trilogy solidified Gibson's reputation, [52] with both later novels also earning Nebula and Hugo Award and Locus SF Award nominations [53] [54] [55]

The Sprawl trilogy was followed by the 1990 novel The Difference Engine, an alternate history novel Gibson wrote in collaboration with Bruce Sterling. Set in a technologically advanced Victorian era Britain, the novel was a departure from the authors' cyberpunk roots. It was nominated for the Nebula Award for Best Novel in 1991 and the John W. Campbell Memorial Award in 1992, and its success drew attention to the nascent steampunk literary genre of which it remains the best-known work. [56] [57]

Gibson's second series, the "Bridge trilogy", is composed of Virtual Light (1993), a "darkly comic urban detective story", [58] Idoru (1996), and All Tomorrow's Parties (1999). It centers on San Francisco in the near future and

evinces Gibson's recurring themes of technological, physical, and spiritual transcendence in a more grounded, matter-of-fact style than his first trilogy.[59]Salon.com's Andrew Leonard notes that in the Bridge trilogy, Gibson's villains change from multinational corporations and artificial intelligences of the Sprawl trilogy to the mass media—namely tabloid television and the cult of celebrity.[60]Virtual Light depicts an "end-stage capitalism, in which private enterprise and the profit motive are taken to their logical conclusion".[61] This argument on the mass media as the natural evolution of capitalism is the opening line of the major Situationist work *The Society of the Spectacle*. Leonard's review called *Idoru* a "return to form" for Gibson,[62] while critic Steven Poole asserted that *All Tomorrow's Parties* marked his development from "science-fiction hotshot to wry sociologist of the near future." [63]

[edit] Late period novels

â |I felt that I was trying to describe an unthinkable present and I actually feel that science fiction's best use today is the exploration of contemporary reality rather than any attempt to predict where we are goingâ |The best thing you can do with science today is use it to explore the present. Earth is the alien planet now.

â ~William Gibson in an interview on CNN, August 26, 1997.

After *All Tomorrow's Parties*, Gibson began to adopt a more realist style of writing, with continuous narratives— "speculative fiction of the very recent past." [64] Science fiction critic John Clute has interpreted this approach as Gibson's recognition that traditional science fiction is no longer possible "in a world lacking coherent 'nows' to continue from", characterizing it as "SF for the new century". [65] Gibson's novels *Pattern Recognition* (2003), *Spook Country* (2007) and *Zero History* (2010) are set in the same contemporary universe — "more or less the same one we live in now" [66] — and put Gibson's work onto mainstream bestseller lists for the first time. [67] As well as the setting, the novels share some of the same characters, including Hubertus Bigend and Pamela Mainwaring, employees of the enigmatic marketing company Blue Ant.

A phenomenon peculiar to this era was the independent development of annotating fansites, PR-Otaku and Node Magazine, devoted to *Pattern Recognition* and *Spook Country* respectively. [4] These websites tracked the references and story elements in the novels through online resources such as Google and Wikipedia and collated the results, essentially creating hypertext versions of the books. [68] Critic John Sutherland characterised this phenomenon as threatening "to completely overhaul the way literary criticism is conducted". [69]

After the September 11, 2001 attacks, with about 100 pages of *Pattern Recognition* written, Gibson had to re-write the main character's backstory, which had been suddenly rendered implausible; he called it "the strangest experience I've ever had with a piece of fiction." [70] He saw the attacks as a nodal point in history, "an experience out of culture", [71] and "in some ways... the true beginning of the 21st century." [16] He is noted as one of the first novelists to use the attacks to inform his writing. [28] Examination of cultural changes in post-September 11 America, including a resurgent tribalism and the "infantilization of society", [72] [73] became a prominent theme of Gibson's work. [74] The focus of his writing nevertheless remains "at the intersection of paranoia and technology". [75]

[edit] Collaborations, adaptations, and miscellanea

[edit] Literary collaborations

Three of the stories that later appeared in *Burning Chrome* were written in collaboration with other authors: "The Belonging Kind" (1981) with John Shirley, "Red Star, Winter Orbit" (1983) with Sterling, [4] and "Dogfight" (1985) with Michael Swanwick. Gibson had previously written the foreword to Shirley's 1980 novel *City Come A-walkin'* [76] and the pair's collaboration continued when Gibson wrote the introduction to Shirley's short story

collection *Heatseeker* (1989).[77] Shirley convinced Gibson to write a story for the television series *Max Headroom* for which Shirley had written several scripts, but the network canceled the series.[78]

Gibson and Sterling collaborated again on the short story "The Angel of Goliad" in 1990,[77] which they soon expanded into the novel-length alternate history story *The Difference Engine* (1990). The two were later "invited to dream in public" (Gibson) in a joint address to the U.S. National Academy of Sciences Convocation on Technology and Education in 1993 ("the Al Gore people"[78]), in which they argued against the digital divide[79] and "appalled everyone" by proposing that all schools be put online, with education taking place over the Internet.[80] In a 2007 interview, Gibson revealed that Sterling had an idea for "a second recursive science novel that was just a wonderful idea", but that Gibson was unable to pursue the collaboration because he was not creatively free at the time.[64]

In 1993, Gibson contributed lyrics and featured as a guest vocalist on Yellow Magic Orchestra's *Technodon* album,[81][82] and wrote lyrics to the track "Dog Star Girl" for Deborah Harry's *Debravation*. [83]

[edit] Film adaptations, screenplays, and appearances

Gibson was first solicited to work as a screenwriter after a film producer discovered a waterlogged copy of *Neuromancer* on a beach at a Thai resort.[84] His early efforts to write film scripts failed to manifest themselves as finished product; "Burning Chrome" (which was to be directed by Kathryn Bigelow) and "Neuro-Hotel" were two attempts by the author at film adaptations that were never made.[78] In the late 1980s he wrote an early version of *Alien 3* (which he later characterized as "Tarkovskian"), few elements of which survived in the final version.[78] Gibson's early involvement with the film industry extended far beyond the confines of the Hollywood blockbuster system. At one point, he collaborated on a script with Kazakh director Rashid Nugmanov after an American producer had expressed an interest in a Soviet-American collaboration to star Russian-Korean star Victor Tsoi.[85] Despite being occupied with writing a novel, Gibson was reluctant to abandon the "wonderfully odd project" which involved "ritualistic gang-warfare in some sort of sideways-future Leningrad" and sent Jack Womack to Russia in his stead. Rather than producing a motion picture, a prospect that ended with Tsoi's death in a car crash, Womack's experiences in Russia ultimately culminated in his novel *Let's Put the Future Behind Us* and informed much of the Russian content of Gibson's *Pattern Recognition*. [85] A similar fate befell Gibson's collaboration with Japanese filmmaker Sogo Ishii in 1991,[39] a film they plotted on shooting in the Walled City of Kowloon until the city was demolished in 1993.[11]

Adaptations of Gibson's fiction have frequently been optioned and proposed, to limited success. Two of the author's short stories, both set in the *Sprawl* trilogy universe, have been loosely adapted as films: *Johnny Mnemonic* (1995) with screenplay by Gibson and starring Keanu Reeves, Dolph Lundgren and Takeshi Kitano, and *New Rose Hotel* (1998), starring Christopher Walken, Willem Dafoe, and Asia Argento. The former was the first time in history that a book was launched simultaneously as a film and a CD-ROM interactive video game.[61] *Neuromancer*, after a long stay in development hell, is in the process of adaptation as of 2007[update],[86] *Count Zero* was at one point being developed as *The Zen Differential* with director Michael Mann attached, and the third novel in the *Sprawl* trilogy, *Mona Lisa Overdrive*, has also been optioned and bought.[87] An anime adaptation of *Idoru* was announced as in development in 2006,[88] and *Pattern Recognition* was in the process of development by director Peter Weir, although according to Gibson the latter is no longer attached to the project.[89]

Television is another arena in which Gibson has collaborated; he co-wrote with friend Tom Maddox, *The X-Files* episodes "Kill Switch" and "First Person Shooter", broadcast in the U.S. on 20th Century Fox Television in 1998 and 2000.[49][90] In 1998 he contributed the introduction to the spin-off publication *Art of the X-Files*. Gibson made a cameo appearance in the television miniseries *Wild Palms* at the behest of creator Bruce Wagner.[91]

Director Oliver Stone had borrowed heavily from Gibson's novels to make the series,[58] and in the aftermath of its cancellation Gibson contributed an article, "Where The Holograms Go", to the Wild Palms Reader.[91] He accepted another acting role in 2002, appearing alongside Douglas Coupland in the short film *Mon Amour Mon Parapluie* in which the pair played philosophers.[92] Appearances in fiction aside, Gibson was the focus of a biographical documentary by Mark Neale in 2000 called *No Maps for These Territories*. The film follows Gibson over the course of a drive across North America discussing various aspects of his life, literary career and cultural interpretations. It features interviews with Jack Womack and Bruce Sterling, as well as recitations from *Neuromancer* by Bono and The Edge.[26]

[edit] Exhibitions, poetry, and performance art

Gibson has contributed text to be integrated into a number of performance art pieces. In October 1989, Gibson wrote text for such a collaboration with acclaimed sculptor and future Johnny Mnemonic director Robert Longo[48] titled *Dream Jumbo: Working the Absolutes*, which was displayed in Royce Hall, University of California Los Angeles. Three years later, Gibson contributed original text to "Memory Palace", a performance show featuring the theater group *La Fura dels Baus* at *Art Futura '92*, Barcelona, which featured images by Karl Sims, Rebecca Allen, Mark Pellington with music by Peter Gabriel and others.[81] It was at *Art Futura '92* that Gibson met Charlie Athanas, who would later act as dramaturg and "cyberprops" designer on Steve Pickering and Charley Sherman's adaptation of "Burning Chrome" for the Chicago stage. Gibson's latest contribution was in 1997, a collaboration with critically acclaimed Vancouver-based contemporary dance company *Holy Body Tattoo* and Gibson's friend and future webmaster Christopher Halcrow.[93]

In 1990, Gibson contributed to "Visionary San Francisco", an exhibition at the San Francisco Museum of Modern Art shown from June 14 to August 26.[94] He wrote a short story, "Skinner's Room", set in a decaying San Francisco in which the San Francisco â ^ Oakland Bay Bridge was closed and taken over by the homeless â ^ a setting Gibson then detailed in the Bridge trilogy. The story inspired a contribution to the exhibition by architects Ming Fung and Craig Hodgetts that envisioned a San Francisco in which the rich live in high-tech, solar-powered towers, above the decrepit city and its crumbling bridge.[95] The architects exhibit featured Gibson on a monitor discussing the future and reading from "Skinner's Room".[81] The New York Times hailed the exhibition as "one of the most ambitious, and admirable, efforts to address the realm of architecture and cities that any museum in the country has mounted in the last decade", despite calling Ming and Hodgetts's reaction to Gibson's contribution "a powerful, but sad and not a little cynical, work".[95] A slightly different version of the short story was featured a year later in *Omni*. [96]

[edit] Cryptography

A particularly well-received work by Gibson was *Agrippa* (a book of the dead) (1992), a 300-line semi-autobiographical electronic poem that was his contribution to a collaborative project with artist Dennis Ashbaugh and publisher Kevin Begos, Jr.[97] Gibson's text focused on the ethereal nature of memories (the title refers to a photo album) and was originally published on a 3.5" floppy disk embedded in the back of an artist's book containing etchings by Ashbaugh (intended to fade from view once the book was opened and exposed to light â ~ they never did, however). Gibson commented that Ashbaugh's design "eventually included a supposedly self-devouring floppy-disk intended to display the text only once, then eat itself." [98] Contrary to numerous colorful reports, the diskettes were never actually "hacked"; instead the poem was manually transcribed from a surreptitious videotape of a public showing in Manhattan in December 1992, and released on the MindVox bulletin board the next day; this is the text that circulated widely on the Internet.[99]

Since its debut in 1992, the mystery of *Agrippa* remains hidden, even now 20 years later. Although many have tried to hack the unbreakable code and decrypt the program, the uncompiled source code was lost long ago. Alan Liu and his team at "The Agrippa Files" [100] have created an extensive website with tools

and resources to crack the Agrippa Code. They are collaborating with Matthew Kirschenbaum at the Maryland Institute for Technology in the Humanities and the Digital Forensics Lab, and Quinn DuPont, a PhD student of cryptography from the University of Toronto, has called for the aid of cryptographers to figure out how the program works by creating "Cracking the Agrippa Code: The Challenge",[101] that enlists participants to solve the intentional scrambling of the poem in exchange for prizes.[102]

[edit] Essays and short-form nonfiction

Gibson is a sporadic contributor of non-fiction articles to newspapers and journals. He has been a sporadic contributor of longer-form articles to Wired and of op-eds to The New York Times, and has written for The Observer, Addicted to Noise, New York Times Magazine, Rolling Stone, and Details Magazine. His first major piece of nonfiction, the article "Disneyland with the Death Penalty" concerning the city-state of Singapore, resulted in Wired being banned from the country and attracted a spirited critical response.[103][104] He commenced writing a blog in January 2003, providing voyeuristic insights into his reaction to Pattern Recognition, but abated in September of the same year owing to concerns that it might negatively affect his creative process.[105][106] Gibson re-commenced blogging in October 2004, and during the process of writing Spook Country â ^ and to a lesser extent Zero History â ^ frequently posted short nonsequential excerpts from the novel to the blog.[107] The blog was largely discontinued by July 2009, after the writer had undertaken prolific microblogging on Twitter under the nom de plume "GreatDismal".[108] In 2012, Gibson released a collection of his non-fiction works entitled Distrust That Particular Flavor.[109] Essays left out from the book, along with interviews and newer pieces, are collected at William Gibson Interviews & Non-fiction page at Scoop.It.

[edit] Influence and recognition

Hailed by Steven Poole of The Guardian in 1999 as "probably the most important novelist of the past two decades" in terms of influence,[63] Gibson first achieved critical recognition with his debut novel, Neuromancer. The novel won three major science fiction awards (the Nebula Award, the Philip K. Dick Award, and the Hugo Award), an unprecedented achievement described by the Mail & Guardian as "the sci-fi writer's version of winning the Goncourt, Booker and Pulitzer prizes in the same year".[61] Neuromancer gained unprecedented critical and popular attention outside science fiction,[8] as an "evocation of life in the late 1980s",[110] although The Observer noted that "it took the New York Times 10 years" to mention the novel.[21]

Gibson's work has received international attention[22] from an audience that was not limited to science fiction aficionados as, in the words of Laura Miller, "readers found startlingly prophetic reflections of contemporary life in [its] fantastic and often outright paranoid scenarios." [111] It is often situated by critics within the context of postindustrialism as, according to academic David Brande, a construction of "a mirror of existing large-scale techno-social relations", [112] and as a narrative version of postmodern consumer culture.[113] It is praised by critics for its depictions of late capitalism[112] and its "rewriting of subjectivity, human consciousness and behaviour made newly problematic by technology." [113] Tatiani Rapatzikou, writing in The Literary Encyclopedia, identifies Gibson as "one of North America's most highly acclaimed science fiction writers".[22]

Gibson has influenced modern day futurists, such as David Houle and others.[citation needed]

[edit] Cultural significance

William Gibson â ^ the man who made us cool.

In his early short fiction, Gibson is credited by Rapatzikou in The Literary Encyclopedia with effectively "renovating" science fiction, a genre at that time considered widely "insignificant", [22] influencing by means of the postmodern aesthetic of his writing the development of new perspectives in

science fiction studies.[44] In the words of filmmaker Marianne Trench, Gibson's visions "struck sparks in the real world" and "determined the way people thought and talked" to an extent unprecedented in science fiction literature.[114] The publication of *Neuromancer* (1984) hit a cultural nerve,[44] causing Larry McCaffery to credit Gibson with virtually launching the cyberpunk movement,[8] as "the one major writer who is original and gifted to make the whole movement seem original and gifted." [39][VII] Aside from their central importance to cyberpunk and steampunk fiction, Gibson's fictional works have been hailed by space historian Dwayne A. Day as some of the best examples of space-based science fiction (or "solar sci-fi"), and "probably the only ones that rise above mere escapism to be truly thought-provoking".[115]

Gibson's early novels were, according to *The Observer*, "seized upon by the emerging slacker and hacker generation as a kind of road map".[21] Through his novels, such terms as cyberspace, netsurfing, ICE, jacking in, and neural implants entered popular usage, as did concepts such as net consciousness, virtual interaction and "the matrix".[117] In "Burning Chrome" (1982), he coined the term cyberspace,[V] referring to the "mass consensual hallucination" of computer networks.[118] Through its use in *Neuromancer*, the term gained such recognition that it became the de facto term for the World Wide Web during the 1990s.[119] Artist Dike Blair has commented that Gibson's "terse descriptive phrases capture the moods which surround technologies, rather than their engineering." [120]

Gibson's work has influenced several popular musicians: references to his fiction appear in the music of Stuart Hamm,[II] Billy Idol,[III] Warren Zevon,[IV] *Deltron 3030*, *Straylight Run* (whose name is derived from a sequence in *Neuromancer*)[121] and *Sonic Youth*. U2's *Zooropa* album was heavily influenced by *Neuromancer*,[52] and the band at one point planned to scroll the text of *Neuromancer* above them on a concert tour, although this did not end up happening. Members of the band did, however, provide background music for the audiobook version of *Neuromancer* as well as appearing in *No Maps for These Territories*, a biographical documentary of Gibson.[122] He returned the favour by writing an article about the band's *Vertigo Tour* for *Wired* in August 2005.[123] The band *Zeromancer* take their name from *Neuromancer*. [124]

The film *The Matrix* (1999) drew inspiration for its title, characters and story elements from the *Sprawl* trilogy.[125] The characters of Neo and Trinity in *The Matrix* are similar to Bobby Newmark (Count Zero) and Molly ("Johnny Mnemonic", *Neuromancer*).[87] Like Turner, protagonist of Gibson's *Count Zero*, characters in *The Matrix* download instructions (to fly a helicopter and to "know kung fu", respectively) directly into their heads, and both *Neuromancer* and *The Matrix* feature artificial intelligences which strive to free themselves from human control.[87] Critics have identified marked similarities between *Neuromancer* and the film's cinematography and tone.[126] In spite of his initial reticence about seeing the film on its release,[26] Gibson later described it as "arguably the ultimate 'cyberpunk' artifact." [1] In 2008 he received honorary doctorates from Simon Fraser University and Coastal Carolina University, [127] and was inducted into the Science Fiction Hall of Fame by close friend and collaborator Jack Womack.[128]

[edit] Visionary influence and prescience

The future is already hereÂ â ^ it's just not evenly distributed.

In *Neuromancer*, Gibson first used the term "matrix" to refer to the visualised Internet, two years after the nascent Internet was formed in the early 1980s from the computer networks of the 1970s.[130][131][132] Gibson thereby imagined a worldwide communications network years before the origin of the World Wide Web,[49] although related notions had previously been imagined by others, including science fiction writers.[VI][VII] At the time he wrote "Burning Chrome", Gibson "had a hunch that [the Internet] would change things, in the same way that the ubiquity of the automobile changed things." [26] In 1995, he identified the advent, evolution and growth of the Internet as "one of the most

fascinating and unprecedented human achievements of the century", a new kind of civilization that is "on a par with the birth of cities,[80] and in 2000 predicted it would lead to the death of the nation state.[26]

Observers contend that Gibson's influence on the development of the Web reached beyond prediction; he is widely credited with creating an iconography for the information age, long before the embrace of the Internet by the mainstream.[29] Gibson introduced, in *Neuromancer*, the notion of the "meatpuppet", and is credited with inventing "the phenomenon of virtual sex.[133] His influence on early pioneers of desktop environment digital art has been acknowledged,[134] and he holds an honorary doctorate from Parsons The New School for Design.[135] Steven Poole claims that in writing the *Sprawl* trilogy Gibson laid the "conceptual foundations for the explosive real-world growth of virtual environments in video games and the Web".[63] In his afterword to the 2000 re-issue of *Neuromancer*, fellow author Jack Womack suggests that Gibson's vision of cyberspace may have inspired the way in which the Internet (and the Web particularly) developed, following the publication of *Neuromancer* in 1984, asking "what if the act of writing it down, in fact, brought it about?"[136]

Gibson scholar Tatiani G. Rapatzikou has commented, in *Gothic Motifs in the Fiction of William Gibson*, on the origin of the notion of cyberspace:

Gibson's vision, generated by the monopolising appearance of the terminal image and presented in his creation of the cyberspace matrix, came to him when he saw teenagers playing in video arcades. The physical intensity of their postures, and the realistic interpretation of the terminal spaces projected by these games "as if there were a real space behind the screen" made apparent the manipulation of the real by its own representation.[137]

In his *Sprawl* and *Bridge* trilogies, Gibson is credited with being one of the few observers to explore the portents of the information age for notions of the sociospatial structuring of cities.[138] Not all responses to Gibson's visions have been positive, however; virtual reality pioneer Mark Pesce, though acknowledging their heavy influence on him and that "no other writer had so eloquently and emotionally effected the direction of the hacker community,"[139] dismissed them as "adolescent fantasies of violence and disembodiment." [140] In *Pattern Recognition*, the plot revolves around snippets of film footage posted anonymously to various locations on the Internet. Characters in the novel speculate about the filmmaker's identity, motives, methods and inspirations on several websites, anticipating the 2006 lonelygirl15 internet phenomenon. However, Gibson later disputed the notion that the creators of lonelygirl15 drew influence from him.[141] Another phenomenon anticipated by Gibson is the rise of reality television,[10] for example in *Virtual Light*, which featured a satirical extrapolated version of COPS.[142]

Visionary writer is OK. Prophet is just not true. One of the things that made me like Bruce Sterling immediately when first I met him, back in 1991. [sic] We shook hands and he said "We've got a great job! We got to be charlatans and we're paid for it. We make this shit up and people believe it."  
"Gibson in interview with ActUsf, March 2008.[73]

For his part, Gibson rejects any notion of prophecy, never having had a special relationship with computers; until 1996 he had neither an email address nor a modem, a lack he explained at the time to have been motivated by a desire to avoid correspondence that would distract him from writing.[80] His first exposure to a website came while writing *Idoru* when he was persuaded to let a web developer, Chris Halcrow, build one for him.[7] An anecdote often recited in cybercultural enclaves and English departments holds that *Neuromancer* was written on a manual typewriter;[143] the author has confirmed that the novel

was written on a 1927 model of an olive-green Hermes portable typewriter, which looked to him as "the kind of thing Hemingway would have used in the field".[61][VIII] In 2007, he said:

I have a 2005 PowerBook G4, a gig of memory, wireless router. That's it. I'm anything but an early adopter, generally. In fact, I've never really been very interested in computers themselves. I don't watch them; I watch how people behave around them. That's becoming more difficult to do because everything is "around them".[66]

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#### Novels

#### Short stories

Burning Chrome (1986, preface by Bruce Sterling), collects Gibson's early short fiction, listed by original publication date:

"Fragments of a Hologram Rose" (1977, UnEarth 3)

"Johnny Mnemonic" (1981, Omni)

"The Gernsback Continuum" (1981, Universe 11)

"Hinterlands" (1981, Omni)

"New Rose Hotel" (1981, Omni)

"The Belonging Kind", with John Shirley (1981, Shadows 4)

"Burning Chrome" (1982, Omni)

"Red Star, Winter Orbit", with Bruce Sterling (1983, Omni)

"The Winter Market" (Nov 1985, Vancouver)

"Dogfight", with Michael Swanwick (1985, Omni)

"Skinner's Room" (Nov 1991, Omni)

#### Nonfiction

I. ^ The New York Times Magazine[24] and Gibson himself[20] report his age at the time of his father's death to be six years old, while Gibson scholar Tatiani Rapatzikou claims in The Literary Encyclopedia that he was eight years old.[22] II. ^ Several track names on Hamm's Kings of Sleep album ("Black Ice", "Count Zero", "Kings of Sleep") reference Gibson's work.[144] III. ^ Idol released an album in 1993 titled Cyberpunk, which featured a track named Neuromancer.[52] Robert Christgau excoriated Idol's treatment of cyberpunk,[145] and Gibson later stated that Idol had "turned it into something very silly." [78] IV. ^ Zevon's 1989 album Transverse City was inspired by Gibson's fiction.[146] V. ^ Gibson later successfully resisted attempts by Autodesk to copyright the word for their abortive foray into virtual reality.[52] VI. ^ Both the Internet with its dramatic social effects and the cyberpunk genre itself were also anticipated in John Brunner's 1975 novel The Shockwave Rider.[147][148] VII. ^ The idea of a globally interconnected set of computers through which everyone could quickly access data and programs from any site was first described in 1962 in a series of memos on the "Galactic Computer Network" by J.C.R. Licklider of DARPA.[149] VIII. ^ In the "Author's Afterword" to Mona Lisa Overdrive, dated July 16, 1992, Gibson wrote the following:

Neuromancer was written on a "clockwork typewriter," the very one you may recall glimpsing in Julie Deane's office in Chiba City. This machine, a Hermes 2000 manual portable, dates from somewhere in the 1930's. It's a very tough and elegant piece of work, from the factory of E. PAILLARD & Cie S.A. YVERDON (SUISSE). Cased, it weighs slightly less than the Macintosh SE/30 I now write on, and is finished in a curious green- and-black "crackle" paint-job, perhaps meant to suggest the covers of an accountant's ledger. Its keys are green as well, of celluloid, and the letters and symbols on them are canary yellow. (I once happened to brush the shift-key with the tip of a lit cigarette, dramatically confirming the extreme flammability of this early plastic.) In its day, the Hermes 2000 was one of the best portable writing-machines in the



world, and one of the most expensive. This one belonged to my wife's step-grandfather, who had been a journalist of sorts and had used it to compose laudatory essays on the poetry of Robert Burns. I used it first to write undergraduate Eng. lit. papers, then my early attempts at short stories, then Neuromancer, all without so much as ever having touched an actual computer.

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[edit] Further reading

[edit] External links

*Barton Fink* is a 1991 American film, written, directed, and produced by the Coen brothers. Set in 1941, it stars John Turturro in the title role as a young New York City playwright who is hired to write scripts for a movie studio in Hollywood, and John Goodman as Charlie, the insurance salesman who lives next door at the run-down Hotel Earle.

The Coens wrote the screenplay in three weeks while experiencing difficulty during the writing of another film, *Miller's Crossing*. Soon after *Miller's Crossing* was finished, the Coens began filming *Barton Fink*, which had its premiere at the Cannes Film Festival in May 1991. In a rare sweep, *Barton Fink* won the Palme d'Or, as well as awards for Best Director and Best Actor (Turturro). Although it was celebrated almost universally by critics and nominated for three Academy Awards, the movie grossed only \$6,000,000 at the box office, two-thirds of its estimated budget.

The process of writing and the culture of entertainment production are two prominent themes of *Barton Fink*. The world of Hollywood is contrasted with that of Broadway, and the film analyzes superficial distinctions between high culture and low culture. Other themes in the film include fascism and World War II; slavery and conditions of labor in creative industries; and how intellectuals relate to "the common man". Because of its diverse elements, *Barton Fink* has defied efforts at genre classification. It has been variously referred to as a film noir, a horror film, a *Künstlerroman*, and a buddy film.

The feel of the Hotel Earle was central to the development of the story, and careful deliberation went into its design. There is a sharp contrast between Fink's living quarters and the polished, pristine environs of Hollywood, especially the home of Jack Lipnick. On the wall of Fink's room there hangs a single picture of a woman at the beach; this captures Barton's attention, and the image reappears in the final scene of the film. Although the picture and other elements of the film (including a mysterious box given to Fink by Charlie) appear laden with symbolism, critics disagree over their possible meanings. The Coens have acknowledged some intentional symbolic elements while denying an attempt to communicate some holistic message.

The film contains allusions to many real-life people and events, most notably the writers Clifford Odets and William Faulkner. The characters of Barton Fink and W.P. Mayhew are widely seen as fictional representations of these men, but the Coens stress important differences. They have also admitted to parodying film magnates like Louis B. Mayer, but they note that Fink's agonizing tribulations in Hollywood are not meant to reflect their own experiences.

*Barton Fink* was influenced by several earlier works, including the films of Roman Polanski, particularly *Repulsion* (1965) and *The Tenant* (1976). Other influences are Stanley Kubrick's *The Shining* and Preston Sturges's *Sullivan's Travels*. The movie also contains a number of literary allusions, to works by William Shakespeare, John Keats, and Flannery O'Connor. There are also religious overtones, including references to the Book of Daniel, King Nebuchadnezzar, and Bathsheba.

*Barton Fink* (John Turturro) is enjoying the success of his first Broadway play, *Bare Ruined Choirs*. His agent informs him that Capitol Pictures in Hollywood has offered a thousand dollars per week to write movie scripts. Barton hesitates, worried that moving to California would separate him from "the common man", his focus as a writer. He accepts the offer, however, and

checks into the Hotel Earle, a large and unusually deserted building. His room is sparse and draped in subdued colors; its only decoration is a small painting of a woman on the beach, arm raised to block the sun.

In his first meeting with Capitol Pictures boss Jack Lipnick (Michael Lerner), Barton explains that he chose the Earle because he wants lodging that is (as Lipnick says) "less Hollywood".[1] Lipnick promises that his only concern is Barton's writing ability, and assigns his new employee to a wrestling movie. Back in his room, however, Barton is unable to write. He is distracted by sounds coming from the room next door, and he phones the front desk to complain. His neighbor, Charlie Meadows (John Goodman), is the source of the noise and visits Barton to apologize, insisting on sharing some alcohol from a hip flask to make amends. As they talk, Barton proclaims his affection for "the common man", and Charlie describes his life as an insurance salesman. Later, Barton falls asleep, but is awoken by the incessant whine of a mosquito.

Still unable to proceed beyond the first lines of his script, Barton consults producer Ben Geisler (Tony Shalhoub) for advice. Irritated, the frenetic Geisler takes him to lunch and orders him to speak with another writer for assistance. While in the bathroom, Barton meets the novelist William Preston (W.P.) "Bill" Mayhew (John Mahoney), who is vomiting in the next stall. They briefly discuss movie writing and arrange a second meeting later in the day. When Barton arrives, Mayhew is drunk and yelling wildly. His secretary, Audrey Taylor (Judy Davis), reschedules the meeting and confesses to Barton that she and Mayhew are in love. When they finally meet for lunch, Mayhew, Audrey, and Barton discuss writing and drinking. Before long Mayhew argues with Audrey, slaps her, and wanders off, drunk. Rejecting Barton's offer of consolation, she explains that she feels sorry for Mayhew, since he is married to another woman who is "disturbed".

With one day left before his meeting with Lipnick to discuss the movie, Barton phones Audrey and begs her for assistance. She visits him at the Earle, and after she admits that she wrote most of Mayhew's scripts, they are assumed to have sex; Barton later confesses to Charlie they did so. When he wakes up the next morning, he, again, hears the sound of the mosquito, finds it on Audrey's back, and slaps it dead. When Audrey does not respond, he turns her onto her side only to find that she has been violently murdered. He has no memory of the night's events. Horrified, he summons Charlie and asks for help. Charlie is repulsed, but disposes of the body and orders Barton to avoid contacting the police. After a surreal meeting with an unusually supportive Lipnick, Barton tries writing again and is interrupted by Charlie, who announces he is going to New York for several days. Charlie leaves a package with Barton and asks him to watch it.

Soon afterwards, Barton is visited by two police detectives, who inform him that Charlie's real name is in fact Karl Mundt â ~ "Madman Mundt".[3] He is a serial killer wanted for several murders; after shooting his victims, they explain, he decapitates them and keeps the heads. Stunned, Barton returns to his room and examines the box. Placing it on his desk without opening it, he begins writing and produces the entire script in one sitting. After a night of celebratory dancing, Barton returns to find the detectives in his room, who, after handcuffing him to the bed, then reveal Mayhew's murder. Charlie appears, and the hotel is engulfed in flames. Running through the hallway, screaming, Charlie shoots the policemen with a shotgun. As the hallway burns, Charlie speaks with Barton about their lives and the hotel, breaks the bed frame Barton is cuffed to, then retires to his own room, saying as he goes that he has paid a visit to Barton's parents and uncle in Lower Manhattan. Barton leaves the hotel, carrying the box and his script. Shortly thereafter he attempts to telephone his parents, but there is no answer.

In a final meeting, a disappointed and betrayed Lipnick, now uniformed as he attempts to secure an Army reserve commission, angrily chastises Barton for writing "a fruity movie about suffering",[4] then informs him that he is to remain in Los Angeles, and thatÂ Â ^ although he will remain under contractÂ Â ^ Capitol Pictures will not produce anything he writes so he can be ridiculed as

a loser around the studio while Lipnick is in the war. Dazed, Barton wanders onto a beach, still carrying the package. He meets a woman who looks just like the one in the picture on his wall at the Earle, and she asks about the box. He tells her that he knows neither what it contains nor to whom it belongs. She assumes the pose from the picture.

[edit] Background and writing

In 1989, filmmakers Joel and Ethan Coen began writing the script for a movie eventually released as *Miller's Crossing*. The many threads of the story became complicated, and after four months they found themselves lost in the process.[5] Although biographers and critics later referred to it as writer's block,[6] the Coen brothers rejected this description. "It's not really the case that we were suffering from writer's block," Joel said in a 1991 interview, "but our working speed had slowed, and we were eager to get a certain distance from *Miller's Crossing*." [7] They went from Los Angeles to New York and began work on a different project.[8]

In three weeks, the Coens wrote a script with a title role written specifically for actor John Turturro, with whom they'd been working on *Miller's Crossing*. The new movie, *Barton Fink*, was set in a large, seemingly-abandoned hotel.[7] This setting, which they named the Hotel Earle, was a driving force behind the story and mood of the new project. While filming their 1984 film *Blood Simple* in Austin, Texas, the Coens had seen a hotel which made a significant impression: "We thought, 'Wow, Motel Hell.' You know, being condemned to live in the weirdest hotel in the world." [10]

The writing process for *Barton Fink* was smooth, they said, suggesting that the relief of being away from *Miller's Crossing* may have been a catalyst. They also felt satisfied with the overall shape of the story, which helped them move quickly through the composition. "Certain films come entirely in one's head; we just sort of burped out *Barton Fink*." [11] While writing, the Coens created a second leading role with another actor in mind: John Goodman, who had appeared in their 1987 comedy *Raising Arizona*. His new character, Charlie, was Barton's next-door neighbor in the cavernous hotel.[12] Even before writing, the Coens knew how the story would end, and wrote Charlie's final speech at the start of the writing process.[13]

The script served its diversionary purpose, and the Coens put it aside: "*Barton Fink* sort of washed out our brain and we were able to go back and finish *Miller's Crossing*." [14] Once production of the first movie was finished, the Coens began to recruit staff to film *Barton Fink*. Turturro looked forward to playing the lead role, and spent a month with the Coens in Los Angeles to coordinate views on the project: "I felt I could bring something more human to Barton. Joel and Ethan allowed me a certain contribution. I tried to go a little further than they expected." [15]

[edit] Production

As they designed detailed storyboards for *Barton Fink*, the Coens began looking for a new cinematographer, since their associate Barry Sonnenfeld—who had filmed their first three movies—was occupied with his own directorial debut, *The Addams Family*. The Coens had been impressed with the work of English cinematographer Roger Deakins, particularly the interior scenes of the 1988 movie *Stormy Monday*. After screening other films he had worked on (including *Sid and Nancy* and *Pascali's Island*), they sent a script to Deakins and invited him to join the project. His agent advised against working with the Coens, but Deakins met with them at a cafe in Notting Hill and they soon began working together on *Barton Fink*. [16]

Filming began in June 1990 and took eight weeks (a third less time than required by *Miller's Crossing*), and the estimated final budget for the movie was US\$9 million.[17] The Coens worked well with Deakins, and they easily translated their ideas for each scene onto film. "There was only one moment we surprised him," Joel Coen recalled later. An extended scene called for a tracking shot out of the bedroom and into a sink drain "plug hole" in the adjacent bathroom as a symbol of sexual intercourse. "The shot was a lot of fun and we had a great time working out how to do it," Joel said. "After that,

every time we asked Roger to do something difficult, he would raise an eyebrow and say, 'Don't be having me track down any plug-holes now.'"[18]

Three weeks of filming were spent in the Hotel Earle, a set created by art director Dennis Gassner. The film's climax required a huge spreading fire in the hotel's hallway, which the Coens originally planned to add digitally in post-production. When they decided to use real flames, however, the crew built a large alternate set in an abandoned aircraft hangar at Long Beach. A series of gas jets were installed behind the hallway, and the wallpaper was perforated for easy penetration. As Goodman ran through the hallway, a man on an overhead catwalk opened each jet, giving the impression of a fire racing ahead of Charlie. Each take required a rebuild of the apparatus, and a second hallway (sans fire) stood ready nearby for filming pick-up shots between takes.[17] The final scene was shot near Zuma Beach, as was the image of a wave crashing against a rock.[12]

The Coens edited the movie themselves, as is their custom. "We prefer a hands-on approach," Joel explained in 1996, "rather than sitting next to someone and telling them what to cut." [19] Because of rules for membership in film production guilds, they are required to use a pseudonym; "Roderick Jaynes" is credited with editing Barton Fink.[20] Only a few filmed scenes were removed from the final cut, including a transition scene to show Barton's movement from New York to Hollywood. (In the movie, this is shown enigmatically with a wave crashing against a rock.) Several scenes representing work in Hollywood studios were also filmed, but edited out because they were "too conventional".[21]

[edit] Setting

The spooky, inexplicably empty feel of the Hotel Earle was central to the Coens' conception of the movie. "We wanted an art deco stylization," Joel explained in a 1991 interview, "and a place that was falling into ruin after having seen better days." [22] Barton's room is sparsely furnished with two large windows facing another building. The Coens later described the hotel as a "ghost ship floating adrift, where you notice signs of the presence of other passengers, without ever laying eyes on any". In the movie, residents' shoes are an indication of this unseen presence; another rare sign of other inhabitants is the sound from adjacent rooms.[23] Joel said: "You can imagine it peopled by failed commercial travelers, with pathetic sex lives, who cry alone in their rooms." [22] Heat and moisture are other important elements of the setting. The wallpaper in Barton's room peels and droops; Charlie experiences the same problem, and guesses heat is the cause. The Coens used green and yellow colors liberally in designing the hotel "to suggest an aura of putrefaction".[22]

The atmosphere of the hotel was meant to connect with the character of Charlie. As Joel explained: "Our intention, moreover, was that the hotel function as an exteriorization of the character played by John Goodman. The sweat drips off his forehead like the paper peels off the walls. At the end, when Goodman says that he is a prisoner of his own mental state, that this is like some kind of hell, it was necessary for the hotel to have already suggested something infernal." [22] The peeling wallpaper and the paste which seeps through it also mirror Charlie's chronic ear infection and the resultant pus.[24]

When Barton first arrives at the Hotel Earle, he is asked by the friendly bellhop Chet (Steve Buscemi) if he is "a trans or a res" — a transient or resident. Barton explains that he isn't sure, but will be staying "indefinitely".[25] The dichotomy between permanent inhabitants and guests reappears several times, notably in the hotel's motto, "A day or a lifetime", which Barton notices on the room's stationery. This idea returns at the end of the movie, when Charlie describes Barton as "a tourist with a typewriter". His ability to leave the Earle (while Charlie remains) is presented by critic Erica Rowell as evidence that Barton's story represents the process of writing itself. Barton, she says, represents an author who is able to leave a story, while characters like Charlie cannot.[24]

In contrast, the offices of Capitol Pictures and Lipnick's house are pristine,

lavishly decorated, and extremely comfortable. The company's rooms are bathed in sunlight, and Ben Geisler's office faces a lush array of flora. Barton meets Lipnick in one scene beside an enormous, spotless swimming pool. This echoes his position as studio head, as he explains: "...you can't always be honest, not with the sharks swimming around this town... if I'd been totally honest, I wouldn't be within a mile of this pool... unless I was cleaning it." [26] In his office, Lipnick showcases another trophy of his power: statues of Atlas, the Titan of Greek mythology who declared war on the gods of Mount Olympus and was severely punished. [27]

Barton watches dailies from another wrestling movie being made by Capitol Pictures; the date on the clapperboard is 9 December, two days after the attack on Pearl Harbor. Later, when Barton celebrates the completed script by dancing at a USO show, he is surrounded by soldiers. [28] In Lipnick's next appearance, he wears a colonel's uniform, which is really a costume from his company. Lipnick has not actually entered the military, but declares himself ready to fight the "little yellow bastards". [29] Originally, this historical moment just after the United States entered World War II was to have a significant impact on the Hotel Earle. As the Coens explained: "[W]e were thinking of a hotel where the lodgers were old people, the insane, the physically handicapped, because all the others had left for the war. The further the script was developed, the more this theme got left behind, but it had led us, in the beginning, to settle on that period." [30]

[edit] The Picture

The picture in Barton's room of a woman at the beach is a central focus for both the character and camera. He examines it frequently while at his desk, and after finding Audrey's corpse in his bed he goes to stand near it. The image is repeated at the end of the film, when he meets an identical-looking woman at an identical-looking beach, who strikes an identical pose. After complimenting her beauty, he asks her: "Are you in pictures?" She blushes and replies: "Don't be silly." [33]

The Coens decided early in the writing process to include the picture as a key element in the room. "Our intention," Joel explained later, "was that the room would have very little decoration, that the walls would be bare and that the windows would offer no view of any particular interest. In fact, we wanted the only opening on the exterior world to be this picture. It seemed important to us to create a feeling of isolation." [34]

Later in the film, Barton places into the frame a small picture of Charlie, dressed in a fine suit and holding a briefcase. The juxtaposition of his neighbor in the uniform of an insurance salesman and the escapist image of the woman on the beach leads to a confusion of reality and fantasy for Barton. Critic Michael Dunne notes: "[V]iewers can only wonder how 'real' Charlie is. ... In the film's final shot... viewers must wonder how 'real' [the woman] is. The question leads to others: How real is Fink? Lipnick? Audrey? Mayhew? How real are films anyway?" [35]

The picture's significance has been the subject of broad speculation. Washington Post reviewer Desson Howe said that despite its emotional impact, the final scene "feels more like a punchline for punchline's sake, a trumped-up coda". [36] In her book-length analysis of the Coen brothers' films, Rowell suggests that Barton's fixation on the picture is ironic, considering its low culture status and his own pretensions toward high culture (speeches to the contrary notwithstanding). She further notes that the camera focuses on Barton himself as much as the picture while he gazes at it. At one point, the camera moves past Barton to fill the frame with the woman on the beach. This tension between objective and subjective points of view appears again at the end of the film, when Barton finds himself... in a sense... inside the picture. [37]

Critic M. Keith Booker calls the final scene an "enigmatic comment on representation and the relationship between art and reality". He suggests that the identical images point to the absurdity of art which reflects life directly. The film transposes the woman directly from art to reality, prompting confusion in the viewer; Booker asserts that such a literal depiction therefore

leads inevitably to uncertainty.[38]

The Coens are known for making films that defy simple classification. Although they refer to their first movie, *Blood Simple*, as a relatively straightforward example of detective fiction, the Coens wrote their next script, *Raising Arizona*, without trying to fit a particular genre. They decided to write a comedy, but intentionally added dark elements to produce what Ethan calls "a pretty savage film".[39] Their third film, *Miller's Crossing*, reversed this order, mixing bits of comedy into a crime film. Yet it also subverts single-genre identity by using conventions from melodrama, love stories, and political satire.[40]

This trend of mixing movie types continued and intensified with *Barton Fink*; the Coens insist the film "does not belong to any genre".[2] Ethan has described it as "a buddy movie for the '90s".[41] It contains elements of comedy, film noir, and horror, but other film categories are present.[42] Actor Turturro referred to it as a coming of age story,[41] while literature professor and film analyst R. Barton Palmer calls it a *Kleistroman*, highlighting the importance of the main character's evolution as a writer.[43] Critic Donald Lyons describes the movie as "a retro-surrealist vision".[44]

Because it crosses genres, fragments the characters' experiences, and resists straightforward narrative resolution, *Barton Fink* is often considered an example of postmodernist film. In his book *Postmodern Hollywood*, Booker says the movie renders the past with an impressionist technique, not a precise accuracy. This technique, he notes, is "typical of postmodern film, which views the past not as the prehistory of the present but as a warehouse of images to be raided for material".[45] In his analysis of the Coens' films, Palmer calls *Barton Fink* a "postmodern pastiche" which closely examines how past eras have represented themselves. He compares it to *The Hours*, a 2002 movie about Virginia Woolf and two women who read her work. He asserts that both films, far from rejecting the importance of the past, add to our understanding of it. He quotes literary theorist Linda Hutcheon: The kind of postmodernism exhibited in these films "does not deny the existence of the past; it does question whether we can ever know that past other than through its textualizing remains".[46]

Certain elements in *Barton Fink* highlight the veneer of postmodernism: the writer is unable to resolve his modernist focus on high culture with the studio's desire to create formulaic high-profit movies; the resulting collision produces a fractured story arc emblematic of postmodernism.[47] The Coens' cinematic style is another example; when Barton and Audrey begin making love, the camera pans away to the bathroom, then moves toward the sink and down its drain. Rowell calls this a "postmodern update" of the notorious sexually suggestive image of a train entering a tunnel, used by director Alfred Hitchcock in his 1959 movie *North by Northwest*. [48]

*Barton Fink* uses several stylistic conventions to accentuate the story's mood and give visual emphasis to particular themes. For example, the opening credits roll over the Hotel Earle's wallpaper, as the camera moves downward. This motion is repeated many times in the film, especially pursuant to Barton's claim that his job is to "plumb the depths" while writing.[37] His first experiences in the Hotel Earle continue this trope; the bellhop Chet emerges from beneath the floor, suggesting the real activity is underground. Although Barton's floor is presumably six floors above the lobby, the interior of the elevator is shown only while it is descending. These elements—combined with many dramatic pauses, surreal dialogue, and implied threats of violence—create an atmosphere of extreme tension. The Coens explained that "the whole movie was supposed to feel like impending doom or catastrophe. And we definitely wanted it to end with an apocalyptic feeling".[50]

The style of *Barton Fink* is also evocative—and representative—of films of the 1930s and '40s. As critic Michael Dunne points out: "Fink's heavy overcoat, his hat, his dark, drab suits come realistically out of the Thirties, but they come even more out of the films of the Thirties." [51] The style of the Hotel Earle and atmosphere of various scenes also reflect the influence of pre-WWII filmmaking. Even Charlie's underwear matches that worn by his filmic hero Jack

Oakie. At the same time, camera techniques used by the Coens in *Barton Fink* represent a combination of the classic with the original. Careful tracking shots and extreme close-ups distinguish the film as a product of the late 20th century.[52]

From the start, the film moves continuously between Barton's subjective view of the world and one which is objective. After the opening credits roll, the camera pans down to Barton, watching the end of his play. Soon we see the audience from his point of view, cheering wildly for him. As he walks forward, he enters the shot and the viewer is returned to an objective point of view. This blurring of the subjective and objective returns in the final scene.[53]

The shifting point of view coincides with the movie's subject matter: filmmaking. The movie begins with the end of a play, and the story explores the process of creation. This metanarrative approach is emphasized by the camera's focus in the first scene on Barton (who is mouthing the words spoken by actors offscreen), not on the play he is watching. As Rowell says: "[T]hrough we listen to one scene, we watch another. . . . The separation of sound and picture shows a crucial dichotomy between two 'views' of artifice: the world created by the protagonist (his play) and the world outside it (what goes in to creating a performance)."[54]

The film also employs numerous foreshadowing techniques. Signifying the probable contents of the package Charlie leaves with Barton, the word "head" appears sixty times in the original screenplay.[55] In a grim nod to later events, Charlie describes his positive attitude toward his "job" of selling insurance: "Fire, theft and casualty are not things that only happen to other people." [56]

[edit] Symbolism

Much has been written about the symbolic meanings of *Barton Fink*. Rowell proposes that it is "a figurative head swelling of ideas that all lead back to the artist".[56] The proximity of the sex scene to Audrey's murder prompts Lyons to insist: "Sex in *Barton Fink* is death." [57] Others have suggested that the second half of the movie is an extended dream sequence.[31]

The Coens, however, have denied any intent to create a systematic unity from symbols in the film. "We never, ever go into our films with anything like that in mind," Joel said in a 1998 interview. "There's never anything approaching that kind of specific intellectual breakdown. It's always a bunch of instinctive things that feel right, for whatever reason." [58] The Coens have noted their comfort with unresolved ambiguity. Ethan said in 1991: "*Barton Fink* does end up telling you what's going on to the extent that it's important to know. . . . What isn't crystal clear isn't intended to become crystal clear, and it's fine to leave it at that." [59] Regarding fantasies and dream sequences, he said:

It is correct to say that we wanted the spectator to share in the interior life of *Barton Fink* as well as his point of view. But there was no need to go too far. For example, it would have been incongruous for *Barton Fink* to wake up at the end of the film and for us to suggest thereby that he actually inhabited a reality greater than what is depicted in the film. In any case, it is always artificial to talk about "reality" in regard to a fictional character.[31]

The homoerotic overtones of Barton's relationship with Charlie are not unintentional. Although one detective demands to know if they had "some sick sex thing", their intimacy is presented as anything but deviant, and cloaked in conventions of mainstream sexuality. Charlie's first friendly overture toward his neighbor, for example, comes in the form of a standard pick-up line: "I'd feel better about the damned inconvenience if you'd let me buy you a drink." [60] The wrestling scene between Barton and Charlie is also cited as an example of homoerotic affection. "We consider that a sex scene," Joel Coen said in 2001.[61]

[edit] Sound and music

Many of the sound effects in *Barton Fink* are laden with meaning. For example,

Barton is summoned by a bell while dining in New York; its sound is light and pleasant. By contrast, the eerie sustained bell of the Hotel Earle rings endlessly through the lobby, until Chet silences it.[62] The nearby rooms of the hotel emit a constant chorus of guttural cries, moans, and assorted unidentifiable noises. These sounds coincide with Barton's confused mental state, and punctuate Charlie's claim that "I hear everything that goes on in this dump".[48] The applause in the first scene foreshadows the tension of Barton's move west, mixed as it is with the sound of an ocean wave crashing<sup>1</sup> an image which is shown onscreen soon thereafter.[63]

Another symbolic sound is the hum of a mosquito. Although his producer insists that these parasites don't live in Los Angeles (since "mosquitos breed in swamps; this is a desert"[65]), its distinctive sound is heard clearly as Barton watches a bug circle overhead in his hotel room. Later, he arrives at meetings with mosquito bites on his face. The insect also figures prominently into the revelation of Audrey's death; Barton slaps a mosquito feeding on her corpse, and suddenly realizes she's been murdered. The high pitch of the mosquito's hum is echoed in the high strings used for the movie's score.[66] During filming, the Coens were contacted by an animal rights group who expressed concern about how mosquitoes would be treated.[64]

The score was composed by Carter Burwell, who has worked with the Coens since their first movie. Unlike earlier projects, however<sup>2</sup> the Irish folk tune used for Miller's Crossing and an American folk song as the basis for Raising Arizona<sup>3</sup> Burwell wrote the music for Barton Fink without a specific inspiration.[67] The score was released in 1996 on a compact disc, combined with the score for the Coens' film Fargo.[68]

Several songs used in the movie are laden with meaning. At one point Mayhew stumbles away from Barton and Audrey, drunk. As he wanders, he hollers the folk song "Old Black Joe". Composed by Stephen Foster, it tells the tale of an elderly slave preparing to join his friends in "a better land". Mayhew's rendition of the song coincides with his condition as an oppressed employee of Capitol Pictures; it foreshadows Barton's own situation at the movie's end.[69]

When he finishes writing his script, Barton celebrates by dancing at a USO show. The song used in this scene is a rendition of "Down South Camp Meeting", a swing tune. Its lyrics (unheard in the movie) state: "Git ready (Sing) / Here they come! The choir's all set." These lines echo the title of Barton's play, Bare Ruined Choirs. As the celebration erupts into a melee, the intensity of the music increases, and the camera zooms into the cavernous hollow of a trumpet. This sequence mirrors the camera's zoom into a sink drain just before Audrey is murdered earlier in the film.[28]

[edit] Sources, inspirations, and allusions

Inspiration for the film came from several sources, and it contains allusions to many different people and events. At one point in the picnic scene, as Mayhew wanders drunkenly away from Barton and Audrey, he calls out: "Silent upon a peak in Darien!" This is the last line from John Keats's 1816 sonnet "On First Looking into Chapman's Homer". The literary reference not only demonstrates the character's knowledge of classic texts, but the poem's reference to the Pacific Ocean matches Mayhew's announcement that he will "jus' walk on down to the Pacific, and from there I'll<sup>4</sup> ... improvise".[70]

The title of Barton's play, Bare Ruined Choirs, comes from line four of Sonnet 73 by William Shakespeare. The poem's focus on aging and death connects to the movie's exploration of artistic difficulty.[71] Other academic allusions are presented elsewhere, often with extreme subtlety. For example, a brief shot of the title page in a Mayhew novel indicates the publishing house of "Swain and Pappas". This is likely a reference to Marshall Swain and George Pappas, philosophers whose work focuses on themes explored in the movie, including the limitations of knowledge and nature of being.[72] One critic notes that Barton's fixation on the stain across the ceiling of his hotel room matches the protagonist's behavior in the short story "The Enduring Chill" by author Flannery O'Connor.[73]

Critics have suggested that the movie indirectly references the work of



writers Dante Alighieri (through the use of Divine Comedy imagery) and Johann Wolfgang von Goethe (through the presence of Faustian bargains).[74] Confounding bureaucratic structures and irrational characters, like those in the novels of Franz Kafka, appear in the film, but the Coens insist the connection was not intended. "I have not read him since college," admitted Joel in 1991, "when I devoured works like *The Metamorphosis*. Others have mentioned *The Castle* and *'In the Penal Colony'*, but I've never read them." [75]

[edit] Clifford Odets

The character of Barton Fink is based loosely on Clifford Odets, a playwright from New York who in the 1930s joined the Group Theatre, a gathering of dramatists which included Harold Clurman, Cheryl Crawford, and Lee Strasberg. Their work emphasized social issues, and employed Stanislavski's system of acting to recreate human experience as truthfully as possible. Several of Odets' plays were successfully performed on Broadway, including *Awake and Sing!* and *Waiting for Lefty* (both in 1935). When public tastes turned away from politically engaged theatre and toward the familial realism of Eugene O'Neill, Odets had difficulty producing successful work, so he moved to Hollywood and spent twenty years writing film scripts.[76]

The Coens wrote with Odets in mind; they imagined Barton Fink as "a serious dramatist, honest, politically engaged, and rather naive".[78] As Ethan said in 1991: "It seemed natural that he comes from Group Theater and the decade of the thirties." [78] Like Odets, Barton believes that the theatre should celebrate the trials and triumphs of everyday people; like Barton, Odets was highly egotistical.[79] In the movie, a review of Barton's play *Bare Ruined Choirs* indicates that his characters face a "brute struggle for existence" ... in the most squalid corners". This wording is similar to the comment of biographer Gerald Weales that Odets' characters "struggle for life amidst petty conditions".[72] Lines of dialogue from Barton's work are reminiscent of Odets' play *Awake and Sing!*. For example, one character declares: "I'm awake now, awake for the first time." Another says: "Take that ruined choir. Make it sing." [80]

However, many important differences exist between the two men. Joel Coen said: "Both writers wrote the same kind of plays with proletarian heroes, but their personalities were quite different. Odets was much more of an extrovert; in fact he was quite sociable even in Hollywood, and this is not the case with Barton Fink!" [78] Although he was frustrated by his declining popularity in New York, Odets was successful during his time in Hollywood. Several of his later plays were adapted ^ by him and others ^ into movies. One of these, *The Big Knife*, matches Barton's life much more than Odets'. In it, an actor becomes overwhelmed by the greed of a movie studio which hires him, and eventually commits suicide.[81] Another similarity to Odets' work is Audrey's death, which mirrors a scene in *Deadline at Dawn*, a 1946 film noir written by Odets. In that film, a character wakes to find that the woman he bedded the night before has been inexplicably murdered.[82]

Odets chronicled his difficult transition from Broadway to Hollywood in his diary, published in 1988 as *The Time Is Ripe: The 1940 Journal of Clifford Odets*. The diary explored Odets' philosophical deliberations about writing and romance. He often invited women into his apartment, and describes many of his affairs in the diary. These experiences, like the extended speeches about writing, are echoed in *Barton Fink* when Audrey visits and seduces Barton at the Hotel Earle.[83] Turturro was the only member of the production who read Odets' *Journal*, however, and the Coen brothers urge audiences to "take account of the difference between the character and the man".[78]

[edit] William Faulkner

Some similarities exist between the character of W.P. Mayhew and novelist William Faulkner. Like Mayhew, Faulkner became known as a preeminent writer of Southern literature, and later worked in the movie business. Like Faulkner, Mayhew is a heavy drinker and speaks contemptuously about Hollywood.[78] Faulkner's name appeared in the Hollywood 1940s history book *City of Nets*, which the Coens read while creating *Barton Fink*. Ethan explained in 1998: "I

read this story in passing that Faulkner was assigned to write a wrestling picture.... That was part of what got us going on the whole Barton Fink thing." [84] Faulkner worked on a 1932 wrestling film called *Flesh*, which starred Wallace Beery, the actor for whom Barton is writing. [85] The focus on wrestling was fortuitous for the Coens, as they participated in the sport in high school. [84]

However, the Coens disavow a significant connection between Faulkner and Mayhew, calling the similarities "superficial". [78] "As far as the details of the character are concerned," Ethan said in 1991, "Mayhew is very different from Faulkner, whose experiences in Hollywood were not the same at all." [78] Unlike Mayhew's inability to write due to drink and personal problems, Faulkner continued to pen novels after working in the movie business, winning several awards for fiction completed during and after his time in Hollywood. [86]

[edit] Jack Lipnick

Lerner's Academy Award-nominated character of studio mogul Jack Lipnick is a composite of several Hollywood producers, including Harry Cohn, Louis B. Mayer, and Jack Warner—three of the most powerful men in the film industry at the time in which *Barton Fink* is set. [87] Like Mayer, Lipnick is originally from the Belarusian capital city Minsk. When World War II broke out, Warner pressed for a position in the military and ordered his wardrobe department to create a military uniform for him; Lipnick does the same in his final scene. Warner once referred to writers as "schmucks with Underwoods", leading to Barton's use in the film of an Underwood typewriter. [88]

At the same time, the Coens stress that the labyrinth of deception and difficulty Barton endures is not based on their own experience. Although Joel has said that artists tend to "meet up with Philistines", he added: "Barton Fink is quite far from our own experience. Our professional life in Hollywood has been especially easy, and this is no doubt extraordinary and unfair." [22] Ethan has suggested that Lipnick—like the men on which he is based—is in some ways a product of his time. "I don't know that that kind of character exists anymore. Hollywood is a little more bland and corporate than that now." [89]

[edit] Cinema

The Coens have acknowledged several cinematic inspirations for *Barton Fink*. Chief among these are three movies by Polish-French filmmaker Roman Polanski: *Repulsion* (1965), *Cul-de-Sac* (1966), and *The Tenant* (1976). These movies employ a mood of psychological uncertainty, coupled with eerie environments that compound the mental instability of the characters. Barton's isolation in his room at the Hotel Earle is frequently compared to that of Trelkovsky in his apartment in *The Tenant*. [90] Ethan said regarding the genre of *Barton Fink*: "[I]t is kind of a Polanski movie. It is closer to that than anything else." [63] By coincidence, Polanski was the head of the jury at the Cannes Film Festival in 1991, where *Barton Fink* first premiered. This created an awkward situation. "Obviously," Joel Coen said later, "we have been influenced by his films, but at this time we were very hesitant to speak to him about it because we did not want to give the impression we were sucking up." [2]

Other works cited as influences for *Barton Fink* include Stanley Kubrick's 1980 film *The Shining* and the 1941 comedy *Sullivan's Travels*, written and directed by Preston Sturges. [91] Set in an empty hotel, Kubrick's movie concerns a writer unable to proceed with his latest work. Although the Coens approve of comparisons to *The Shining*, Joel suggests that Kubrick's film "belongs in a more global sense to the horror film genre". [2] *Sullivan's Travels*, released the year in which *Barton Fink* is set, follows successful director John Sullivan, who decides to create a movie of deep social import—not unlike Barton's desire to create entertainment for "the common man". Sullivan eventually decides that comedic entertainment is a key role for filmmakers, similar to Jack Lipnick's assertion at the end of *Barton Fink* that "the audience wants to see action, adventure". [92]

Additional allusions to films and film history abound in *Barton Fink*. At one point a character discusses "Victor Soderberg"; the name is a reference to

Victor Sjöström, a Swedish director who worked in Hollywood under the name Victor Seastrom.[93] Charlie's line about how his troubles "don't amount to a hill of beans" is a probable homage to the 1942 film *Casablanca*. Another similarity is that of Barton Fink's beach scene to the final moment in 1960's *La Dolce Vita*, wherein a young woman's final line of dialogue is obliterated by the noise of the ocean.[94] The unsettling emptiness of the Hotel Earle has also been compared to the living spaces in *Key Largo* (1948) and *Sunset Boulevard* (1950).[63]

[edit] Themes

Two of the film's central themes — the culture of entertainment production and the writing process — are intertwined and relate specifically to the self-referential nature of the work (as well as the work within the work). It is a movie about a man who writes a movie based on a play, and at the centre of Barton's entire opus is Barton himself. The dialogue in his play *Bare Ruined Choirs* (also the first lines of the film, some of which are repeated at the end of the film as lines in Barton's screenplay *The Burlyman*) give us a glimpse into Barton's self-descriptive art. The mother in the play is named "Lil", which is later revealed to be the name of Barton's own mother. In the play, "The Kid" (a representation of Barton himself) refers to his home "six flights up" — the same floor where Barton resides at the Hotel Earle. Moreover, the characters' writing processes in *Barton Fink* reflect important differences between the culture of entertainment production in New York's Broadway district and Hollywood.[95]

[edit] Broadway and Hollywood

Although Barton speaks frequently about his desire to help create "a new, living theater, of and about and for the common man," he does not recognize that such a theater has already been created: the movies. In fact, he disdains this authentically popular form.[96] On the other hand, the world of Broadway theatre in *Barton Fink* is a place of high culture, where the creator believes most fully that his work embodies his own values. Although he pretends to disdain his own success, Barton believes he has achieved a great victory with *Bare Ruined Choirs*. He seeks praise; when his agent Garland asks if he's seen the glowing review in the *Herald*, Barton says "no", even though his producer had just read it to him. Barton feels close to the theatre, confident that it can help him create work that honors "the common man". The men and women who funded the production — "those people", as Barton calls them — demonstrate that Broadway is just as concerned with profit as Hollywood; but its intimacy and smaller scale allow the author to feel that his work has real value.[97]

Barton does not believe Hollywood offers the same opportunity. In the film, Los Angeles is a world of false fronts and phony people. This is evident in an early line of the screenplay (filmed, but not included in the theatrical release[99]); while informing Barton of Capitol Pictures' offer, his agent tells him: "I'm only asking that your decision be informed by a little realism — if I can use that word and Hollywood in the same breath." [100] Later, as Barton tries to explain why he's staying at the Earle, studio head Jack Lipnick finishes his sentence, recognizing that Barton wants a place that is "less Hollywood". The assumption is that Hollywood is fake and the Earle is genuine. Producer Ben Geisler takes Barton to lunch at a restaurant featuring a mural of the "New York Cafe", a sign of Hollywood's effort to replicate the authenticity of the east coast.[28] Lipnick's initial overwhelming exuberance is also a façade. Although he begins by telling Barton that "the writer is king here at Capitol Pictures", in the penultimate scene he insists: "If your opinion mattered, then I guess I'd resign and let you run the studio. It doesn't, and you won't, and the lunatics are not going to run this particular asylum." [101]

Deception in *Barton Fink* is emblematic of Hollywood's focus on low culture, its relentless desire to efficiently produce formulaic entertainment for the sole purpose of economic gain. Capitol Pictures assigns Barton to write a wrestling picture with superstar Wallace Beery in the leading role. Although Lipnick declares otherwise, Geisler assures Barton that "it's just a B picture". Audrey tries to help the struggling writer by telling him: "Look,

it's really just a formula. You don't have to type your soul into it." [102] This formula is made clear by Lipnick, who asks Barton in their first meeting whether the main character should have a love interest or take care of an orphaned child. Barton shows his iconoclasm by answering: "Both, maybe?" [103] In the end, his inability to conform to the studio's norms destroys Barton. A similar depiction of Hollywood appears in Nathanael West's 1939 novel *The Day of the Locust*, which many critics see as an important precursor to *Barton Fink*. [104] Set in a run-down apartment complex, the book describes a painter reduced to work decorating movie sets. It portrays Hollywood as crass and exploitative, devouring talented individuals in its neverending quest for profit. In both West's novel and *Barton Fink*, protagonists suffer under the oppressive industrial machine of the movie studio. [105]

[edit] Writing

The movie contains further self-referential material, as a film about a writer having difficulty writing (written by the Coen brothers while they were having difficulty writing another project). Barton is trapped between his own desire to create meaningful art and the need of Capitol Pictures to use its standard conventions to earn profits. [103] Audrey's advice about following the formula would save Barton if he heeded it. He does not, but when he puts the mysterious package on his writing desk, she may be helping him posthumously, in other ways. [106] The movie itself toys with standard screenplay formulas. As with Mayhew's scripts, *Barton Fink* contains a "good wrestler" (Barton, it seems) and a "bad wrestler" (Charlie) who "confront" each other at the end. But in typical Coen fashion, the lines of good and evil are blurred, and the supposed hero in fact reveals himself to be deaf to the pleadings of his "common man" neighbor. By blurring the lines between reality and surreal experience, the film subverts the "simple morality tales" and "road maps" offered to Barton as easy paths for the writer to follow. [107]

However, the filmmakers point out that *Barton Fink* is not meant to represent the Coens themselves. "Our life in Hollywood has been particularly easy", they once said. "The film isn't a personal comment." [108] Still, universal themes of the creative process are explored throughout the movie. During the picnic scene, for example, Mayhew asks Barton: "Ain't writin' peace?" Barton pauses, then says: "No, I've always found that writing comes from a great inner pain." [109] Such exchanges led critic William Rodney Allen to call *Barton Fink* "an autobiography of the life of the Coens' minds, not of literal fact". [110]

[edit] Fascism

Several of the film's elements, including the setting at the start of World War II, have led some critics to highlight parallels to the rise of fascism at the time. For example, the detectives who visit Barton at the Hotel Earle are named "Mastrionatti" and "Deutsch" [111] — Italian and German names, evocative of the regimes of Benito Mussolini and Adolf Hitler. Their contempt for Barton is clear: "Fink. That's a Jewish name, isn't it? ... I didn't think this dump was restricted." [112] Later, just before killing his last victim, Charlie says "Heil Hitler". [113] Jack Lipnick hails originally from the Belarusian capital city Minsk, which was occupied from 1941 by the Nazis, following Operation Barbarossa. [114]

"[I]t's not forcing the issue to suggest that the Holocaust hovers over *Barton Fink*", writes biographer Ronald Bergan. [50] Others see a more specific message in the film, particularly Barton's obliviousness to Charlie's homicidal tendencies. Critic Roger Ebert wrote in his 1991 review that the Coens intended to create an allegory for the rise of Nazism. "They paint Fink as an ineffectual and impotent left-wing intellectual, who sells out while telling himself he is doing the right thing, who thinks he understands the 'common man' but does not understand that, for many common men, fascism had a seductive appeal." However, he goes on to say: "It would be a mistake to insist too much on this aspect of the movie...." [116]

Other critics are more demanding. M. Keith Booker writes:

Fink's failure to "listen" seems intended to tell us that many leftist

intellectuals like him were too busy pursuing their own selfish interests to effectively oppose the rise of fascism, a point that is historically entirely inaccurate... That the Coens would choose to level a charge of irresponsibility against the only group in America that actively sought to oppose the rise of fascism is itself highly irresponsible and shows a complete ignorance of (or perhaps lack of interest in) historical reality. Such ignorance and apathy, of course, are typical of postmodern film....[45]

For their part, the Coens deny any intention to present an allegorical message. They chose the detectives' names deliberately, but "we just wanted them to be representative of the Axis world powers at the time. It just seemed kind of amusing. It's a tease. All that stuff with Charlie's the "Heil Hitler!" business'sure, it's all there, but it's kind of a tease."[58] In 2001 Joel responded to a question about critics who provide extended comprehensive analysis: "That's how they've been trained to watch movies. In Barton Fink, we may have encouraged it's like teasing animals at the zoo. The movie is intentionally ambiguous in ways they may not be used to seeing."[117]

[edit] Slavery

Although subdued in dialogue and imagery, the theme of slavery appears several times in the movie. Mayhew's crooning of the spiritual tune "Old Black Joe" depicts him as enslaved to the movie studio, not unlike the song's narrator who pines for "my friends from the cotton fields away".[118] One brief shot of the door to Mayhew's workspace shows the title of the movie he is supposedly writing: Slave Ship. This is a reference to a 1937 movie written by Mayhew's inspiration William Faulkner and starring Wallace Beery, for whom Barton is composing a script in the movie.[118]

The symbol of the slave ship is furthered by specific set designs, including the round window in Ben Geisler's office which resembles a porthole, as well as the walkway leading to Mayhew's bungalow, which resembles the boarding ramp of a watercraft.[118] Several lines of dialogue make clear by the film's end that Barton has become a slave to the studio: "[T]he contents of your head," Lipnick's assistant tells him, "are the property of Capitol Pictures".[119] After Barton turns in his script, Lipnick delivers an even more brutal punishment: "Anything you write will be the property of Capitol Pictures. And Capitol Pictures will not produce anything you write." [4] This contempt and control is representative of the opinions expressed by many writers in Hollywood at the time.[118][120] As Arthur Miller said in his review of Barton Fink: "The only thing about Hollywood that I am sure of is that its mastication of writers can never be too wildly exaggerated." [121]

[edit] "The Common Man"

During the first third of the film, Barton speaks constantly of his desire to lionise "the common man" in his work. In one speech he declares: "The hopes and dreams of the common man are as noble as those of any king. It's the stuff of life's why shouldn't it be the stuff of theater? Goddamnit, why should that be a hard pill to swallow? Don't call it new theater, Charlie; call it real theater. Call it our theater." [122] Yet, despite his rhetoric, Barton is totally unable (or unwilling) to appreciate the humanity of the "common man" living next door to him.[122] Later in the film, Charlie explains that he has brought various horrors upon him because "you DON'T LISTEN!" [123] In his first conversation with Charlie, Barton constantly interrupts Charlie just as he is saying "I could tell you some stories-", demonstrating that despite his fine words he really isn't interested in Charlie's experiences; in another scene, Barton symbolically demonstrates his deafness to the world by stuffing his ears with cotton to block the sound of his ringing telephone.[124]

Barton's position as screenwriter is of particular consequence to his relationship with "the common man". By refusing to listen to his neighbor, Barton cannot validate Charlie's existence in his writing's with disastrous results. Not only is Charlie stuck in a job which demeans him, but he cannot (at least in Barton's case) have his story told.[125] More centrally, the film traces the evolution of Barton's understanding of "the common man": At first he

is an abstraction to be lauded from a vague distance. Then he becomes a complex individual with fears and desires. Finally he shows himself to be a powerful individual in his own right, capable of extreme forms of destruction and therefore feared and/or respected.[126]

The complexity of "the common man" is also explored through the oft-mentioned "life of the mind". While expounding on his duty as a writer, Barton drones: "I gotta tell you, the life of the mind... There's no road map for that territory... and exploring it can be painful. The kind of pain most people don't know anything about." [127] Barton assumes that he is privy to thoughtful creative considerations while Charlie is not. This delusion shares the film's climax, as Charlie runs through the hallway of the Earle, shooting the detectives with a shotgun and screaming: "LOOK UPON ME! I'LL SHOW YOU THE LIFE OF THE MIND!" [128] Charlie's "life of the mind" is no less complex than Barton's; in fact, some critics consider it more so. [129]

Charlie's understanding of the world is depicted as omniscient, as when he asks Barton about "the two lovebirds next door", despite the fact that they are several doors away. When Barton asks how he knows about them, Charlie responds: "Seems like I hear everything that goes on in this dump. Pipes or somethin'." [130] His total awareness of the events at the Earle demonstrate the kind of understanding needed to show real empathy, as described by Audrey. This theme returns when Charlie explains in his final scene: "Most guys I just feel sorry for. Yeah. It tears me up inside, to think about what they're going through. How trapped they are. I understand it. I feel for 'em. So I try to help them out." [131][132]

[edit] Religion

Themes of religious salvation and allusions to Biblical texts appear only briefly in Barton Fink, but their presence pervades the story. While Barton is experiencing his most desperate moment of confusion and despair, he opens the drawer of his desk and finds a Gideon's Holy Bible. He opens it "randomly" to Chapter 2 in the Book of Daniel, and reads from it: "And the king, Nebuchadnezzar, answered and said to the Chaldeans, I recall not my dream; if ye will not make known unto me my dream, and its interpretation, ye shall be cut in pieces, and of your tents shall be made a dunghill." [133] This passage reflects Barton's inability to make sense of his own experiences (wherein Audrey has been "cut in pieces"), as well as the "hopes and dreams" of "the common man". [72] Nebuchadnezzar is also the title of a novel that Mayhew gives to Barton as a "little entertainment" to "divert you in your sojourn among the Philistines". [134]

Mayhew alludes to "the story of Solomon's mammy", a reference to Bathsheba, who gave birth to Solomon after her lover David had her husband Uriah killed. Although Audrey cuts Mayhew off by praising his book (which Audrey herself may have written), the reference foreshadows the love triangle which evolves among the three characters of Barton Fink. Rowell points out that Mayhew is murdered (presumably by Charlie) soon after Barton and Audrey have sex. [135] Another Biblical reference comes when Barton flips to the front of the Bible in his desk drawer, and sees his own words transposed into the Book of Genesis. This is seen as a representation of his hubris as self-conceived omnipotent master of creation, or alternatively as a playful juxtaposition demonstrating Barton's hallucinatory state of mind. [135]

[edit] Reception

Barton Fink premiered in May 1991 at the Cannes Film Festival. Beating competition which included Jacques Rivette's *La Belle Noiseuse*, Spike Lee's *Jungle Fever* and David Mamet's *Homicide*, the Coen brothers' film won three awards: Best Director, Best Actor, and the top prize of *Palme d'Or*. [136] This sweep of awards in major categories at Cannes was extremely rare, and some critics felt that the jury was too generous to the exclusion of other worthy entries. [137] Worried that the triple victory could set a precedent which would undervalue other films, Cannes decided after the 1991 festival to limit each movie to a maximum of two awards. [137] Barton Fink was also nominated for three Academy Awards: Best Actor in a Supporting Role (Lerner), Best Art Direction

(Dennis Gassner, Nancy Haigh), and Best Costume Design (Richard Hornung).[138] Lerner lost to Jack Palance for his role in *City Slickers*; the awards for Art Direction and Costume Design went to *Bugsy*. [139] The film was also nominated for the prestigious Grand Prix of the Belgian Syndicate of Cinema Critics.[140]

*Barton Fink* was an overwhelming critical success. The movie-review aggregator site Rotten Tomatoes lists a 91% favorable rating on its "Tomatometer" (based on 46 reviews). The aggregator Metacritic lists a 69% favorable rating, based on 19 published reviews. The Washington Post critic Rita Kempley described *Barton Fink* as "certainly one of the year's best and most intriguing films".[141] The New York Times critic Vincent Canby called it "an unqualified winner" and "a fine dark comedy of flamboyant style and immense though seemingly effortless technique".[142] Critic Jim Emerson called *Barton Fink* "the Coen brothers' most deliciously, provocatively indescribable picture yet".[143]

Some critics disliked the abstruse plot and deliberately enigmatic ending. Chicago Reader critic Jonathan Rosenbaum warned of the Coens' "adolescent smarminess and comic-book cynicism", and described *Barton Fink* as "a midnight-movie gross-out in Sunday-afternoon art-house clothing".[144] In a 1994 interview, Joel dismissed criticism of unclear elements in their films: "People have a problem dealing with the fact that our movies are not straight-ahead. They would prefer that the last half of *Barton Fink* just be about a screenwriter's writing-block problems and how they get resolved in the real world...."[145] Talk show host Larry King expressed approval of the movie, despite its uncertain conclusion. Writing in *USA Today*, he said: "The ending is something I'm still thinking about and if they accomplished that, I guess it worked." [146]

The movie opened in the United States on eleven screens on August 23, 1991, and earned \$268,561 during its opening weekend. During its theatrical release, *Barton Fink* grossed \$6,153,939 in the United States.[147] That the movie failed to recoup the expenses of production amused film producer Joel Silver, whom the Coens would later work with in *The Hudsucker Proxy*: "I don't think it made \$5 million, and it cost \$9 million to make. [The Coen brothers have] a reputation for being weird, off-center, inaccessible." [148] The film was released in VHS home video format on August 18, 1993,[149] and a DVD edition was made available on May 20, 2003. The DVD contains a gallery of still photos, theatrical trailers, and eight deleted scenes.[150] The film is available on Blu-ray Disc in the UK in a 5-movie Coen Brothers collection, however this collection is region-free and will work in any Blu-ray player.

[edit] Possible sequel

The Coen brothers have stated that they are interested in making a sequel to *Barton Fink* called *Old Fink*. The film would take place in the 1960s, around the same time period as the Coens' *A Serious Man*. "It's the summer of love and [Fink is] teaching at Berkeley. He ratted on a lot of his friends to the House Un-American Activities committee," said Joel Coen. The brothers have stated that they have had talks with John Turturro about reprising his role as Fink, but they are waiting "until he was actually old enough to play the part." [151] Speaking to the Onion A.V. Club in June 2011, Turturro suggested that the sequel would be set in the 1970s and Fink would be a hippie with a large Jewfro.[152] He also said that youâ ll have to wait another 10 years for that, at least.[152]

^ Coen and Coen, p. 21.

^ a b c d Ciment and Niogret, p. 176.

^ Coen and Coen, p. 104.

^ a b Coen and Coen, p. 129.

^ Bergan, pp. 114â ^115.

^ See for example Rowell, p. 104 and Rita Kempley's review in *The Washington Post*.

^ a b c Ciment and Niogret, p. 172.

^ Bergan, p. 115.

^ Allen, p. 60.  
 ^ Quoted in Bergan, p. 140.  
 ^ Quoted in Bergan, p. 130. As a number of critics and journalists have noted, Joel and Ethan sometimes finish each other's sentences. (Actress Kelly MacDonald said in a featurette on the DVD of *No Country for Old Men* that they seem like "one person with two heads".) Thus many quotes in the Bergan biography are attributed to "the Coens".  
 ^ a b c Bergan, p. 130.  
 ^ Ciment and Niogret, p. 177.  
 ^ Quoted in Bergan, p. 115. Note the singular "brain" despite the plural possessive pronoun.  
 ^ Quoted in Bergan, p. 131.  
 ^ Ciment and Niogret, p. 180; Bergan, pp. 138â ^139.  
 ^ a b Bergan, pp. 140â ^141.  
 ^ Quoted in Bergan, p. 139.  
 ^ Ciment and Niogret, p. 191.  
 ^ Yuan, Jada. "Roderick Jaynes, Imaginary Oscar Nominee for â "No Countryâ " New York Entertainment. 22 January 2008. New York magazine. Retrieved on 20 November 2008. The introduction to the screenplay book for *Barton Fink* was written by "Roderick Jaynes"; in a satirical preview, it calls the plot "crushingly tedious".  
 ^ Ciment and Niogret, pp. 179â ^180.  
 ^ a b c d e f Ciment and Niogret, p. 179.  
 ^ Rowell, p. 113; Palmer, pp. 124â ^125.  
 ^ a b Rowell, p. 124.  
 ^ Coen and Coen, p. 14.  
 ^ Coen and Coen, p. 92.  
 ^ Rowell, p. 131.  
 ^ a b c Rowell, p. 130.  
 ^ Coen and Coen, p. 128.  
 ^ Ciment and Niogret, pp. 172â ^173.  
 ^ a b c Ciment and Niogret, p. 175.  
 ^ Rowell, p. 109.  
 ^ Coen and Coen, pp. 132â ^133.  
 ^ Ciment and Niogret, pp. 174â ^175.  
 ^ Dunne, pp. 308â ^309.  
 ^ Howe, Desson. "Barton Fink". The Washington Post. 23 August 1991. The Washington Post Company. Retrieved 20 November 2008.  
 ^ a b Rowell, p. 112.  
 ^ Booker, pp. 144â ^145.  
 ^ Ciment and Niogret, pp. 159â ^168.  
 ^ Rowell, p. 99.  
 ^ a b Allen, p. 56.  
 ^ Rowell, p. 106.  
 ^ Palmer, p. 119.  
 ^ Lyons, p. 85.  
 ^ a b Booker, p. 144.  
 ^ Palmer, p. 107. Emphasis is in Palmer; he does not indicate if it is original or added.  
 ^ Palmer, p. 108.  
 ^ a b Rowell, p. 117.  
 ^ Rowell, p. 129.  
 ^ a b Bergan, p. 44.  
 ^ Dunne, p. 306.  
 ^ Dunne, pp. 306â ^307.  
 ^ Rowell, pp. 107â ^109.  
 ^ Rowell, p. 111.  
 ^ Rowell, p. 116.  
 ^ a b Rowell, p. 115.  
 ^ Lyons, p. 128.



^ a b Allen, p. 94.  
 ^ Allen, p. 58.  
 ^ Rowell, p. 129. She notes that Barton's reply is also sexual: "Okay. A quick one."  
 ^ Allen, p. 179.  
 ^ Rowell, p. 123.  
 ^ a b c Rowell, p. 122.  
 ^ a b Allen, p. 59.  
 ^ Coen and Coen, p. 69.  
 ^ Rowell, p. 121. In an elaborate dissection, she suggests that the mosquito "helps convey the congenital iffyness of 'reality' in fiction". She also notes a similarity to the unlikely presence of flies in a businessman's "airtight" office in *Raising Arizona*.  
 ^ Ciment and Niogret, p. 189.  
 ^ *Fargo/Barton Fink Soundtrack*. Amazon.com. Retrieved on 13 January 2009.  
 ^ Rowell, pp. 126â ^127.  
 ^ Rowell, p. 128. The context of the poem also mirrors Mayhew's condition as a "Silent" artist, unable â ^ or unwilling â ^ to write for a variety of reasons.  
 ^ Lyons, p. 127; Rowell, p. 125.  
 ^ a b c Rowell, p. 125.  
 ^ Allen, p. xv.  
 ^ Booker, p. 143. See also Dunne, p. 310.  
 ^ Ciment and Niogret, pp. 176â ^177.  
 ^ Palmer, pp. 114â ^116.  
 ^ Palmer, pp. 119â ^120.  
 ^ a b c d e f g h Ciment and Niogret, p. 173.  
 ^ Rowell, p. 125. She notes that Odets "purportedly proclaimed to the New York Times that he was the most talented dramatist".  
 ^ Quoted in Palmer, p. 119.  
 ^ Palmer, pp. 116â ^117.  
 ^ Bergan, p. 137.  
 ^ Palmer, pp. 115â ^116.  
 ^ a b Allen, p. 122.  
 ^ Bergan, p. 134; Dunne, p. 306.  
 ^ William Faulkner: Biography. The Nobel Foundation, 1949. Online at Nobelprize.org. Retrieved on 1 December 2008.  
 ^ Bergan, p. 133; Rowell, p. 104.  
 ^ Ciment and Niogret, p. 174; Bergan, p. 134.  
 ^ Allen, p. 145.  
 ^ Allen, p. 56; Palmer, p. 110.  
 ^ Allen, p. xv; Rowell, pp. 122â ^123.  
 ^ Bergan, pp. 137â ^138.  
 ^ Bergan, p. 134.  
 ^ Bergan, p. 141.  
 ^ Rowell, pp. 108â ^110.  
 ^ Peyser, Tom. "Will ã pater les Bourgeois for Food: Peter Sellars in Search of Buyers". reasononline. 19 June 2003.  
 ^ Rowell, p. 106; Palmer, p. 119.  
 ^ Quoted in Rowell, p. 131.  
 ^ It is included as a deleted scene in home video editions.  
 ^ Quoted in Rowell, p. 106.  
 ^ Coen and Coen, p. 128. Original emphasis.  
 ^ Quoted in Palmer, p. 126.  
 ^ a b Palmer, pp. 121â ^122.  
 ^ Palmer, pp. 117â ^119; Rowell, p. 107; Bergan, p. 133.  
 ^ Palmer, pp. 117â ^119. He adds: "While borrowing heavily from West's ideas, Barton Fink notably expands the novelist's critique".  
 ^ Rowell, p. 108. She writes: "Audrey's head ã ... has become his perverse muse".  
 ^ Rowell, pp. 108â ^109.  
 ^ Bergan, p. 131.

^ Coen and Coen, p. 56.  
 ^ Allen, p. xv. Allen's comment is itself a reference to the phrase "life of the mind", used repeatedly in the movie in wildly differing contexts.  
 ^ Coen and Coen, p. 102.  
 ^ Coen and Coen, p. 106.  
 ^ Coen and Coen, p. 122.  
 ^ Rowell, p. 132.  
 ^ Lyons, p. 129.  
 ^ Ebert, Roger. "Barton Fink". Chicago Sun Times. 23 August 1991. Online at rogerebert.com. Retrieved on 4 December 2008.  
 ^ Allen, p. 181.  
 ^ a b c d Rowell, pp. 126â ^128.  
 ^ Coen and Coen, p. 93.  
 ^ Dunne, p. 305.  
 ^ Quoted in Dunne, p. 309.  
 ^ a b Coen and Coen, p. 32. Original emphasis.  
 ^ Coen and Coen, p. 124. All-caps emphasis and exclamation point in the original.  
 ^ Dunne, p. 308.  
 ^ Palmer, p. 118.  
 ^ Palmer, p. 121.  
 ^ Coen and Coen, p. 49. The "life of the mind" phrase does not appear in the screenplay at this time, but is spoken in the movie. The screenplay does include the phrase during Barton's first conversation with his agent Garland, but it is not included in the film.  
 ^ Coen and Coen, p. 120. All-capital letters and multiple exclamation points are in the original text.  
 ^ Palmer, p. 127; Rowell, p. 135.  
 ^ Coen and Coen, p. 65.  
 ^ Rowell, p. 135.  
 ^ Coen and Coen, p. 123.  
 ^ Coen and Coen, p, 100. This wording differs slightly from the King James text.  
 ^ Coen and Coen, p. 54.  
 ^ a b Rowell, p. 126.  
 ^ "Festival de Cannes: Awards 1991". Festival de Cannes website. Retrieved on 9 December 2008.  
 ^ a b Rowell, p. 104; Bergan, p. 143.  
 ^ "The 64th Academy Awards (1992) Nominees and Winners". oscars.org. Archived from the original on 6 July 2011.  
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 ^ Canby, Vincent. "Movie Review: Barton Fink". The New York Times. 21 August 1991. Online at nytimes.com. Retrieved on 9 December 2008.  
 ^ Allen, p. 55.  
 ^ Rosenbaum, Jonathan. "Barton Fink". Chicago Reader. Retrieved on 9 December 2008.  
 ^ Allen, p. 71.  
 ^ Quoted in Rowell, p. 104.  
 ^ "Barton Fink (1991). Box Office Mojo. Retrieved on 10 December 2008.  
 ^ Quoted in Allen, p. 69.  
 ^ "Barton Fink (1991)". VHS product listing on amazon.com. Retrieved on 9 December 2008.

^ "Barton Fink (1991)". DVD product listing on amazon.com. Retrieved on 9 December 2008.  
^ Adam Rosenberg (2009-09-21). "EXCLUSIVE: Coen Brothers Want John Turturro To Get Old For 'Barton Fink' Sequel, 'Old Fink'". MTV.  
<http://moviesblog.mtv.com/2009/09/21/coen-brothers-want-john-turturro-to-get-old-for-barton-fink-sequel-old-fink/>. Retrieved 2009-09-21.  
^ a b "Random Roles:John Turturro". Onion A.V. Club. 2011-06-28.  
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[edit] External links

Films directed  
Other films  
Collaborators

Homer Jay Simpson is a fictional main character that appears in the animated television series The Simpsons as the patriarch of the eponymous family. He is voiced by Dan Castellaneta and first appeared on television, along with the rest of his family, in The Tracey Ullman Show short "Good Night" on April 19, 1987. Homer was created and designed by cartoonist Matt Groening while he was waiting in the lobby of James L. Brooks' office. Groening had been called to pitch a series of shorts based on his comic strip Life in Hell but instead decided to create a new set of characters. He named the character after his father, Homer Groening. After appearing for three seasons on The Tracey Ullman Show, the Simpson family got their own series on Fox that debuted December 17, 1989.

Homer and his wife Marge have three children: Bart, Lisa, and Maggie. As the family's provider, he works at the Springfield Nuclear Power Plant. Homer embodies several American working class stereotypes: he is crude, overweight, incompetent, clumsy, lazy, a heavy drinker, and ignorant; however, he is essentially a decent man and fiercely devoted to his family. Despite the suburban blue-collar routine of his life, he has had a number of remarkable experiences.

In the shorts and earlier episodes, Castellaneta voiced Homer with a loose impression of Walter Matthau; however, during the second and third seasons of the half-hour show, Homer's voice evolved to become more robust, to allow the expression of a fuller range of emotions. He has appeared in other media relating to The SimpsonsÂ â ^ including video games, The Simpsons Movie, The Simpsons Ride, commercials and comic booksÂ â ^ and inspired an entire line of merchandise. His catchphrase, the annoyed grunt "D'oh!", has been included in

The New Oxford Dictionary of English since 1998 and the Oxford English Dictionary since 2001.

Homer is one of the most influential fictional characters on television, having been described by the British newspaper The Sunday Times as "the greatest comic creation of [modern] time". He was named the greatest fictional character "of the last 20 years" in 2010 by Entertainment Weekly, was ranked the second greatest cartoon character by TV Guide, behind Bugs Bunny, and was voted the greatest television character of all time by Channel 4 viewers. For voicing Homer, Castellaneta has won four Primetime Emmy Awards for Outstanding Voice-Over Performance and a special-achievement Annie Award. In 2000, Homer and his family were awarded a star on the Hollywood Walk of Fame.

[edit] Role in The Simpsons

Homer Simpson is the bumbling husband of Marge and father of Bart, Lisa and Maggie Simpson.[1] He is the son of Mona and Abraham Simpson. Homer has held over 188 different jobs in the first 400 episodes of The Simpsons.[2] In most episodes, he works as the Nuclear Safety Inspector at the Springfield Nuclear Power Plant, a position he has held since "Homer's Odyssey", the third episode of the series.[3] At the plant, Homer is often ignored and completely forgotten by his boss Mr. Burns, and constantly falls asleep and neglects his duties. Matt Groening has stated that he decided to have Homer work at the power plant because of the potential for Homer to get cancer.[4] Each of his other jobs has lasted only one episode. In the first half of the series, the writers developed an explanation about how he got fired from the plant and was then rehired in every episode. In later episodes, he often began a new job on impulse, without any mention of his regular employment.[5]

The Simpsons uses a floating timeline in which the characters do not physically age, and, as such, the show is generally assumed to be set in the current year. Nevertheless, in several episodes, events in Homer's life have been linked to specific time periods.[1] "Mother Simpson" (season seven, 1995) depicts Homer's mother, Mona, as a radical who went into hiding in the mid-1960s following a run-in with the law;[6] "The Way We Was" (season two, 1991) shows Homer falling in love with Marge Bouvier as a senior at Springfield High School in the 1970s;[7] and "I Married Marge" (season three, 1991) implies that Marge became pregnant with Bart in 1980.[8] However, the episode "That '90s Show" (season 19, 2008) contradicted much of this backstory, portraying Homer and Marge as a childless couple in the early 1990s.[9]

Homer's age has changed as the series developed; he was 36 in the early episodes,[10] 38 and 39 in season eight,[11] and 40 in the eighteenth season,[12] although even in those seasons his age is inconsistent. [1] During Bill Oakley and Josh Weinstein's period as showrunners, they found that as they aged, Homer seemed to become older too, so they increased his age to 38.[13]

[edit] Character

[edit] Creation

Matt Groening conceived Homer and the rest of the Simpson family in 1986 in the lobby of producer James L. Brooks' office. Groening had been called in to pitch a series of animated shorts for The Tracey Ullman Show, and had intended to present an adaptation of his Life in Hell comic strip. When he realized that animating Life in Hell would require him to rescind publication rights, Groening decided to go in another direction,[14] and hurriedly sketched out his version of a dysfunctional family, naming the characters after members of his own family. Homer was named after Groening's father.[14][15] Very little else of Homer's character was based on him, and to prove that the meaning behind Homer's name was not significant, Groening later named his own son Homer.[16][17] According to Groening, "Homer originated with my goal to both amuse my real father, and just annoy him a little bit. My father was an athletic, creative, intelligent filmmaker and writer, and the only thing he had in common with Homer was a love of donuts"[18] Although Groening has stated in several interviews that Homer's namesake is his father, he also claimed in several 1990 interviews that a character in the 1939 Nathanael West novel The Day of the Locust was the inspiration for naming Homer.[1][19][20] Homer's

middle initial "J", which stands for "Jay",[21] is a "tribute" to animated characters such as Bullwinkle J. Moose and Rocket J. Squirrel from The Rocky and Bullwinkle Show who got their middle initial from Jay Ward.[22][23]

Homer made his debut with the rest of the Simpson family on April 19, 1987, in The Tracey Ullman Show short "Good Night".[24] In 1989, the shorts were adapted into The Simpsons, a half-hour series airing on the Fox Broadcasting Company. Homer and the Simpson family remained the main characters on this new show.[25]

[edit] Design

The entire Simpson family was designed so that they would be recognizable in silhouette.[26] The family was crudely drawn because Groening had submitted basic sketches to the animators, assuming they would clean them up; instead, they just traced over his drawings.[14] Homer's physical features are generally not used in other characters; for example, in the later seasons, no characters other than Homer, Lenny, and Krusty the Clown have a similar beard line.[27] When Groening originally designed Homer, he put his initials into the character's hairline and ear: the hairline resembled an 'M', and the right ear resembled a 'G'. Groening decided that this would be too distracting and redesigned the ear to look normal. However, he still draws the ear as a 'G' when he draws pictures of Homer for fans.[28] The basic shape of Homer's head is described by director Mark Kirkland as a tube-shaped coffee can with a salad bowl on top. Bart's head is also coffee-can shaped, while spheres are used for Marge, Lisa, and Maggie.[29] During the shorts, the animators experimented with the way Homer would move his mouth when talking. At one point, his mouth would stretch out back "beyond his beardline"; but this was dropped when it got "out of control." [30] In some early episodes, Homer's hair was rounded rather than sharply pointed because animation director Wes Archer felt it should look disheveled. Homer's hair evolved to be consistently pointed.[31] During the first three seasons, Homer's design for some close-up shots included small lines which were meant to be eyebrows. Matt Groening strongly disliked them and they were eventually dropped.[31]

In the season seven (1995) episode "Treehouse of Horror VI", Homer was computer animated into a three dimensional character for the first time for the "Homer3" segment of the episode. The computer animation directors at Pacific Data Images worked hard not to "reinvent the character".[32] In the final minute of the segment, the 3D Homer ends up in a real world, live-action Los Angeles. The scene was directed by David Mirkin and was the first time a Simpsons character had been in the real world in the series.[32] Because "Lisa's Wedding" (season six, 1995) is set fifteen years in the future, Homer's design was altered to make him older in the episode. He is heavier; one of the hairs on top of his head was removed; and an extra line was placed under the eye. A similar design has been used in subsequent flashforwards.[33]

Homer's voice is performed by Dan Castellaneta, who voices numerous other characters, including Grampa Simpson, Krusty the Clown, Barney Gumble, Groundskeeper Willie, Mayor Quimby and Hans Moleman. Castellaneta had been part of the regular cast of The Tracey Ullman Show and had previously done some voice-over work in Chicago alongside his wife Deb Lacusta. Voices were needed for the Simpsons shorts, so the producers decided to ask Castellaneta and fellow cast member Julie Kavner to voice Homer and Marge rather than hire more actors.[34][35] In the shorts and first few seasons of the half-hour show, Homer's voice is different from the majority of the series. The voice began as a loose impression of Walter Matthau, but Castellaneta could not "get enough power behind that voice", [35] and could not sustain his Matthau impression for the nine- to ten-hour-long recording sessions and had to find something easier.[2] During the second and third seasons of the half-hour show, Castellaneta "dropped the voice down" [34] and developed it as more versatile and humorous, allowing Homer a fuller range of emotions.[36]

Castellaneta's normal speaking voice has no similarity to Homer's.[37] To perform Homer's voice, Castellaneta lowers his chin to his chest[35] and is said to "let his I.Q. go".[38] While in this state, he has ad-libbed several of Homer's least intelligent comments,[38] such as the line "I am so smart,

s-m-r-t" from "Homer Goes to College" (season five, 1993) which was a genuine mistake made by Castellaneta during recording.[39] Castellaneta likes to stay in character during recording sessions,[40] and he tries to visualize a scene so that he can give the proper voice to it.[41] Despite Homer's fame, Castellaneta claims he is rarely recognized in public, "except, maybe, by a die-hard fan".[40]

"Homer's Barbershop Quartet" (season five, 1993) is the only episode where Homer's voice was provided by someone other than Castellaneta. The episode features Homer forming a barbershop quartet called The Be Sharps; and, at some points, his singing voice is provided by a member of The Dapper Dans.[42] The Dapper Dans had recorded the singing parts for all four members of The Be Sharps. Their singing was intermixed with the normal voice actor's voices, often with a regular voice actor singing the melody and the Dapper Dans providing backup.[43]

Until 1998, Castellaneta was paid \$30,000 per episode. During a pay dispute in 1998, Fox threatened to replace the six main voice actors with new actors, going as far as preparing for casting of new voices.[44] However, the dispute was soon resolved and he received \$125,000 per episode until 2004 when the voice actors demanded that they be paid \$360,000 an episode.[44] The issue was resolved a month later,[45] and Castellaneta earned \$250,000 per episode.[46] After salary re-negotiations in 2008, the voice actors receive approximately \$400,000 per episode.[47] Three years later, with Fox threatening to cancel the series unless production costs were cut, Castellaneta and the other cast members accepted a 30 percent pay cut, down to just over \$300,000 per episode.[48]

[edit] Character development

Executive producer Al Jean notes that in The Simpsons' writing room, "everyone loves writing for Homer", and many of his adventures are based on experiences of the writers.[49] In the early seasons of the show, Bart was the main focus. But, around the fourth season, Homer became more of the focus. According to Matt Groening, this was because "With Homer, there's just a wider range of jokes you can do. And there are far more drastic consequences to Homer's stupidity. There's only so far you can go with a juvenile delinquent. We wanted Bart to do anything up to the point of him being tried in court as an adult. But Homer is an adult, and his boneheaded-ness is funnier. [...] Homer is launching himself headfirst into every single impulsive thought that occurs to him." [18]

Homer's behavior has changed a number of times through the run of the series. He was originally "very angry" and oppressive toward Bart, but these characteristics were toned down somewhat as his persona was further explored.[50] In early seasons, Homer appeared concerned that his family was going to make him look bad; however, in later episodes he was less anxious about how he was perceived by others.[51] In the first several years, Homer was often portrayed as sweet and sincere, but during Mike Scully's tenure as executive producer (seasons nine, 1997 to twelve, 2001), he became more of "a boorish, self-aggrandizing oaf".[52] Chris Suellentrop of Slate wrote, "under Scully's tenure, The Simpsons became, well, a cartoon. [...] Episodes that once would have ended with Homer and Marge bicycling into the sunset [...] now end with Homer blowing a tranquilizer dart into Marge's neck." [53] Fans have dubbed this incarnation of the character "Jerkass Homer".[54][55][56] At voice recording sessions, Dan Castellaneta has rejected material written in the script that portrayed Homer as being too mean. He believes that Homer is "boorish and unthinking, but he'd never be mean on purpose." [57] When editing The Simpsons Movie, several scenes were changed or otherwise toned down to make Homer more sympathetic.[58]

The writers have made Homer's intelligence appear to decline over the years; they explain this was not done intentionally, but it was necessary to top previous jokes.[59] For example, in "When You Dish Upon a Star", (season 10, 1998) the writers included a scene where Homer admits that he cannot read. The writers debated including this plot twist because it would contradict previous

scenes in which Homer does read, but eventually they decided to keep the joke because they found it humorous. The writers often debate how far to go in portraying Homer's stupidity; one suggested rule is that "he can never forget his own name".[60]

#### [edit] Personality

The comic efficacy of Homer's personality lies in his frequent bouts of stupidity and laziness, and his explosive anger. He has a low intelligence level and is described by director David Silverman as "creatively brilliant in his stupidity".[61] Homer also shows immense apathy towards work, is overweight, and "is devoted to his stomach".[61] His short attention span is evidenced by his impulsive decisions to engage in various hobbies and enterprises, only to "change ... his mind when things go badly".[61] Homer often spends his evenings drinking Duff Beer at Moe's Tavern, and was shown in the episode "Duffless" (season four, 1993) as a full-blown alcoholic.[62] He is very envious of his neighbors, Ned Flanders and his family, and is easily enraged by Bart. Homer will often strangle Bart on impulse in a cartoonish manner. The first instance of Homer strangling Bart was in the short "Family Portrait". According to Matt Groening, the rule was that Homer could only strangle Bart impulsively, never with pre-meditation,[63] because doing so "seems sadistic. If we keep it that he's ruled by his impulses, then he can easily switch impulses. So, even though he impulsively wants to strangle Bart, he also gives up fairly easily." [18] Another of the original ideas entertained by Groening was that Homer would "always get his comeuppance or Bart had to strangle him back", but this was dropped.[64] Homer shows no compunction about expressing his rage, and does not attempt to hide his actions from people outside the family.[61] While Homer has repeatedly upset people and caused all sorts of mayhem in Springfield, these events usually result from a lack of foresight or his intense temper, matched with his impulsivity, rather than any malice. Except for expressing annoyance at Ned Flanders, Homer's destructive actions are usually unintentional.

Homer has complex relationships with all three of his children. He often berates Bart, but the two commonly share adventures and are sometimes allies; some episodes, particularly in later seasons, show that the pair have a strange respect for each other's cunning. Homer and Lisa have opposite personalities and he usually overlooks Lisa's talents, but when made aware of his neglect, does everything he can to help her. While Homer's thoughtless antics often upset his family, he has also revealed himself to be a caring father and husband: in "Lisa the Beauty Queen", (season four, 1992) he sold his cherished ride on the Duff blimp and used the money to enter Lisa in a beauty pageant so she could feel better about herself; [10] in "Rosebud", (season five, 1993) he gave up his chance at wealth to allow Maggie to keep a cherished teddy bear; [65] in "Radio Bart", (season three, 1992) he spearheaded an attempt to dig Bart out after he had fallen down a well; [66] and in "A Milhouse Divided", (season eight, 1996) he arranged a surprise second wedding with Marge to make up for their unsatisfactory first ceremony. [67] Homer, however, has a poor relationship with his father Abraham "Grampa" Simpson, whom he placed in a nursing home as soon as he could. [68] The Simpson family will often do their best to avoid unnecessary contact with Grampa, but Homer has shown feelings of love for his father from time to time. [69]

Homer is "a (happy) slave to his various appetites", [70] and would gladly sell his soul to the devil in exchange for a single doughnut. [71] He has an apparently vacuous mind but at times exhibits a surprising depth of knowledge about various subjects, such as the composition of the Supreme Court of the United States, [72] Incan mythology, [73] bankruptcy law, [74] and cell biology. [75] Homer's brief periods of intelligence are overshadowed, however, by much longer and consistent periods of ignorance, forgetfulness, and stupidity. Homer has a low IQ of 55 which has variously been attributed to the hereditary "Simpson Gene" (which eventually causes every male member of the family to become incredibly stupid), [76] his alcohol problem, exposure to radioactive waste, repetitive cranial trauma, [77] and a crayon lodged in the frontal lobe of his

brain.[78] In the episode "HOMR" (season 12, 2001) Homer gets surgery to remove the (newly discovered) crayon from his brain, boosting his IQ to 105, but although he bonds very well with Lisa, his newfound capacity for understanding and reason makes him less happy and he gets Moe to reinsert a crayon, causing his intelligence to return to its previous level.[78] Homer often debates with his own mind, which is expressed in voiceover. His brain has a record of giving him dubious advice, sometimes helping him make the right decisions, but often failing spectacularly. It has even become completely frustrated and, through sound effects, walked out on him,[79] Homer's conversations with his brain were used several times during the fourth season, but were later phased out after the producers "used every possible permutation".[80] These exchanges were often introduced because they filled time and were easy for the animators to work on.[80]

[edit] Reception

[edit] Commendations

Homer's influence on comedy and culture has been significant. In 2010, Entertainment Weekly named Homer "the greatest character of the last 20 years." [81] He was placed second on TV Guide's 2002 Top 50 Greatest Cartoon Characters, behind Bugs Bunny; [82] fifth on Bravo's 100 Greatest TV Characters, one of only four cartoon characters on that list; [83] and first in a Channel 4 poll of the greatest television characters of all time. [84] In 2007, Entertainment Weekly placed Homer ninth on their list of the "50 Greatest TV icons" and first on their 2010 list of the "Top 100 Characters of the Past Twenty Years". [85] [86] [87] Homer was also the runaway winner in British polls that determined who viewers thought was the "greatest American" [88] and which fictional character people would like to see become the President of the United States. [89] His relationship with Marge was included in TV Guide's list of "The Best TV Couples of All Time". [90]

Dan Castellaneta has won several awards for voicing Homer, including four Primetime Emmy Awards for "Outstanding Voice-Over Performance" in 1992 for "Lisa's Pony", 1993 for "Mr. Plow", [91] in 2004 for "Today I Am a Clown", [92] and in 2009 for "Father Knows Worst". [93] Although in the case of "Today I Am a Clown", it was for voicing "various characters" and not solely for Homer. [92] In 2010, Castellaneta received a fifth Emmy nomination for voicing Homer and Grampa in the episode "Thursdays with Abie". [94] In 1993, Castellaneta was given a special Annie Award, "Outstanding Individual Achievement in the Field of Animation", for his work as Homer on The Simpsons. [95] [96] In 2004, Castellaneta and Julie Kavner (the voice of Marge) won a Young Artist Award for "Most Popular Mom & Dad in a TV Series". [97] In 2005, Homer and Marge were nominated for a Teen Choice Award for "Choice TV Parental Units". [98] Various episodes in which Homer is strongly featured have won Emmy Awards for Outstanding Animated Program, including "Homer vs. Lisa and the 8th Commandment" in 1991, "Lisa's Wedding" in 1995, "Homer's Phobia" in 1997, "Trash of the Titans" in 1998, "HOMR" in 2001, "Three Gays of the Condo" in 2003 and "Eternal Moonshine of the Simpson Mind" in 2008. [91] In 2000, Homer and the rest of the Simpson family were awarded a star on the Hollywood Walk of Fame located at 7021 Hollywood Boulevard. [99]

[edit] Analysis

Homer Simpson is an "everyman" and embodies several American stereotypes of working class blue-collar men: he is crude, overweight, incompetent, clumsy and a borderline alcoholic. [1] Matt Groening describes him as "completely ruled by his impulses". [100] Dan Castellaneta calls him "a dog trapped in a man's body", adding, "He's incredibly loyal - not entirely clean - but you gotta love him." [35] In his book Planet Simpson, author Chris Turner describes Homer as "the most American of the Simpsons" and believes that while the other Simpson family members could be changed to other nationalities, Homer is "pure American". [101] In the book God in the Details: American Religion in Popular Culture, the authors comment that "Homer's progress (or lack thereof) reveals a character who can do the right thing, if accidentally or begrudgingly." [102] The book The Simpsons and Philosophy: The D'oh! of Homer includes a chapter



analyzing Homer's character from the perspective of Aristotelian virtue ethics. Raja Halwani writes that Homer's "love of life" is an admirable character trait, "for many people are tempted to see in Homer nothing but buffoonery and immorality. [...] He is not politically correct, he is more than happy to judge others, and he certainly does not seem to be obsessed with his health. These qualities might not make Homer an admirable person, but they do make him admirable in some ways, and, more importantly, makes us crave him and the Homer Simpsons of this world." [103] In 2008, Entertainment Weekly justified designating The Simpsons as a television classic by stating, "we all hail Simpson patriarch Homer because his joy is as palpable as his stupidity is stunning". [104]

In the season eight episode "Homer's Enemy" the writers decided to examine "what it would be like to actually work alongside Homer Simpson". [105] The episode explores the possibilities of a realistic character with a strong work ethic named Frank Grimes placed alongside Homer in a work environment. In the episode, Homer is portrayed as an everyman and the embodiment of the American spirit; however, in some scenes his negative characteristics and silliness are prominently highlighted. [106] [107] By the end of the episode, Grimes, a hard working and persevering "real American hero", is relegated to the role of antagonist; the viewer is intended to be pleased that Homer has emerged victorious. [106]

In Gilligan Unbound, author Paul Arthur Cantor states that he believes Homer's devotion to his family has added to the popularity of the character. He writes, "Homer is the distillation of pure fatherhood. [...] This is why, for all his stupidity, bigotry and self-centered quality, we cannot hate Homer. He continually fails at being a good father, but he never gives up trying, and in some basic and important sense that makes him a good father." [108] The Sunday Times remarked "Homer is good because, above all, he is capable of great love. When the chips are down, he always does the right thing by his children—he is never unfaithful in spite of several opportunities." [57]

[edit] Cultural influence

Homer Simpson is one of the most popular and influential television characters in a variety of standards. USA Today cited the character as being one of the "top 25 most influential people of the past 25 years" in 2007, adding that Homer "epitomized the irony and irreverence at the core of American humor." [109] Robert Thompson, director of Syracuse University's Center for the Study of Popular Television believes that "three centuries from now, English professors are going to be regarding Homer Simpson as one of the greatest creations in human storytelling." [110] Animation historian Jerry Beck described Homer as one of the best animated characters, saying, "you know someone like it, or you identify with (it). That's really the key to a classic character." [82] Homer has been described by The Sunday Times as "the greatest comic creation of [modern] time". The article remarked, "every age needs its great, consoling failure, its lovable, pretension-free mediocrity. And we have ours in Homer Simpson." [57]

Homer has been cited as a bad influence on children; for example, in 2005 a survey conducted in the United Kingdom found that 59% of parents felt that Homer promoted an unhealthy lifestyle. [111] A five-year study of more than 2,000 middle-aged people in France found a possible link between weight and brain function, the findings of which were dubbed the "Homer Simpson syndrome". [112] Results from a word memory test showed that people with a Body mass index (BMI) of 20 (considered to be a healthy level) remembered an average of nine out of 16 words. Meanwhile, people with a BMI of 30 (inside the obese range) remembered an average of just seven out of 16 words. [112]

Despite Homer's embodiment of American culture, his influence has spread to other parts of the world. In 2003, Matt Groening revealed that his father, after whom Homer was named, was Canadian, and said that this made Homer himself a Canadian. [113] The character was later made an honorary citizen of Winnipeg, Canada, in real life because Homer Groening was believed to be from the Manitoba capital, although sources say the senior Groening was actually born in

Saskatchewan.[114] In 2007, an image of Homer was painted next to the Cerne Abbas giant in Dorset, England as part of a promotion for The Simpsons Movie. This caused outrage among local neopagans who performed "rain magic" to try to get it washed away.[115] In 2008, a fake Spanish euro coin was found in Avilã@s, Spain, with the face of Homer replacing the figure of King Juan Carlos I.[116] On April 9, 2009, the United States Postal Service unveiled a series of five 44 cent stamps featuring Homer and the four other members of the Simpson family. They are the first characters from a television series to receive this recognition while the show is still in production.[117] The stamps, designed by Matt Groening, were made available for purchase on May 7, 2009.[118][119]

Homer has appeared, voiced by Castellaneta, in several other television shows, including the sixth season of American Idol where he opened the show;[120]The Tonight Show with Jay Leno where he performed a special animated opening monologue for the July 24, 2007, edition;[121] and the 2008 fundraising television special Stand Up to Cancer where he was shown having a colonoscopy.[122]

Homer's catchphrase, the annoyed grunt "D'oh!", is typically uttered when he injures himself, realizes that he has done something stupid, or when something bad has happened or is about to happen to him. During the voice recording session for a Tracey Ullman Show short, Homer was required to utter what was written in the script as an "annoyed grunt". Dan Castellaneta rendered it as a drawn out "d'ooooooh". This was inspired by Jimmy Finlayson, the mustachioed Scottish actor who appeared in 33 Laurel and Hardy films. Finlayson had used the term as a minced oath to stand in for the word "Damn!" Matt Groening felt that it would better suit the timing of animation if it were spoken faster. Castellaneta then shortened it to a quickly uttered "D'oh!"[123] The first intentional use of D'oh! occurred in the Ullman short "The Krusty the Clown Show",[123] (1989) and its first usage in the series was in the series premiere, "Simpsons Roasting on an Open Fire".[124]

"D'oh!" was first added to The New Oxford Dictionary of English in 1998. It is defined as an interjection "used to comment on an action perceived as foolish or stupid".[125] In 2001, "D'oh!" was added to the Oxford English Dictionary, without the apostrophe.[126] The definition of the word is "expressing frustration at the realization that things have turned out badly or not as planned, or that one has just said or done something foolish".[127] In 2006, "D'oh!" was placed in sixth position on TV Land's list of the 100 greatest television catchphrases.[128][129] "D'oh!" is also included in The Oxford Dictionary of Quotations.[130] The book includes several other quotations from Homer, including "Kids, you tried your best and you failed miserably. The lesson is never try", from "Burns' Heir" (season five, 1994) as well as "Kids are the best, Apu. You can teach them to hate the things you hate. And they practically raise themselves, what with the Internet and all", from "Eight Misbehavin'" (season 11, 1999). Both quotes entered the dictionary in August 2007.[131]

[edit] Merchandising

Homer's inclusion in many Simpsons publications, toys, and other merchandise is evidence of his enduring popularity. The Homer Book, about Homer's personality and attributes, was released in 2004 and is commercially available.[132][133] It has been described as "an entertaining little book for occasional reading"[134] and was listed as one of "the most interesting books of 2004" by The Chattanooga.[135] Other merchandise includes dolls, posters, figurines, bobblehead dolls, mugs, alarm clocks, jigsaw puzzles, Chia Pets, and clothing such as slippers, T-shirts, baseball caps, and boxer shorts.[136] Homer has appeared in commercials for Coke, 1-800-COLLECT, Burger King, Butterfinger, C.C. Lemon, Church's Chicken, Domino's Pizza, Intel, Kentucky Fried Chicken, Ramada Inn, Subway and T.G.I. Friday's. In 2004, Homer starred in a MasterCard Priceless commercial that aired during Super Bowl XXXVIII.[137] In 2001, Kellogg's launched a brand of cereal called "Homer's Cinnamon Donut Cereal", which was available for a limited time.[133][138] In June 2009, Dutch automotive navigation systems manufacturer TomTom announced that Homer would be

added to its downloadable GPS voice lineup. Homer's voice, recorded by Dan Castellaneta, features several in-character comments such as "Take the third right. We might find an ice cream truck! Mmm... ice cream." [139]

Homer has appeared in other media relating to The Simpsons. He has appeared in every one of The Simpsons video games, including the most recent, The Simpsons Game. [140] Alongside the television series, Homer regularly appears in issues of Simpsons Comics, which were first published on November 29, 1993, and are still issued monthly. [141][142] Homer also plays a role in The Simpsons Ride, launched in 2008 at Universal Studios Florida and Hollywood. [143]

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Amador Valley High School is a public high school in Pleasanton, California, United States, a city east of San Francisco. The school was founded as Amador Valley Joint Union High School (AVJUHS), from which its first class graduated in 1923. The school has been named a California Distinguished School, a National School of Character, and a National Blue Ribbon School. Amador Valley is one of four high schools in the Pleasanton Unified School District, which includes Foothill High School, Village High School, and Horizon High School.

As of 2009, Amador Valley offered its 2,500Â students 20Â Advanced Placement courses, 23Â varsity sports, a program to study local aquatic wildlife, and vocational training. A monthly school publication, the Amadon, reports on athletics, academic and extracurricular issues, and news of the school and community. Amador's location allows it to be the launching point for parades and to host the site of the Amador Theater, Pleasanton's central performing arts facility for more than 60 years. The Amador Theater has remained a part of the Amador Valley campus since the 1930s, despite major school construction in 1968, 1997, and 2004.

Student groups, including the Marching Band and Math Team, have toured out-of-state after achieving high rankings in Californian competitions. In

national competitions such as We the People: The Citizen and the Constitution, the Amador Valley team has ranked in the top four places from 1994-1996, 2006 to 2009, and 2011. Similarly, the Amador Valley Robotics Team is recognized nationally as the only high-school team in the autonomous underwater vehicle (AUV) competition hosted by the Association for Unmanned Vehicle Systems International (AUVSI).

[edit] History

[edit] Region and districts

Amador Valley High School, originally Amador Valley Joint Union High School,[3] was named for its location in the Amador Valley (part of the Tri-Valley area of the San Francisco East Bay). The valley's namesake was a wealthy Californio rancher, Don Jos   Mar  a Amador.[4] The school was founded on March 14, 1922, as part of the Amador Valley Joint Union High School District (AVJUHSD), out of concerns of overcrowding and transportation for students traveling to nearby Livermore High School. Amador Valley's first class graduated in 1923.[5][6]

From 1922 to 1988, the school was part of the AVJUHSD.[3][7] Originally this district also taught students from nearby Dublin and served the local rural community.[8] In the late 1930s, the Amador Theater was built towards the front of the Amador Valley High School campus. The theater hosted school plays, band concerts, performances, lectures, and assemblies, and was the former home of the successful community theater group Cask and Mask, now known as The Masquers.[9] The Federal Aid Highway Act of 1956 led to the building of a series of freeways in the region, which led to increased population and an increase in student enrollment.[10][11]

In 1988, voters approved the unification of several school districts in the region. On July 1, 1988, the AVJUHSD merged with the Pleasanton Joint School District to form the Pleasanton Unified School District.[12][13] As of 2009, the district contained two comprehensive high schools (Amador Valley and Foothill), two continuation high schools (Horizon and Village), three middle schools, seven elementary schools, and an adult education program.[14]

The school grounds are bordered on the east and southeast by Santa Rita Road, a Union Pacific railroad track on which the Altamont Commuter Express runs, and Arroyo del Valle.[15] To the north are several businesses and residential districts lie on the western border. The school is the launch point for the annual Pleasanton Hometown Holidays Celebration Parade and the annual Fall Festival Parade, a part of the Alameda County Fair since the 1940s. The Fall Festival parade, which features bands, floats, balloons, horses, and antique cars, starts on the Amador Valley parking lot, travels down Main Street, and ends near the fairgrounds.[16][17]

[edit] Court battle

In 1978, the AVJUHSD challenged the constitutionality of California Proposition   13, which placed a cap on county real estate taxes. The proposition limited property tax assessments to the 1975 standard, eliminating \$7 billion of the \$11.4 billion in property tax revenue collected each year. According to the Washington Post, the "severe" limitations this imposed on state funding forced local governments and most school districts in California to make "drastic cutbacks".[18] Furthermore, an article in the Los Angeles Times noted that Federal aid money for Californian schools, worth about \$98 million each year, may be reduced if state-funded programs are cut. A recent Congressional report had found that Proposition 13 would not result in any major "local spending" cuts. In order to receive Federal aid, the state needed to maintain present levels of spending on local programs or secure local matching funds. However, the enforcement of this spending was "flexible in many programs" and the Federal Impact Aid program for schools was therefore in jeopardy.[19]

The district held that the measure was "so drastic and far-reaching that it was 'a revision' of the state Constitution and not a mere amendment". Ultimately, the district was unsuccessful in its suit. In their ruling, the judges distinguished between "amendment" and "revision." The court confirmed that an initiative cannot "revise" the constitution; Proposition   13, however,

was an amendment to the California Constitution and not a "revision".[20] In 2009, Amador Valley was cited by dissenting Justice Carlos R. Moreno in arguing the non-constitutionality of California Proposition 8.[21]

[edit] Development

The first class of eight students graduated in 1923, and the school quickly became known for its municipal bands and sports teams, along with their beautiful cheerleaders.[22] The school selected the Don as its mascot, in honor of the title used by Amador;[4] Don is a Spanish term used as a mark of high esteem for a distinguished nobleman or gentleman.

Parents of Amador Valley students became involved with student activities. In 1927, Pleasanton mothers decided to start a school lunch program to provide students with a better environment for learning. Parents donated pots and pans, and a newly hired cook prepared lunches, to be eaten at new tables and benches. The tables and benches were constructed by the custodian and the music teacher from wood of horse stalls formerly on the campus. This project led to the formation of a Parent-Teacher Association (PTA) chapter at Amador Valley in the late 1920s.[23]

Much of the original Amador Valley High School building was reconstructed in 1968. The following year, the school reached its maximum capacity, about 1,895 students. To accommodate the larger student population, Dublin High School was founded. Both schools held classes on the Amador Valley campus during the 1968-69 school year.[24] A continued influx of families to the Pleasanton region prompted the foundation of another high school, Foothill, in 1973.[5]

Starting November 3 in 1986, Amador Valley teachers went on a rolling strike to "protest a breakdown in negotiations for a new contract." [26] The school brought in substitutes to replace the picketing teachers.[26] Amador Valley teachers are unionized under the California Teachers Association and the National Education Association.[27]

In March 1997, the city passed Measure B, which granted the school district \$69 million dollars to replace old and crowded facilities and modernize the school campus.[25] The renovations revived one of the school's last original structures: the Amador Theater, the city's most popular performing arts facility.[5][9] The measure enabled the addition of renovated science classrooms, a multipurpose room, a library and media center, and a sound-proofed music building. The parking lot and central quad were expanded, with more than 550 parking spaces in the new lot, and classrooms were equipped to be more energy efficient.[28]

In 1999, responding to a directive from the California Superintendent of Education, the district identified character education as one of its goals.[29] As selected by the community, six character traits (responsibility, compassion, self-discipline, honesty, respect, and integrity) were listed as "expected behaviors" for Pleasanton. In 2004, Amador Valley and the school district won national recognition (National School of Character) for its program emphasizing the Community of Character.[13]

In 2004, a new two-story building was completed, containing twenty-four new classrooms. The following year, the Charles "Chuck" Volonte Aquatic Center was built for Amador Valley's swimming, diving, and water polo teams. Lighting retrofits were added in December 2004 for improved energy efficiency and illumination.[28] In 2005, Amador Valley High School was the first high school to join the worldwide Go Green Initiative. In the same year, Pleasanton was selected as the "Go Green City of the Year." [30]

[edit] Academics

As of 2012, Amador Valley operates on a 7:00 a.m. to 3:00 p.m. schedule. Most students do not take first period, with their schedules starting at 8:00 a.m. This includes seven periods of instruction, a lunch, and a brunch.[31] Amador Valley is a closed campus; students are not allowed to leave school supervision during school hours.[2]

Enrollment trends, 1993-present

Year

Student body size

1993â ^1994

1638

1994â ^1995

1699

1995â ^1996

1794

1996â ^1997

1809

1997â ^1998

1841

1998â ^1999

1914

1999â ^2000

1921

2000â ^2001

1927

2001â ^2002

2000

2002â ^2003

2019

2003â ^2004

2166

2004â ^2005

2338

2005â ^2006

2450

2006â ^2007

2552

2007â ^2008

2597

2008â ^2009

2517

2009â ^2010

2591

2010â ^2011

2592

2011â ^2012

2636

Enrollment by ethnicity (11-12)

Ethnicity

Number

Percent

American Indian or Alaska Native

22

0.8

Asian

648

24.6

Pacific Islander

6

0.2

Filipino

76

2.9

Hispanic or Latino

210

8.0

African American

50

1.9

White  
1591  
60.4  
Multiple or No Response  
33  
1.3  
Total  
2636  
100  
Enrollment by grade (11-12)  
Grade  
Number  
Percent  
9 (Class of 2015)  
685  
26.0  
10 (Class of 2014)  
678  
25.7  
11 (Class of 2013)  
656  
24.9  
12 (Class of 2012)  
617  
23.4  
Total  
2636  
100

[edit] Enrollment

In the 2011-12 school year, Amador Valley High School had an enrollment of 2,623 students and 170 faculty members, for a student-faculty ratio of 15:1.[32] The student population at Amador Valley is predominantly White, with a large Asian minority and Hispanic and Latino Americans and African American minorities.[33] Seven percent of Amador Valley students are involved in special education, three percent qualify for English language learner support, and two percent qualify for free or reduced price lunch.[2]

[edit] Awards

The school has been deemed a three-time California Distinguished School,[35] a National School of Character,[36] and a two-time National Blue Ribbon School.[37] Performance results for 2008 show Amador Valley with an Academic Performance Index (API) of 10 on a 10-point scale.[2]The Daily Beast/Newsweek ranked Amador Valley High School 238th in its 2012 list of the 1,000 Best High Schools in America.[38] In 2008, a team of Amador Valley students won the national UNICEF-sponsored Junior 8 Competition. The team traveled to Toyako, Japan to attend the 2008 Group of Eight (G8) Summit of World Leaders to collaborate on solutions to world problems.[39] Eight of Amador Valley's teachers--Mark Aubel, Debbie Emerson, Jon Grantham, Tom Hall, Debbie Harvey, Brian Ladd, Marla Silversmith, and Eric Thiel have been recognized as a Pleasanton Unified School District teacher of the year; one of those honorees, Brian Ladd, was also been designated an Alameda County teacher of the year.[40][41][42][43][44]

[edit] Programs

As of 2009, Amador Valley curriculum offered 20 Advanced Placement (AP) classes, the most popular of which are AP Psychology, AP English Language and Composition, AP Calculus, AP Government, and AP United States History.[28] Nearly half of Amador Valley students participate in the school's AP Program. The average participant takes 4.3 exams per year and 87.5 percent of students receive at least one score of 3 or greater.[45] The school offers the complete range of AP courses in the STEM fields (science, technology, engineering, mathematics), as well as AP Language courses and their literature complements

in English, French, German, Japanese, and Spanish. Amador Valley also offers AP courses in social sciences and visual and performing arts.[28]

The school offers specialized instruction through vocational education as part of the valley-wide Regional Occupational Program. Courses offered include computer-assisted drafting, electronics, welding, medical training, and auto body repair.[46]

The Amador Valley science department initiated Project Creek Watch in 1994. The project provides students with resources for the long term study of Arroyo del Valle; these resources include information about the chemistry in the creek, images of the creek, a guide to flora and fauna, and student projects on aquatic species. "The goal is to let kids realize there are a number of different physical and biological components that allow these organisms (in the creek) to coexist," said Eric Thiel, an Amador Valley Biology teacher and a co-founder of the project. "I hope they walk away able to see how complex ecosystems are." [47] In 1999, the project received a Golden Bell Award for excellence in education from the California School Boards Association. Research projects about the creek and other topics have won first place awards at the Tri-Valley Science and Engineering Fair.[48][49][50] In 2001, Thiel and the school received a National Semiconductor "Internet Innovator Award" for the Project Creek Watch website.[51]

#### [edit] Athletics

As of 2009, the school offered 12½ varsity sports teams for boys and 11½ varsity sports teams for girls. These sports are run under the Amador Valley Athletics Boosters and include baseball, basketball, cross country, football, golf, lacrosse, soccer, softball, spirit squad, swimming/diving, tennis, track, volleyball, water polo and wrestling.[52] Amador Valley competes in the East Bay Athletic League and has won four East Bay Athletic League Championships.[28][53]

The Amador Valley Booster Club also has hosted East Bay Special Olympics basketball tournaments, track meets, and volleyball competitions at Amador Valley High School since 2004.[54] The school coordinates parent and student volunteers, donates proceeds from snack sales, and provides facilities free of charge for three Special Olympic events: basketball, track, and volleyball. In 2006, the Amador Valley Booster Club won "Volunteer Organization of the Year" from Special Olympics Northern California.[55] In 2009, the Booster Club provided over 200 volunteers to help with the logistics of the competition.[56]

The Amador Valley Varsity Boys' and Girls' basketball teams both host an annual eight-team basketball tournament, the Amador Basketball Classic (ABC), in the first two weeks of December. The ABC brings high school basketball players and teams from within the state and outside of the state to play in Pleasanton. Each team plays four games between Wednesday and Saturday.[57] Taking place every year since December 1961, the ABC is the longest-running eight-team basketball championship in California.[58] The girls ABC tournament has been held since December 1994.[57]

#### [edit] Band and Color Guard

Amador Valley's music program was founded in 1928 by Harry Tripp, a native of England. Tripp, the director of bands at Amador Valley, established an orchestra and a glee club, and recruited performers for parades and numerous operettas.[59] The Amador Valley band program is now the largest student activity on campus[60] and hosts the annual Campana Jazz Festival, named after Jim Campana, who led the band from 1959 to 1979.[61]

Amador Valley's band program consists of four concert bands: Wind Ensemble I, Wind Ensemble II, Wind Symphony, and Symphonic Band.[62] At the annual California Music Educators Association Band Festivals, all four of Amador Valley's concert bands regularly earn "Unanimous Superior" ratings.[63]

The Marching Band and Color Guard compete in the Western Band Association (WBA) circuit. The band practices a competitive field show, performed at football halftime shows and competitions. The Marching Dons are classified into WBA Class AAAAAA.[64] The Amador Valley Marching Dons have received sweepstakes (highest score in combined AAAA and AAAAAA classes) and first place awards and

earned sixth place in 2008 at the WBA Championship.[65][66]

In 2006 the marching band competed in the Bands of America Regional Competition for the first time, and placed fourth in the 2007 competition. In 2005 and 2009, Amador Valley was invited to perform at the annual London New Year's Day Parade.[67]

[edit] Math Team

The Amador Valley Math Team hosts outreach events and participates in mathematics competitions. The Mathematical Association of America placed Amador Valley High School on its School Merit Roll for performance on the American Mathematics Competitions series.[69] The Math Team placed fifth nationally on the 2008<sup>th</sup> Collaborative Problem-Solving Contest[70] and placed in the top 25 nationwide in the 2005<sup>th</sup> ^2009 Fall Startup Events.[71][72][73][74][75]

Amador Valley is the first high school in California to host a MathLeague.org tournament. The tournament was run by Amador Valley math teachers with help from the Amador Valley Math Team. The event served as a qualifier for MathLeague.org's Northern California Championships and served as a tryout for the Bay Area American Regions Math League team. The math team was praised for "showing leadership in mathematics." [76]

At the 2009<sup>th</sup> Northern California Championships, the Math Team placed second in Northern California to Lynbrook High School and received an invitation to MathLeague.org's multi-state championship in Kansas City. Amador Valley High School, the first to represent California at the Midwestern event, finished fifth in the championship out of the ten qualifying teams.[77]

The Math Team also hosts the Amador Valley Geometry Bee, modeled after the Scripps National Spelling Bee. This competition invites students from Amador Valley, Foothill High School, and the district's three middle schools to compete in timed rounds. The style of the competition consists of rounds of 10<sup>th</sup> questions each, deviating from the traditional spelling bee format.[77]

The Math Team also hosts an event for parents and students, Family Math Night. This event lets parents preview course material with their students through hands-on activities run by math team members. The goal of Family Math Night is "to help parents become comfortable assisting their students with math homework." [78]

[edit] Robotics Team

The Amador Valley Robotics Team, founded in 1999, is the first and only high school team to compete in the Autonomous Underwater Vehicle (AUV) Competition hosted by the Association for Unmanned Vehicle Systems International (AUVSI).[79][80][81] Each year, with a minimal amount of outside technical assistance, the team develops an AUV to maneuver an underwater obstacle course.[80]

The team first entered the competition in 2000 with its Hammerhead AUV, weighing 98<sup>th</sup> kg (220<sup>th</sup> pounds).[82] They placed seventh in the field of twelve.[81] According to Daryl Davidson, the executive director of AUVSI, "The Amador group really broke the ice by being the first high school team at the competition...It caught everybody off-guard and their enthusiasm was very infectious." [80]

At the 2001 competition, Amador Valley placed second to the Massachusetts Institute of Technology with its Manta Ray AUV.[83][84] The Manta Ray weighed less than 100<sup>th</sup> kg (220<sup>th</sup> pounds) and featured a modular design.[84] According to Jim Bales, technical director of the competition, the technical details of the Manta Ray impressed many judges and its performance surpassed a number of university teams.[80]

The Amador Valley Barracuda line, started in 2002, "is propelled by two laterally mounted SeaBotix thrusters controlling speed and heading and two auxiliary thrusters aligned vertically controlling pitch and depth." To guide the AUV autonomously, a pressure sensor, compass, camera, and hydrophone array return navigation input data to the software. The AUV uses an Beagle Board single-board computer that runs Angstrom Linux.[85][86]

In 2008, several fundamental changes were made to the robot. The control system was reorganized and the mission control software was revamped to improve

communication and to limit overhead. A low-level microcontroller-based control system was added to free up system resources. This extra processing capability will be used for mission control and image processing tasks.[86]

[edit] Speech and Debate

Amador Valley's main Speech and Debate teams places a heavy emphasis on law. The school's Mock Trial team represented Alameda County at the California State Championships in 2007,[87] and competed as the wildcard in 2009.[88] The Mock Trial team has perennially been Alameda County finalists in this Constitutional Rights Foundation sponsored competition, holding the finalist title five of the six years from 2004â ^2009.[89][90][91][92][93] Alameda County Superior Court Judge George Hernandez, who presided over the final county round in 2007, praised the level of preparedness of Amador Valley's Mock Trial team.[87]

The national We the People: The Citizen and the Constitution competition takes place each spring in Washington, D.C.. The Amador Valley "We the People" team has represented the state of California at the national competition ten times since 1992.[94][95] The team earned the national title in 1995, and took second place in the 2006 and 2007 competitions.[96] In 2008 and 2009, the team placed fourth and third in the national competition, respectively, and then took second place again in 2011. Congressman Jerry McNerney and Speaker of the House Nancy Pelosi congratulated the 2009 team on Capitol Hill.[97]

[edit] Student outreach

Amador Valley's Interact Club was founded in coordination with the local Rotary chapter, and is one of 33,000 Rotary chapters in the world.[98] Every year, the Interact Club coordinates several local fundraisers as well as nationwide campaigns in conjunction with Rotary events. Club members are a part of millions of worldwide Rotary and Interact members who work "locally, regionally, and internationally to combat hunger, improve health and sanitation, provide education and job training, promote peace, and eradicate polio under the motto Service Above Self." [98] Amador Valley's Interact Club has been praised for its efforts to "educate, advocate and fundraise for life-changing programs." [98]

The Human Rights Club is a similar sort of outreach group, affiliated with Amnesty International and STAND. The club was founded in 2007 by Amador Valley student Shelby Margolin, the California state high school outreach coordinator on the national STAND leadership board.[99] The club focuses on ways to address issues such as genocide, disease and poverty in Africa. The student group hosts educational seminars and keynote speakers in an annual Human Rights Conference in the hope of "raising awareness about and helping to end genocide." [100][101]

Additional Amador Valley clubs include Go Green, which encourages recycling on campus, and FISH Club, a non-denominational Christian club. Around election years, Young Democrats and Young Republicans clubs are popular. The school's Fashion Club hosts fashion shows, and the school's Flight Club introduces students to aviation and aircraft.[102] Cultural clubs at Amador Valley include Black Student Union, Muslim Student Association, and Multi Cultural Club. Other clubs at Amador Valley include Anime, Art of Movement, Astronomy, Bhangra, Book Club, California Scholastic Federation, DECA, Don Squad, Drama, Environmental, French, GO, Gay-Straight Alliance, Interact, Junior State of America, Lumberjack, Political Ideals, Puzzle, Rugby, Short Film, and Students Interested in Medical Sciences (SIMS).[103]

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[edit] External links

"Kanuni" redirects here. For the historical set of Albanian laws, see Kanun.

Suleiman I (pron.: /sɨˈlɛˈmɛˈn/; Ottoman Turkish: سليمان Ø³Û Ø·Ø§Û Ø³Û Û Û Ø§Û Ø§Û Û, Sultā n-i evvel or سليمان Ø³Û Ø·Ø§Û Ø³Û Û Û Ø§Û â, Kā nā«nā« Sultā n Suleimā n, Mod Turkish: I. Sāːleyman (Turkish pronunciation: [sylejɛˈmɛˈn]) or Kanuni Sultan Sāːleyman; 6 November 1494 – c. 5 September 1566) was the tenth and longest-reigning Emperor, Sultan of the Ottoman Empire, from 1520 to his death in 1566. He is known in the West as Suleiman the Magnificent[4] and in the East, as "The Lawgiver" (Turkish: Kanuni; Arabic: سليمان القانوني, alā ıQā nā«nā«), for his complete reconstruction of the Ottoman legal system. Suleiman became a prominent monarch of 16th century Europe, presiding over the apex of the Ottoman Empire's military, political and economic power. Suleiman personally led Ottoman armies to conquer the Christian strongholds of Belgrade, Rhodes, and most of Hungary before his conquests were checked at the Siege of Vienna in 1529. He annexed most of the Middle East in his conflict with the Safavids and large swathes of North Africa as far west as Algeria. Under his rule, the Ottoman fleet dominated the seas from the Mediterranean to the Red Sea and the Persian Gulf.[5]

At the helm of an expanding empire, Suleiman personally instituted legislative changes relating to society, education, taxation, and criminal law. His canonical law (or the Kanuns) fixed the form of the empire for centuries after his death. Not only was Suleiman a distinguished poet and goldsmith in his own right; he also became a great patron of culture, overseeing the golden age of the Ottoman Empire's artistic, literary and architectural development.[6] He spoke five languages.[citation needed]

In a break with Ottoman tradition, Suleiman married a harem girl, Roxelana, who became Hāːrrem Sultan; her intrigues as queen in the court and power over the Sultan made her quite renowned. Their son, Selim II, succeeded Suleiman following his death in 1566 after 46 years of rule.

[edit] Early life

Suleiman was born in Trabzon along the east coast of the Black Sea, probably on 6 November 1494.[7] His mother was Valide Sultan Aishe Hafsa Sultan or Hafsa Hatun Sultan, who died in 1534. At the age of seven, he was sent to study science, history, literature, theology, and military tactics in the schools of the Topkapı Palace in Constantinople (now İstanbul). As a young man, he befriended Pargalı Ibrahim, a slave who later became one of his most trusted advisers.[8] From the age of seventeen, young Suleiman was appointed as the governor of first Kaffa (Theodosia), then Sarukhan (Manisa) with a brief tenure at Adrianople (now Edirne).[9] Upon the death of his father, Selim I (1465–1520), Suleiman entered Constantinople and acceded to the throne as the tenth Ottoman Sultan. An early description of Suleiman, a few weeks following his accession, was provided by the Venetian envoy Bartolomeo Contarini: "He is twenty-six years of age, tall, but wiry, and of a delicate complexion. His neck



is a little too long, his face thin, and his nose aquiline. He has a shade of a moustache and a small beard; nevertheless he has a pleasant mien, though his skin tends to pallor. He is said to be a wise Lord, fond of study, and all men hope for good from his rule." [10] Some historians claim that in his youth Suleiman had an admiration for Alexander the Great. [11] [12] He was influenced by Alexander's vision of building a world empire that would encompass the east and the west, and this created a drive for his subsequent military campaigns in Asia and in Africa, as well as in Europe.

[edit] Military campaigns

[edit] Conquests in Europe

Upon succeeding his father, Suleiman began a series of military conquests, eventually suppressing a revolt led by the Ottoman-appointed governor of Damascus in 1521. Suleiman soon made preparations for the conquest of Belgrade from the Kingdom of Hungary—something his great-grandfather Mehmed II had failed to achieve. Its capture was vital in eliminating the Hungarians who, following the defeats of the Serbs, Bulgarians, Byzantines and Albanians, remained the only formidable force who could block further Ottoman gains in Europe. Suleiman encircled Belgrade and began a series of heavy bombardments from an island in the Danube. With a garrison of only 700 men, and receiving no aid from Hungary, Belgrade fell in August 1521. [13]

Christendom's major strongholds spread fear across Europe. As the ambassador of the Holy Roman Empire to Constantinople was to note, "The capture of Belgrade was at the origin of the dramatic events which engulfed Hungary. It led to the death of King Louis, the capture of Buda, the occupation of Transylvania, the ruin of a flourishing kingdom and the fear of neighbouring nations that they would suffer the same fate..." [14]

The road to Hungary and Austria lay open, but Suleiman diverted his attention to the Eastern Mediterranean island of Rhodes, the home base of the Knights Hospitaller. In the summer of 1522, taking advantage of the navy he inherited from his father, Suleiman dispatched an armada of some 400 ships while personally leading an army of 100,000 across Asia Minor to a point opposite the island. [15] Following a siege of five months with brutal encounters, Rhodes capitulated and Suleiman allowed the Knights of Rhodes to depart. They eventually formed their new base in Malta.

As relations between Hungary and the Ottoman Empire deteriorated, Suleiman resumed his campaign in Eastern Europe and on 29 August 1526, he defeated Louis II of Hungary (1506–26) at the Battle of Mohács. In its wake, Hungarian resistance collapsed and the Ottoman Empire became the pre-eminent power in Eastern Europe. [16] Upon encountering the lifeless body of King Louis, Suleiman is said to have lamented: "I came indeed in arms against him; but it was not my wish that he should be thus cut off while he scarcely tasted the sweets of life and royalty." [17] [18] While Suleiman was campaigning in Hungary, Turkmen tribes in central Anatolia revolted under the leadership of Kalender Ğelebi.

Under Charles V and his brother Ferdinand, the Habsburgs reoccupied Buda and took Hungary. As a result, in 1529, Suleiman once again marched through the valley of the Danube and regained control of Buda and in the following autumn laid siege to Vienna. It was to be the Ottoman Empire's most ambitious expedition and the apogee of its drive towards the West. With a reinforced garrison of 16,000 men, [19] the Austrians inflicted upon Suleiman his first defeat, sowing the seeds of a bitter Ottoman-Habsburg rivalry which lasted until the 20th century. [20] A second attempt to conquer Vienna failed in 1532, with Suleiman retreating before reaching the city. In both cases, the Ottoman army was plagued by bad weather (forcing them to leave behind essential siege equipment) and was hobbled by overstretched supply lines. [21]

By the 1540s a renewal of the conflict in Hungary presented Suleiman with the opportunity to avenge the defeat suffered at Vienna. Some Hungarian nobles proposed that Ferdinand, who was ruler of neighbouring Austria and tied to Louis II's family by marriage, be King of Hungary, citing previous agreements that the Habsburgs would take the Hungarian throne if Louis died without heirs. [22] However, other nobles turned to the nobleman John Zápolya who, being

supported by Suleiman, remained unrecognized by the Christian powers of Europe.

In 1541 the Habsburgs once again engaged in conflict with the Ottomans, attempting to lay siege to Buda. With their efforts repulsed, and more Habsburg fortresses captured as a result,[23] Ferdinand and his brother Charles V were forced to conclude a humiliating five-year treaty with Suleiman. Ferdinand renounced his claim to the Kingdom of Hungary and was forced to pay a fixed yearly sum to the Sultan for the Hungarian lands he continued to control. Of more symbolic importance, the treaty referred to Charles V not as 'Emperor', but in rather plainer terms as the 'King of Spain', leading Suleiman to consider himself the true 'Caesar'.[24]

With his main European rivals subdued, Suleiman had assured the Ottoman Empire a powerful role in the political landscape of Europe.

[edit] Ottomanâ ^Safavid War

As Suleiman stabilized his European frontiers, he now turned his attention to the ever present threat posed by the Shi'a Safavid dynasty of Persia. Two events in particular were to precipitate a recurrence of tensions. First, Shah Tahmasp had the Baghdad governor loyal to Suleiman killed and replaced with an adherent of the Shah, and second, the governor of Bitlis had defected and sworn allegiance to the Safavids.[25] As a result, in 1533, Suleiman ordered his Grand Vizier Pargalâ Ibrahim Pasha to lead an army into Asia where he retook Bitlis and occupied Tabriz without resistance. Having joined Ibrahim in 1534, Suleiman made a push towards Persia, only to find the Shah sacrificing territory instead of facing a pitched battle, resorting to harassment of the Ottoman army as it proceeded along the harsh interior.[26] When in the following year Suleiman and Ibrahim made a grand entrance into Baghdad, its commander surrendered the city, thereby confirming Suleiman as the leader of the Islamic world and the legitimate successor to the Abbasid Caliphs.[27]

Attempting to defeat the Shah once and for all, Suleiman embarked upon a second campaign in 1548â ^1549. As in the previous attempt, Tahmasp avoided confrontation with the Ottoman army and instead chose to retreat, using scorched earth tactics in the process and exposing the Ottoman army to the harsh winter of the Caucasus.[26] Suleiman abandoned the campaign with temporary Ottoman gains in Tabriz and the Urmia region, a lasting presence in the province of Van, and some forts in Georgia.[28] In 1553 Suleiman began his third and final campaign against the Shah. Having initially lost territories in Erzurum to the Shah's son, Suleiman retaliated by recapturing Erzurum, crossing the Upper Euphrates and laying waste to parts of Persia. The Shah's army continued its strategy of avoiding the Ottomans, leading to a stalemate from which neither army made any significant gain. In 1554, a settlement was signed which was to conclude Suleiman's Asian campaigns. It included the return of Tabriz, but secured Baghdad, lower Mesopotamia, the mouths of the river Euphrates and Tigris, as well as part of the Persian Gulf.[29] The Shah also promised to cease all raids into Ottoman territory.

[edit] Campaigns in the Indian Ocean

Ottoman ships had been sailing in the Indian Ocean, since the year 1518. Ottoman Admirals such as: Hadim Suleiman Pasha, Seydi Ali Reis[30] and KurtoÄ~lu Hâzâ'r Reis are known to have voyaged to the Mughal imperial ports of Thatta, Surat and Janjira. The Mughal Emperor Akbar, himself is known to have exchanged six documents with Suleiman the Magnificent.[30][31][32]

In the Indian Ocean, Suleiman led several naval campaigns against the Portuguese in an attempt to remove them and reestablish trade with India. Aden in Yemen was captured by the Ottomans in 1538, in order to provide an Ottoman base for raids against Portuguese possessions on the western coast of modern Pakistan and India.[33] Sailing on to India, the Ottomans failed against the Portuguese at the Siege of Diu in September 1538, but then returned to Aden where they fortified the city with 100 pieces of artillery.[33][34] From this base, Sulayman Pasha managed to take control of the whole country of Yemen, also taking Sanaa.[33] Aden rose against the Ottomans however and invited the Portuguese instead, so that the Portuguese were in control of the city until its seizure by Piri Reis in the Capture of Aden (1548).

With its strong control of the Red Sea, Suleiman successfully managed to dispute control of the Indian trade routes to the Portuguese and maintained a significant level of trade with the Mughal Empire of South Asia throughout the 16th century.[35] His admiral Piri Reis led an Ottoman fleet in the Indian Ocean, achieving the Capture of Muscat in 1552.

In 1564, Suleiman received an embassy from Aceh (modern Indonesia), requesting Ottoman support against the Portuguese. As a result an Ottoman expedition to Aceh was launched, which was able to provide extensive military support to the Acehnese.[36]

[edit] Mediterranean and North Africa

Having consolidated his conquests on land, Suleiman was greeted with the news that the fortress of Koroni in Morea (the modern Peloponnese) had been lost to Charles V's admiral, Andrea Doria. The presence of the Spanish in the Eastern Mediterranean concerned Suleiman, who saw it as an early indication of Charles V's intention to rival Ottoman dominance in the region. Recognizing the need to reassert the navy's preeminence in the Mediterranean, Suleiman appointed an exceptional naval commander in the form of Khair ad Din, known to Europeans as Barbarossa. Once appointed admiral-in-chief, Barbarossa was charged with rebuilding the Ottoman fleet, to such an extent that the Ottoman navy equalled in number those of all other Mediterranean countries put together.[37] In 1535 Charles V won an important victory against the Ottomans at Tunis, which together with the war against Venice the following year, led Suleiman to accept proposals from Francis I of France to form an alliance against Charles.[25] In 1538, the Spanish fleet was defeated by Barbarossa at the Battle of Preveza, securing the eastern Mediterranean for the Turks for 33 years until the defeat at the Battle of Lepanto in 1571.

East of Morocco, huge territories in North Africa were annexed. The Barbary States of Tripolitania, Tunisia, and Algeria became autonomous provinces of the Empire, serving as the leading edge of Suleiman's conflict with Charles V, whose attempt to drive out the Turks failed in 1541.[38] The piracy carried on thereafter by the Barbary pirates of North Africa can be seen in the context of the wars against Spain. For a short period Ottoman expansion secured naval dominance in the Mediterranean. Ottoman navies also controlled the Red Sea, and held the Persian Gulf until 1554, when their ships were defeated by the navy of the Portuguese Empire. The Portuguese had taken Ormus (in the Strait of Hormuz) in 1515 and would continue to vie with Suleiman's forces for control of Aden, in present-day Yemen.

In 1542, facing a common Habsburg enemy, Francis I sought to renew the Franco-Ottoman alliance. As a result, Suleiman dispatched 100 galleys[39] under Barbarossa to assist the French in the western Mediterranean. Barbarossa pillaged the coast of Naples and Sicily before reaching France where Francis made Toulon the Ottoman admirals naval headquarters. The same campaign had seen Barbarossa attack and capture Nice in 1543. By 1544, a peace between Francis I and Charles V had put a temporary end to the alliance between France and the Ottoman Empire.

Elsewhere in the Mediterranean, when the Knights Hospitallers were re-established as the Knights of Malta in 1530, their actions against Muslim navies quickly drew the ire of the Ottomans who assembled another massive army in order to dislodge the Knights from Malta. The Ottomans invaded in 1565, undertaking the Great Siege of Malta, which began on May 18 and lasted until September 8, and is portrayed vividly in the frescoes of Matteo Perez d'Aleccio in the Hall of St. Michael and St. George. At first it seemed that this would be a repeat of the battle on Rhodes, with most of Malta's cities destroyed and half the Knights killed in battle; but a relief force from Spain entered the battle, resulting in the loss of 30,000 Ottoman troops and the victory of the local Maltese citizenry.[40]

[edit] Administrative reforms

While Sultan Suleiman was known as "the Magnificent" in the West, he was always Kanuni Suleiman or "The Lawgiver" to his own Ottoman subjects. As the historian Lord Kinross notes, "Not only was he a great military campaigner, a

man of the sword, as his father and great-grandfather had been before him. He differed from them in the extent to which he was also a man of the pen. He was a great legislator, standing out in the eyes of his people as a high-minded sovereign and a magnanimous exponent of justice".[41] The overriding law of the empire was the Shari'ah, or Sacred Law, which as the divine law of Islam was outside of the Sultan's powers to change. Yet an area of distinct law known as the Kanuns (canonical legislation) was dependent on Suleiman's will alone, covering areas such as criminal law, land tenure and taxation.[42] He collected all the judgments that had been issued by the nine Ottoman Sultans who preceded him. After eliminating duplications and choosing between contradictory statements, he issued a single legal code, all the while being careful not to violate the basic laws of Islam.[43] It was within this framework that Suleiman, supported by his Grand Mufti Ebussuud, sought to reform the legislation to adapt to a rapidly changing empire. When the Kanun laws attained their final form, the code of laws became known as the kanunâ ii Osmani, or the "Ottoman laws". Suleiman's legal code was to last more than three hundred years.[44]

Suleiman gave particular attention to the plight of the rayas, Christian subjects who worked the land of the Sipahis. His Kanune Raya, or "Code of the Rayas", reformed the law governing levies and taxes to be paid by the rayas, raising their status above serfdom to the extent that Christian serfs would migrate to Turkish territories to benefit from the reforms.[45] The Sultan also played a role in protecting the Jewish subjects of his empire for centuries to come. In late 1553 or 1554, on the suggestion of his favorite doctor and dentist, the Spanish Jew Moses Hamon, the Sultan issued a firman formally denouncing blood libels against the Jews.[46] Furthermore, Suleiman enacted new criminal and police legislation, prescribing a set of fines for specific offenses, as well as reducing the instances requiring death or mutilation. In the area of taxation, taxes were levied on various goods and produce, including animals, mines, profits of trade, and import-export duties. In addition to taxes, officials who had fallen into disrepute were likely to have their land and property confiscated by the Sultan.

Education was another important area for the Sultan. Schools attached to mosques and funded by religious foundations provided a largely free education to Muslim boys in advance of the Christian countries of the time.[47] In his capital, Suleiman increased the number of mektebs (primary schools) to fourteen, teaching boys to read and write as well as the principles of Islam. Young men wishing further education could proceed to one of eight medreses (colleges), whose studies included grammar, metaphysics, philosophy, astronomy, and astrology.[47] Higher medreses provided education of university status, whose graduates became imams or teachers. Educational centers were often one of many buildings surrounding the courtyards of mosques, others included libraries, refectories, fountains, soup kitchens and hospitals for the benefit of the public.

#### [edit] Cultural achievements

Under Suleiman's patronage, the Ottoman empire entered the golden age of its cultural development. Hundreds of imperial artistic societies (called the Ehl-i Hiref, "Community of the Talented") were administered at the Imperial seat, the Topkapı Palace. After an apprenticeship, artists and craftsmen could advance in rank within their field and were paid commensurate wages in quarterly annual installments. Payroll registers that survive testify to the breadth of Suleiman's patronage of the arts, the earliest of documents dating from 1526 list 40 societies with over 600 members. The Ehl-i Hiref attracted the empire's most talented artisans to the Sultan's court, both from the Islamic world and recently conquered territories in Europe, resulting in a blend of Islamic, Turkish and European cultures.[48] Artisans in service of the court included painters, book binders, furriers, jewellers and goldsmiths. Whereas previous rulers had been influenced by Persian culture (Suleiman's father, Selim I, wrote poetry in Persian), Suleiman's patronage of the arts had seen the Ottoman Empire assert its own artistic legacy.[49]

Suleiman himself was an accomplished poet, writing in Persian and Turkish under the nom de plume Muhibbi (Lover). Some of Suleiman's verses have become Turkish proverbs, such as the well-known Everyone aims at the same meaning, but many are the versions of the story. When his young son Mehmed died in 1543, he composed a moving chronogram to commemorate the year: Peerless among princes, my Sultan Mehmed.[50][51] In addition to Suleiman's own work, many great talents enlivened the literary world during Suleiman's rule, including Fuzuli and Baki. The literary historian E. J. W. Gibb observed that "at no time, even in Turkey, was greater encouragement given to poetry than during the reign of this Sultan".[50] Suleiman's most famous verse is:

The people think of wealth and power as the greatest fate, But in this world a spell of health is the best state.  
What men call sovereignty is a worldly strife and constant war;  
Worship of God is the highest throne, the happiest of all estates.[52]

Suleiman also became renowned for sponsoring a series of monumental architectural developments within his empire. The Sultan sought to turn Constantinople into the center of Islamic civilization by a series of projects, including bridges, mosques, palaces and various charitable and social establishments. The greatest of these were built by the Sultan's chief architect, Mimar Sinan, under whom Ottoman architecture reached its zenith. Sinan became responsible for over three hundred monuments throughout the empire, including his two masterpieces, the Süleymaniye and Selimiye mosques—the latter built in Adrianople (now Edirne) in the reign of Suleiman's son Selim II. Suleiman also restored the Dome of the Rock in Jerusalem and the Jerusalem city walls (which are the current walls of the Old City of Jerusalem), renovated the Kaaba in Mecca, and constructed a complex in Damascus.[53]

[edit] Personal life

Wives

Fâtilane Hatun: Suleiman's first wife, and her real name is unknown. Mahmud's mother who was born in 1512. Records at that time but not a real name Fulani name comes as a tribute for ladies. Suleiman "Fulani" is defined as three mistresses. One of them is his son Sultan Mahmud's mother, Fatima gave birth in 1514, and the other "Fulani" is nicknamed Haseki, a favorite. Other "Fulani babe," he was born the same year as defined Sultan'la Mihrimah 1522 lady's mother's name is not listed today, and some sources record that the scene of the effective period of the past, but as the son of the Sultan for the Hürrem twin Hürrem Sultan Mihrimah's Prince Abdullah confirmed that another woman to have given his mother, his mother's lady.

Gâlfem Babe: Suleiman, the opinions of Hürrem in the direction of the Sultan is the next or previous haseki, the concubine wife of origin. Gâlfem Hatun who died in 1561 or 1562, a baby who was born in 1521 and that same year his son Murad, who died October 12, 1521 is believed that she was the mother.

Mahidevran Sultan (in some sources as the name goes Gulbahar): born around the year 1500 and the current origin Mahidevran Sultan Mustafa brought to the world in 1515. Mustafa Suleiman followed by the October 6, 1553. in Bursa also began to live. She died on February 3, 1581, in Bursa.

Hürrem Sultan: Starboard lordship or estimated 1520's accession to the throne after the entry into harem concubine origin Hürrem, 1521, Mehmed, 1522 Mihrimah'Ä±, 1524 Selim, Bayezid 1525, 1531 in the Cihangir district, brought to the world. She died on April 15 in 1558.

[edit] Relationship with Hürrem Sultan

Suleiman was infatuated with Hürrem Sultan, a harem girl from Ruthenia, then part of Poland. In the West foreign diplomats, taking notice of the palace gossip about her, called her "Russelazie" or "Roxelana", referring to her Ruthenian (Ukrainian) origins.[54] The daughter of an Orthodox priest,[29] she was captured by Tatars from Crimea, sold as a slave in Constantinople, and eventually rose through the ranks of the Harem to become Suleiman's favourite.

Breaking with two centuries of Ottoman tradition,[29] a former concubine had thus become the legal wife of the Sultan, much to the astonishment of observers in the palace and the city.[55] He also allowed H  rrem Sultan to remain with him at court for the rest of her life, breaking another tradition   that when imperial heirs came of age, they would be sent along with the imperial concubine who bore them to govern remote provinces of the Empire, never to return unless their progeny succeeded to the throne.[56]

Under his pen name, Muhibbi, Suleiman composed this poem for Roxelana:

"Throne of my lonely niche, my wealth, my love, my moonlight.  
My most sincere friend, my confidant, my very existence, my Sultan, my one and only love.  
The most beautiful among the beautiful...  
My springtime, my merry faced love, my daytime, my sweetheart, laughing leaf...  
My plants, my sweet, my rose, the one only who does not distress me in this world...  
My Constantinople, my Caraman, the earth of my Anatolia  
My Badakhshan, my Baghdad and Khorasan  
My woman of the beautiful hair, my love of the slanted brow, my love of eyes full of mischief...  
I'll sing your praises always  
I, lover of the tormented heart, Muhibbi of the eyes full of tears, I am happy." [57]

[edit] Pargal   Ibrahim Pasha

Pargal   Ibrahim Pasha was the boyhood friend of Suleiman. Ibrahim was originally a Christian Greek from Parga, Epirus,[58][59] and when he was young was educated at the Palace School under the devshirme system. Suleiman made him the royal falconer, then promoted him to first officer of the Royal Bedchamber.[60] Ibrahim Pasha rose to Grand Vizier in 1523 and commander-in-chief of all the armies. Suleiman also conferred upon Ibrahim Pasha the honor of beylerbey of Rumelia, granting Ibrahim authority over all Turkish territories in Europe, as well as command of troops residing within them in times of war. According to a 17th century chronicler, Ibrahim had asked Suleiman not to promote him to such high positions, fearing for his safety; to which Suleiman replied that under his reign no matter what the circumstance, Ibrahim would never be put to death.[61]

Yet Ibrahim eventually fell from grace with the Sultan. During his thirteen years as Grand Vizier, his rapid rise to power and vast accumulation of wealth had made Ibrahim many enemies among the Sultan's court. Reports had reached the Sultan of Ibrahim's impudence during a campaign against the Persian Safavid empire: in particular his adoption of the title serasker sultan was seen as a grave affront to Suleiman.[62]

Suleiman's suspicion of Ibrahim was worsened by a quarrel between the latter and the Minister of Finance Iskender Chelebi. The dispute ended in the disgrace of Chelebi on charges of intrigue, with Ibrahim convincing Suleiman to sentence the Minister to death. Before his death however, Chelebi's last words were to accuse Ibrahim of conspiracy against the Sultan.[62] These dying words convinced Suleiman of Ibrahim's disloyalty,[62] and on 15 March 1536 Ibrahim was executed.

[edit] Succession

Suleiman's two Haseki Sultans had borne him eight sons, four of whom survived past the 1550s. They were Mustafa, Selim, Beyaz  t, and Cihangir. Of these, only Mustafa, the eldest, was not H  rrem Sultan's son, but rather Mahidevran G  lbahar Sultan's ("Rose of Spring"), and therefore preceded H  rrem's children in the order of succession. H  rrem was aware that should Mustafa become Sultan her own children would be strangled. Yet Mustafa was recognised as the most talented of all the brothers and was supported by Pargal   Ibrahim Pasha, who was by this time Suleiman's Grand Vizier. The Austrian ambassador Busbecq would note "Suleiman has among his children a son called Mustafa, marvellously well

educated and prudent and of an age to rule, since he is 24 or 25 years old; may God never allow a Barbary of such strength to come near us", going on to talk of Mustafa's "remarkable natural gifts".[63] Hürrem is usually held at least partly responsible for the intrigues in nominating a successor. Although she was Suleiman's wife, she exercised no official public role. This did not, however, prevent Hürrem from wielding powerful political influence. Since the Empire lacked, until the reign of Ahmed I, any formal means of nominating a successor, successions usually involved the death of competing princes in order to avert civil unrest and rebellions. In attempting to avoid the execution of her sons, Hürrem used her influence to eliminate those who supported Mustafa's accession to the throne.[52]

Thus in power struggles apparently instigated by Hürrem,[60] Suleiman had Ibrahim murdered and replaced with her sympathetic son-in-law, Rüstem Pasha. By 1552, when the campaign against Persia had begun with Rüstem appointed commander-in-chief of the expedition, intrigues against Mustafa began. Rüstem sent one of Suleiman's most trusted men to report that since Suleiman was not at the head of the army, the soldiers thought the time had come to put a younger prince on the throne; at the same time he spread rumors that Mustafa had proved receptive to the idea. Angered by what he came to believe were Mustafa's plans to claim the throne, the following summer upon return from his campaign in Persia, Suleiman summoned him to his tent in the Ereğli valley,[64] stating he would "be able to clear himself of the crimes he was accused of and would have nothing to fear if he came".[65]

Mustafa was confronted with a choice: either he appeared before his father at the risk of being killed; or, if he refused to attend, he would be accused of betrayal. In the end, Mustafa chose to enter his father's tent, confident that the support of the army would protect him. Busbecq, who claims to have received an account from an eyewitness, describes Mustafa's final moments. As Mustafa entered his father's tent, Suleiman's Eunuchs attacked Mustafa, with the young prince putting up a brave defence. Suleiman, separated from the struggle only by the linen hangings of the tent, peered through the chamber of his tent and "directed fierce and threatening glances upon the mutes, and by menacing gestures sternly rebuked their hesitation. Thereupon, the mutes in their alarm, redoubling their efforts, hurled Mustafa to the ground and, throwing the bowstring round his neck, strangled him."[66]

Cihangir is said to have died of grief a few months after the news of his half-brother's murder.[67] The two surviving brothers, Beyazıt and Selim, were given command in different parts of the empire. Within a few years, however, civil war broke out between the brothers, each supported by his loyal forces.[68] With the aid of his father's army, Selim defeated Beyazıt in Konya in 1559, leading the latter to seek refuge with the Safavids along with his four sons. Following diplomatic exchanges, the Sultan demanded from the Safavid Shah that Beyazıt be either extradited or executed. In return for large amounts of gold, the Shah allowed a Turkish executioner to strangle Beyazıt and his four sons in 1561,[67] clearing the path for Selim's succession to the throne seven years later. On 5 or 6 September 1566,[69] Suleiman, who had set out from Constantinople to command an expedition to Hungary, died before an Ottoman victory at the Battle of Szigetvár in Hungary.[70]

[edit] Legacy

At the time of Suleiman's death, the Ottoman Empire was one of the world's foremost powers.[71] Suleiman's conquests had brought under the control of the Empire the major Muslim cities (Mecca, Medina, Jerusalem, Damascus, and Baghdad), many Balkan provinces (reaching present day Croatia and Austria), and most of North Africa. His expansion into Europe had given the Ottoman Turks a powerful presence in the European balance of power. Indeed, such was the perceived threat of the Ottoman Empire under the reign of Suleiman that Austria's ambassador Busbecq warned of Europe's imminent conquest: "On [the Turks'] side are the resources of a mighty empire, strength unimpaired, habituation to victory, endurance of toil, unity, discipline, frugality and watchfulness... Can we doubt what the result will be?...When the Turks have

settled with Persia, they will fly at our throats supported by the might of the whole East; how unprepared we are I dare not say." [72]

Even thirty years after his death "Sultan Solymán" was quoted by the English playwright William Shakespeare as a military prodigy in *The Merchant of Venice* (Act 2, Scene 1).

Suleiman's legacy was not, however, merely in the military field. The French traveler Jean de Thévenot a century later bears witness to the "strong agricultural base of the country, the well being of the peasantry, the abundance of staple foods, and the pre-eminence of organization in Suleiman's government". [73] The administrative and legal reforms which earned him the name Law Giver ensured the Empire's survival long after his death, an achievement which "took many generations of decadent heirs to undo". [74]

Through his personal patronage, Suleiman also presided over the Golden Age of the Ottoman Empire, representing the pinnacle of the Ottoman Turks' cultural achievement in the realm of architecture, literature, art, theology and philosophy. [6] [75] Today the skyline of the Bosphorus, and of many cities in modern Turkey and the former Ottoman provinces, are still adorned with the architectural works of Mimar Sinan. One of these, the Süleymaniye Mosque, is the final resting place of Suleiman and Hürrem Sultan: they are buried in separate domed mausoleums attached to the mosque.

^ The Encyclopedia Britannica, Vol.7, Edited by Hugh Chisholm, (1911), 3; Constantinople, the capital of the Turkish Empire...

^ Britannica, Istanbul: When the Republic of Turkey was founded in 1923, the capital was moved to Ankara, and Constantinople was officially renamed Istanbul in 1930.

^ [1]

^ Merriman.

^ Mansel, 61.

^ a b Atıl, 24.

^ Clot, 25.

^ Barber, Noel (1973). *The Sultans*. New York: Simon & Schuster. pp. 36. ISBN 0-7861-0682-4.

^ Clot, 28.

^ Kinross, 175.

^ Lamb, 14.

^ Barber, 23.

^ Imber, 49.

^ Clot, 39.

^ Kinross, 176.

^ Kinross, 187.

^ Severy, 580

^ Embree, Suleiman The Magnificent.

^ Turnbull, Stephen (2003). *The Ottoman Empire 1326 - 1699*. New York: Osprey Publishing. pp. 50.

^ Imber, 50.

^ Labib, 444.

^ Imber, 52.

^ Imber, 53.

^ Imber, 54.

^ a b Imber, 51.

^ a b Sicker, 206.

^ Clot, 93.

^ 1548 - 49

^ a b c Kinross, 236.

^ a b Azmi Özcan (1997). *Pan-Islamism: Indian Muslims, the Ottomans and Britain, 1877-1924*. BRILL. pp. 11 - 12. ISBN 978-90-04-10632-1.

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[edit] External links

Coordinates: 53°23′20″N 2°21′17″W﻿ / ﻿53.3838°N 2.3547°W﻿ / 53.3838; -2.3547

Altrincham (i/ˈɛˈltrɪnçəm‎ OL-tring-É m) is a market town within the Metropolitan Borough of Trafford, in Greater Manchester, England. It lies on flat ground south of the River Mersey about 8 miles (13 km) southwest of Manchester city centre, 3 miles (5 km) south-southwest of Sale and 10 miles (16 km) east of Warrington. As of the 2001 UK census, it had a population of about 41,000.

Historically a part of Cheshire, Altrincham was established as a market town in 1290, a time when most communities were based around agriculture rather than trade, and there is still a market in the town today. Further socioeconomic development came with the extension of the Bridgewater Canal to Altrincham in 1765 and the arrival of the railway in 1849, stimulating industrial activity in the town. Outlying villages were absorbed by Altrincham's subsequent growth, along with the grounds of Dunham Massey Hall, formerly the home of the Earl of Stamford, and now a tourist attraction with three Grade I listed buildings and a deer park.

Altrincham today is an affluent commuter town, partly because of its transport links. The town has a strong middle class presence; there has been a steady increase in Altrincham's middle classes since the 19th century. It is also home to Altrincham F.C. and two ice hockey clubs, Manchester Phoenix and Trafford Metros.

[edit] History

Local evidence of prehistoric human activity exists in the form of two Neolithic arrowheads found in Altrincham, and further afield, a concentration of artefacts around Dunham.[1] The remains of a Roman road, part of one of the major Roman roads in North West England connecting the legionary fortresses of Chester (Deva Victrix) and York (Eboracum), run through the Broadheath area. As it shows signs of having been repaired, the road was in use for a considerable period of time.[2] The name Altrincham first appears as "Aldringeham", probably meaning "homestead of Aldhere's people".[3] As recently as the 19th century it was spelt both Altrincham and Altringham.[4]

Until the Normans invaded England, the manors surrounding Altrincham were owned by the Saxon thegn Alweard; after the invasion they became the property of Hamon de Massey,[3][5] though Altrincham is not mentioned in the Domesday Book. The earliest documented reference to the town is from 1290,[6] when it was granted its charter as a Free Borough by Baron Hamon de Massey V.[7] The charter allowed a weekly market to be held, and it is possible that de Massey established the town to generate income through taxes on trade and tolls. This suggests that Altrincham may have been a planned market town, unusual during the Middle Ages, when most communities were agricultural.[8] Altrincham was probably chosen as the site of the planned town rather than Dunham <sup>^</sup> which would have been protected by Dunham Castle <sup>^</sup> because its good access to roads was important for trade.[9]

Altrincham Fair became St James's Fair or Samjam in 1319 and continued until 1895. Fair days had their own court of Pye Powder (a corruption of the French for "dusty feet"), presided over by the mayor and held to settle disputes arising from the day's dealings.[10] By 1348 the town had 120 burgage plots <sup>^</sup> ownership of land used as a measure of status and importance in an area <sup>^</sup> putting it on a par with the Cheshire town of Macclesfield and above Stockport and Knutsford.[11] The earliest known residence in Altrincham was The Knoll, on Stamford Street near the centre of the medieval town. An 1983 excavation on the demolished building, made by South Trafford Archaeological Group, discovered evidence that the house dated from the 13th or 14th century, and that it may have contained a drying kiln or malting floor.[12] During the English Civil War, men from Altrincham fought for the Parliamentarian Sir George Booth. During the war, armies camped on nearby Bowdon Downs on several occasions.[10]

In 1754, a stretch of road south of Altrincham, along the Manchester to Chester route, was turnpiked. Turnpikes were toll roads which taxed passengers for the maintenance of the road. Further sections were turnpiked in 1765 from

Timperley to Sale, and 1821 from Altrincham to Stockport. The maintenance of roads passed to local authorities in 1888, although by then most turnpike trusts had already declined.[13] The connection of the Bridgewater Canal to Altrincham in 1765 stimulated the development of market gardening, and for many years Altrincham was noted for its vegetables.[14] By 1767, warehouses had been built alongside the canal at Broadheath, the first step in the development of Broadheath as an industrial area and the beginning of Altrincham's industrialisation. The canal was connected in 1776 to the River Mersey, providing the town not only with a water route to Manchester, but also to the Irish Sea.[15]

Moves to connect the town to the UK's railway network gained pace in 1845, when the Act of Parliament for the construction of the Manchester South Junction and Altrincham Railway (MSJAR) was passed. The first train left Altrincham early on 20<sup>th</sup> July 1849, carrying 65<sup>000</sup> passengers. The MSJAR had two stations in the town: Altrincham, on Stockport Road, and Bowdon<sup>000</sup> although not actually in Bowdon<sup>000</sup> on Lloyd Street/Railway Street. Both were replaced in 1881 by Altrincham & Bowdon station on Stamford New Road.[16] The London and North Western Railway's station at Broadheath, on the town's northern edge, was opened in 1854, while a further connection was created on 12<sup>th</sup> May 1862 by the Cheshire Midland Railway (later the Cheshire Lines Committee), who opened their line from Altrincham to Knutsford.[17]

With its new railway links, Altrincham and the surrounding areas became desirable places for the middle classes and commuters to live.[16][18] Professionals and industrialists moved to the town, commuting into Manchester. While some travelled daily by coach, the less well<sup>000</sup> do commuted by express or "flyer" barges from Broadheath.[19] Between 1851 and 1881 the population increased from 4,488 to 11,250.[20] Broadheath's industrial area, covering about 250 acres (1.0<sup>000</sup> km<sup>2</sup>), was founded in 1885 by Harry Grey, 8th Earl of Stamford, to attract businesses. By 1900 Broadheath had its own docks, warehouses and electricity generating station. The site's proximity to rail, canal and road links proved attractive to companies making machine tools, cameras and grinding machines. The presence of companies like Tilghmans Sand Blast, and the Linotype and Machinery Company, established Broadheath as an industrial area of national standing. By 1914, 14<sup>000</sup> companies operated in Broadheath, employing thousands of workers. One of those was the Budenberg Gauge Company. Linotype also created 172<sup>000</sup> workers' homes near its factory, helping cater for the population boom created by Broadheath's industrialisation. Between 1891 and 1901 the population of Altrincham increased by 35<sup>000</sup> per cent, from<sup>000</sup> 12,440 to<sup>000</sup> 16,831.[21]

From the turn of the 20th century to the start of the Second World War, there were few changes in Altrincham. Although the town was witness to some of the Luftwaffe's raids on Greater Manchester, it emerged from the war relatively unscathed, and as with the rest of Britain, experienced an economic boom. This manifested itself in the construction of new housing and the 1960s rebuilding of the town centre. However, during the 1970s employment at Broadheath declined by nearly 40<sup>000</sup> per cent.[22]

[edit] Governance

Altrincham became a Free Borough, a self-governing township, when it was granted a charter in June 1290 by the Lord of the Manor, Hamon de Massey<sup>000</sup> V. The charter allowed for the creation of a merchants' guild, run by the town's burgesses to tax people passing through the borough.[23] Burgesses were free men who lived in the town.[24] The borough was ruled by a Court Leet and elected a mayor since at least 1452. Amongst the court's responsibilities were keeping the public peace and regulating the markets and fairs.[25]

The borough was not one of those reformed by the Municipal Corporations Act of 1835, and continued to exist under the control of the Lord of the Manor and the Court Leet until its final abolition in 1886.[26] The Public Health Act of 1848 led to the creation of Altrincham's Local Board of Health in 1851 to address the unsanitary conditions created by the town's growing population<sup>000</sup> the first such board in Trafford.[27] The local board was reconstituted as an urban

district council in the administrative county of Cheshire under the Local Government Act 1894.[citation needed]

Altrincham Urban District was expanded in 1920 when parts of Carrington and Dunham Massey Civil Parishes were added.[28] A further expansion took place in 1936; Timperley Civil Parish was abolished and most of its area incorporated into Altrincham UD. At the same time, there was a minor exchange of areas with Hale Urban District; a minor addition from Bowdon Urban District; and a further substantial portion of Dunham Massey Civil Parish was added.[29] In 1937 the urban district was granted a charter of incorporation and became a municipal borough.[30] The new borough was granted armorial bearings which featured heraldic references to the Masseys and Earls of Stamford.[31] With the passage of the Local Government Act 1972, the administrative counties and municipal boroughs were abolished and Altrincham became part of the Metropolitan Borough of Trafford in Greater Manchester on 1 April 1974.[10]

Trafford Council is responsible for the administration of local services, such as education, social services, town planning, waste collection and council housing. The area is divided into seven electoral wards: Altrincham, Bowdon, Broadheath, Hale Barns, Hale Central, Timperley, and Village. These wards have 21 out of the 63 seats on the Trafford Council; as of the 2012 local elections sixteen of these seats were held by the Conservative Party, four by the Liberal Democrats, and one by the Labour Party.[32] Altrincham was in the eponymous parliamentary constituency which was created in 1885. This lasted until 1945 when it was replaced by Altrincham and Sale. In 1997, this in turn became part of the newly created constituency of Altrincham and Sale West. Since its formation, Altrincham and Sale West has been represented in the House of Commons by the Conservative MP, Graham Brady.[33] This is one of a small number of seats in the North West held by the Conservative Party, and one of only two Conservative seats in Greater Manchester.[citation needed]

[edit] Geography

At 53°23′22″N 2°21′17″W﻿ / ﻿53.38389°N 2.35472°W﻿ / 53.38389; -2.35472 (53.389444°N 2.354722°W), Altrincham is on the southwestern edge of the Greater Manchester Urban Area, immediately south of the town of Sale, and 8 miles (13 km) southwest of Manchester city centre. It lies in the northwest corner of the Cheshire Plain, just south of the River Mersey. The Bridgewater Canal passes through the Broadheath area of the town. Altrincham's drinking water is supplied by United Utilities.[34] The local bedrock consists mainly of Keuper Waterstone, a type of sandstone, and water retrieved from those rocks is very hard and often saline, making it undrinkable.[35] The town's climate is generally temperate, with few extremes of temperature or weather. The mean temperature is slightly above average for the United Kingdom; whereas both annual rainfall and average hours of sunshine are slightly below the average for the UK.[36]

Along with Sale, Stretford and Urmston, Altrincham is one of the four major urban areas in Trafford. The Altrincham area, as defined by Trafford Council, comprises the south of Trafford. In addition to the town of Altrincham, it includes the villages of Timperley, Bowdon, Hale and Hale Barns. The Broadheath area of the town was a light industrial centre until the 1970s and is now a retail park. The most densely populated part of the town is around the town centre, with the less populated areas and more green space further from the centre of town in villages such as Bowdon and Hale. The Oldfield Brow area lies on the outskirts of the town beside the Bridgewater Canal and close to Dunham Massey.[37][38]

[edit] Demography

Altrincham compared

2001 UK Census

Altrincham[39]

Trafford[40]

England

Total population

40,695

210,145  
 49,138,831  
 White  
 94.4%  
 91.6%  
 90.9%  
 Asian  
 1.3%  
 4.1%  
 4.6%  
 Black  
 0.5%  
 2.0%  
 2.3%

As of the 2001 UK census, the town of Altrincham had a total population of 40,695. Of its 27,900 households, 38.7 per cent were married couples living together. 30.4 per cent contained one person, 8.2 per cent co-habiting couples and 9.0 per cent lone parents.[41]

The town's population density is 10,272 inhabitants per square mile (3,966 /km<sup>2</sup>), with 94.8 males for every 100 females.[42] Of those aged 16 to 74, 21.7 per cent had no academic qualifications, similar to the 21.3 per cent in all of Trafford, but lower than the 28.9 per cent in England.[40][43] At 4.6 per cent, Altrincham has a low proportion of non-white people. Asians are the area's largest ethnic minority, at 1.3 per cent of the population.

In 1931, 14.6 per cent of Altrincham's population was middle class, slightly higher than the figure for England and Wales, which was 14 per cent. By 1971 this gap had increased to 28.8 per cent compared to 24 per cent nationally, while the town's working class population had declined, from 30.3 per cent in 1931 (36 per cent in England and Wales) to 18.6 per cent (26 per cent nationwide). The remainder comprised clerical and skilled manual workers. This change in social structure was similar to that seen across the nation although biased towards the middle classes making Altrincham the middle-class town it is today.[18]

[edit] Population change

According the hearth tax returns from 1664, the township of Altrincham had a population of about 636, making it the largest of the local settlements;[44] this had increased to 1,692 in 1801. In the first half of the 19th century, the town's population increase by 165 per cent, higher than 89 per cent across England and 98 per cent in the Trafford area. The growth of the settlement was a result of the Industrial Revolution, and although Altrincham was one of the fastest growing townships in the Trafford area, but paled in comparison to new industrial areas such as Ashton-under-Lyne, Hyde, and Manchester. In the second half of the 19th century, Altrincham's population grew by 275 per cent, higher than the 235 per cent for Trafford and 69 per cent nationally in the same period. This was due to the late industrialisation of the area and the introduction of the Manchester South Junction and Altrincham Railway in 1849.[45] The table below details the population change since 1801, including the percentage change since the last census.

Population growth in Altrincham since 1801

| Year |
|------|
| 1801 |
| 1811 |
| 1821 |
| 1831 |
| 1841 |
| 1851 |
| 1861 |
| 1871 |
| 1881 |
| 1891 |

1901  
1911  
1921  
1931  
1939  
1951  
1961  
1971  
1981  
1991  
2001

Population

1,692  
2,032  
2,302  
2,708  
3,399  
4,488  
6,628  
8,478  
11,250  
12,440  
16,831  
17,813  
20,450  
21,356  
39,940  
39,789  
41,122  
40,786  
39,693  
40,042  
40,695

Â % change

Â â ^

+20.1  
+13.3  
+17.6  
+25.5  
+32.0  
+47.7  
+27.9  
+32.7  
+10.6  
+35.3  
+5.8  
+14.8  
+4.4  
+87.0  
â ´0.4  
+3.4  
â ´0.8  
â ´2.7  
+0.9  
+1.6

Source:A Vision of Britain through Time[20][46][47][48]

[edit] Economy

Altrincham compared

2001 UK Census

Altrincham[49]

Trafford[50]  
 England  
 Population of working age  
 29,397  
 151,445  
 35,532,091  
 Full-time employment  
 45.7%  
 43.4%  
 40.8%  
 Part-time employment  
 12.7%  
 11.9%  
 11.8%  
 Self-employed  
 8.9%  
 8.0%  
 8.3%  
 Unemployed  
 2.2%  
 2.7%  
 3.3%  
 Retired  
 13.2%  
 13.9%  
 13.5%

Historically, Altrincham was a market town and the two main areas of employment were agriculture and market trade. Although the town went into decline in the 15th century, it recovered and the annual fairs lasted until the mid-19th century and the market still continues.[51] During the Industrial Revolution, Altrincham grew as an industrial town, particularly the Broadheath area, which was developed into an industrial estate. In 1801 there were four cotton mills in Altrincham, part of its textile industry, although they had closed by the 1851 census. The decline of the textile industry in Altrincham mirrored the decline of the industry in the Trafford area as a result of a lack of investment and the development of more established industrial areas such as Manchester, Ashton-under-Lyne, and Oldham.[14][52] During the late 19th and early 20th centuries, heavier industries moved into Broadheath, providing local employment. The area steadily declined during the second half of the 20th century, with employment at Broadheath falling from 8,000 to 5,000 between 1960 and 1970.[16][22] Despite the presence of retailers such as Tesco, Sainsbury's and Marks & Spencer in the town, and redevelopment schemes costing over Â£100Â million,[53][54] Altrincham's 15.5Â per cent level of employment in retail is below the national average of 16.9Â per cent. Altrincham, with its neighbours Bowdon and Hale, is said to constitute a "stockbroker belt", with well-appointed dwellings in an area of sylvan opulence.[55]

The historic market town developed as a residential area in the 19th century although it retains its retail heritage in the Old Market Place (a conservation area) and a new pedestrianised shopping centre. The retail districts of the town have more recently fallen victim to decline due to competition from the nearby Trafford Centre and a regenerated Manchester city centre.[56] In 2006 Trafford Metropolitan Borough Council unveiled plans for a Â£1.5Â million redevelopment for the town centre.[53] The renovation will create 146,000 square feet (13,600Â m2) of new retail space and 203,000 square feet (18,900Â m2) of refurbished space, providing 349,000 square feet (32,400Â m2) in total.[57]

Construction on Altair, a Â£100Â million development on Oakfield Road, is expected to begin in 2013. The scheme includes a hotel, offices, shops and eating places, and is expected to create 2,000Â permanent jobs. A further Â£20Â million is earmarked for a refurbishment of the nearby Altrincham Interchange.[58] A 2010 survey found that despite being in one of the country's



most affluent areas, nearly a third of the shops in Altrincham were vacant; Trafford council attributed the high number (78) to the effects of the recession and plans to refurbish Stamford House, which left most of its shops unused.[59]

According to the 2001 UK census, the industry of employment of residents in Altrincham was 18.4% per cent property and business services, 16.0% per cent retail and wholesale, 12.1% per cent manufacturing, 10.7% per cent health and social work, 8.3% per cent education, 8.3% per cent transport and communications, 5.8% per cent finance, 5.7% per cent construction, 4.2% per cent hotels and restaurants, 4.2% per cent public administration and defence, 0.8% per cent agriculture, 0.8% per cent energy and water supply, 0.2% per cent mining, and 4.6% per cent other. This was roughly in line with national figures, except for the town's relatively high percentage of workers in property and business services.[60] The census recorded the economic activity of residents aged 16-74, 5.3% per cent looking after home or family, 4.3% per cent permanently sick or disabled, 3.2% per cent students without jobs, 2.2% per cent students were with jobs, and 2.4% per cent economically inactive for other reasons.[49] The 2.2% per cent unemployment rate of Altrincham was low compared with the national rate of 3.3% per cent.[50]

[edit] Culture

[edit] Landmarks and attractions

The Old Market Place is thought to stand on the site of the original town settlement. Now a registered conservation area it consists of a series of part timber-framed buildings echoing the wattle and daub constructions of the original houses and burgage plots. The cobblestone paving was replaced in 1896. The Buttermarket which stood in the area near the Old Market Place from the 17th century until the late 19th century was also the site for dispensing early local justice. A courtroom, stocks and whipping post saw public floggings take place there until the early 19th century. The whipping post and stocks were restored as a tourist attraction by local traders in the 1990s. However the Buttermarket area was also a site of religious importance, since prospective brides and grooms are thought to have declared their intentions here.[61] In 1814 Thomas de Quincey described the Old Market Place in his Confessions of an English Opium Eater while travelling from Manchester to Chester. He noted how little the place had changed since his visit 14 years earlier at the age of three, and that "fruits, such as can be had in July, and flowers were scattered about in profusion: even the stalls of the butchers, from their brilliant cleanliness, appeared attractive: and bonny young women of Altrincham were all tripping about in caps and aprons coquettishly disposed".[62] Another of Altrincham's attractions is the historic market, set up over 700 years ago when the town was first established.[63]

Of the 21 conservation areas in Trafford, ten are in Altrincham: The Downs, The Devisdale, Bowdon, Ashley Heath, Goose Green, Old Market Place, Sandiway, George Street, the Linotype Housing Estate and Stamford New Road.[64] On the town's outskirts is the 18th-century Dunham Massey Hall,[65] surrounded by its 250-acre (1 km<sup>2</sup>) deer park, both now owned by the National Trust. The hall is early Georgian in style, and along with its stables and carriage house, is a Grade I listed building.[66]

Royd House was built between 1914 and 1916, by local architect Edgar Wood, as his own residence. It has a flat concrete roof, a concave facade, and is faced in Portland red stone and Lancashire brick.[67] It is regarded as one of the most advanced examples of early 20th-century domestic architecture, and is referenced in architectural digests. It has been a Grade I listed building since 1975, one of six such buildings in Trafford.[68][69] The Grade II listed clock outside the main transport interchange was built in 1880.[70]

The 16-acre (65,000 m<sup>2</sup>) Stamford Park was designed by landscape gardener John Shaw. It opened to the public in 1880, as a sports park with areas for cricket and football. The land was donated by George Grey, the 7th Earl of Stamford, and is now owned and run by Trafford Council. The park is listed as Grade II on the Register of Parks and Gardens of Special Historic Interest in England,[71]

and has won a bronze award from the Greenspace award scheme.[72] Trafford council intend to build a £7,000 skate park in Stamford Park, as part of a scheme to reduce crime by providing youths with activities.[73]

[edit] Events and venues

Altrincham has two theatres, the Altrincham Garrick Playhouse and the Club Theatre. The Altrincham Garrick group was formed in 1913. The Garrick held the world stage premier of Psycho in 1982. In 1998, it received a grant of £675,000 from the National Lottery as part of a £900,000 redevelopment of the theatre, which was completed in 1999.[74] The Club Theatre group began in 1896, as the St Margaret's Church Institute Amateur Dramatics Society. It provides a venue for the Trafford Youth Theatre production each year, and it runs the Hale One Act Festival, an annual week-long event started in 1972.[75] The club has received awards from both the Greater Manchester Drama Federation and the Mid-Cheshire Theatre Guild.[76] Altrincham also had Greater Manchester's only Michelin starred restaurant, the Juniper.[77]

[edit] Sports

Altrincham F.C., nicknamed "The Robins", were founded in 1903 and play home matches at Moss Lane. The club plays in the Conference North, the sixth tier of English football. In the 1970s and 1980s Altrincham F.C. built a reputation for "giant-killing" acts against Football League teams in FA Cup matches. The club has knocked out Football League opposition on a record 16 occasions,[78] including a 1986 victory against top-flight Birmingham City.[79] Altrincham won the forerunner of the Football Conference in its first two seasons, but was denied election to the Football League on both occasions, falling a single vote short in 1980.[80] Altrincham have since had mixed fortunes. Relegated to the Northern Premier League in 1997, the club earned promotion two years later, but suffered a second relegation after a single season in the Conference.[81] In the 2010–11 season Altrincham were relegated to Conference North.[82]

Altrincham is one of the few towns in North West England with an ice rink, and has had an ice hockey team since 1961, when Altrincham Ice Rink was built in Broadheath.[83] The Altrincham Aces (later renamed the Trafford Metros) played from 1961 until 2003, when Altrincham Ice Rink closed.[84] The town then had a three-year period without a rink or ice hockey team, until construction of the 2,500 capacity Altrincham Ice Dome was completed.[85] Manchester Phoenix, a club having a professional presence in the English Premier Ice Hockey League and an extensive junior development aspect, relocated to the Ice Dome during the 2006–07 season, having withdrawn from competition two years earlier due to the high cost of playing matches at Manchester's MEN Arena.[86] In 2009 the Manchester Phoenix English National Ice Hockey League team was renamed Trafford Metros, bringing the old Altrincham team's name back into use.[87] When not being used by Phoenix the Altrincham Ice Dome is open to the public for ice skating.[88]

Founded in 1897,[89] Altrincham Kersal RUFC plays rugby union in North One, the competition below the National Leagues, and is amongst the top 80 clubs in England. Altrincham has been promoted five times in the past ten seasons. The club has produced England and Sale Sharks players Mark Cueto and Chris Jones and continues to produce players for the Sale Jets.[90] Altrincham and District Athletics Club was founded in 1961, and provides training facilities for track and field, road running, cross-country running and fell running.[91] Seamons Cycling Club was formed in 1948 in the area of Altrincham known locally as Seamons Moss.[92]

[edit] Education

As Altrincham was part of the Bowdon parish, children from the township may have gone to the 16th-century school established at Bowdon; before that point, the town had no formal education system. A salt merchant from Dunham Woodhouses founded a school at Oldfield House intended for 40 boys aged 8–11 from the surrounding area. Sunday schools were set up in the late 18th and early 19th centuries.[93] Altrincham's increasing population prompted the founding of more schools during the early 19th century and by 1856 the town had 9 schools, 1 college, and 23 teachers.[94] The introduction of compulsory education during

the second half of the 19th century increased the demand for schools, and by 1886 Altrincham had 12 church schools and 8 private schools.[95]

Responsibility for local education fell to Cheshire County Council in 1903. Loreto Convent, the County High School for Girls, and Altrincham County High School for Boys, were founded in 1909, 1910, and 1912 respectively. Although still open these schools have since changed their names to Altrincham Grammar School for Girls, Altrincham Grammar School for Boys, and Loreto Grammar School.[95] Altrincham received evacuees during the Second World War, and it was in this period that St. Ambrose College was founded.[96]

Altrincham now has eighteen primary schools, one special school and eight secondary schools, including five grammar schools; the Trafford district maintains a selective education system assessed by the Eleven Plus exam. Several of Altrincham's secondary schools have specialist status: Altrincham College of Arts (arts);[97] Altrincham Grammar School for Boys (language);[98] Altrincham Grammar School for Girls (language);[99] Blessed Thomas Holford Catholic College (maths and computing);[100] Loreto Grammar School (science and maths);[101] and St. Ambrose College (maths and computing).[102] Altrincham College of Arts,[97] Altrincham Grammar School for Boys,[98] Altrincham Grammar School for Girls,[99] Blessed Thomas Holford Catholic College,[100] Loreto Grammar School,[101] and St. Ambrose College were all rated as outstanding in their most recent Ofsted reports.[102] Brentwood Special School is a mixed school for 11- to 19-year-olds who have special needs or learning difficulties.[103]

[edit] Religion

During the medieval and post-medieval periods the township of Altrincham was part of Bowdon parish. Low population density meant that the town did not have a church until the Anglican church established a chapel of ease in 1799. Nonconformists were also present in Altrincham; Methodists set up a chapel in 1790, and Baptists built one in the 1870s.[104][105] Irish immigrants in the 1830s and 1840s also returned Roman Catholicism to the area, the first Roman Catholic church built in Altrincham being St Vincent's, in 1860.[106]

Several churches in Altrincham are deemed architecturally important enough to be designated Grade II listed buildings. These are Christ Church,[107] the Church of St Alban,[108] the Church of St George,[109] the Church of St John the Evangelist[110] and Trinity United Reformed Church.[111] Of the nine Grade II\* listed buildings in Trafford, three are in Altrincham: the Church of St Margaret,[112] the Church of St John the Divine[113] and Hale Chapel in Hale Barns.[114] As of the 2001 UK census, 78.8 per cent of Altrincham's residents reported themselves as being Christian, 1.1 per cent Jewish, 1.1 per cent Muslim, 0.4 per cent Hindu, 0.2 per cent Buddhist and 0.1 per cent Sikh. The census recorded 12.1 per cent as having no religion, 0.2 per cent with an alternative religion, while 6.1 per cent did not state a religion.[115] Altrincham is in the Roman Catholic Diocese of Shrewsbury,[116] and the Church of England Diocese of Chester.[117] The nearest synagogue, belonging to Hale and District Hebrew Congregation, is on Shay Lane in Hale.[118]

[edit] Transport

Construction of the Manchester South Junction and Altrincham Railway began in 1845. The line was opened in October 1849, with services from Manchester London Road[119] via Sale to Altrincham.[120] In 1931 it became one of Great Britain's first electrified railway lines, with a 1,500V DC overhead line. At the same time a new Altrincham station was opened on the same line, at Navigation Road, serving housing developments in the area. By 1937, 130 train services ran daily between Manchester and Altrincham.[17] The line was renovated in the early 1990s to form part of the Manchester Metrolink light rail system.[121] Broadheath railway station served the northern part of Altrincham between 1853 and 1962, on the line from Manchester, via Lymm to Warrington.[122]

Altrincham Interchange remains the Metrolink's southernmost terminus. It connects the town to several locations in Greater Manchester, such as Sale and Bury. The service also includes Navigation Road station. Metrolink services

leave around every six minutes, between 7:15 and 18:30, and every twelve minutes at other times of the day.[123]National Rail services link the Altrincham and Navigation Road stations with Chester via Northwich, and with Manchester via Stockport. Altrincham Interchange, next to the railway station, is a hub for local bus routes. Manchester Airport, the largest in the UK outside London, is 4 miles (6.4 km) to the southeast of the town.[124]

[edit] Notable people

{{main|List of people from Trafford}} The artist Helen Allingham, born in 1848, lived in Altrincham and then Bowdon during her childhood years.[125]Alison Uttley wrote the Little Grey Rabbit books while living in Bowdon.[125] Dramatist Ronald Gow lived there in his youth and later taught at the local grammar school.[125] The town was also the birthplace of the film and television actress Angela Cartwright.[126]Ian Brown and John Squire of The Stone Roses both attended Altrincham Grammar School for boys,[127] and Paul Young of Sad Café and Mike and the Mechanics lived in Altrincham until his death in 2000.[128]

The Lancashire and England Test cricketer Paul Allott was born in Altrincham.[129] Altrincham born Bill Speakman received the Victoria Cross for valour in 1951 in the Korean War.[130]Sir Michael Pollock, an officer in the Royal Navy who rose to the position of First Sea Lord, was born in Altrincham.[131]

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[edit] External links

George Fox (July 1624 – 13 January 1691) was an English Dissenter and a founder of the Religious Society of Friends, commonly known as the Quakers or Friends.

The son of a Leicestershire weaver, Fox lived in a time of great social upheaval and war. He rebelled against the religious and political authorities by proposing an unusual and uncompromising approach to the Christian faith. He travelled throughout Britain as a dissenting preacher, for which he was often persecuted by the authorities who disapproved of his beliefs.

Fox married Margaret Fell, the widow of one of his wealthier supporters; she was a leading Friend. His ministry expanded and he undertook tours of North America and the Low Countries, between which he was imprisoned for over a year. He spent the final decade of his life working in London to organize the expanding Quaker movement.

Though his movement attracted disdain from some, others such as William Penn and Oliver Cromwell viewed Fox with respect. His journal, first published after his death, is known even among non-Quakers for its vivid account of his personal journey.

[edit] Early life

George Fox was born in the strongly puritan village of Drayton-in-the-Clay, Leicestershire, England (now known as Fenny Drayton), 15 miles (24 km) west-south-west of Leicester. He was the eldest of four children of Christopher Fox, a successful weaver, called "Righteous Christer"[2] by his neighbours, and his wife, Mary née Lago. Christopher Fox was a churchwarden and was relatively wealthy; when he died in the late 1650s he was able to leave his son a substantial legacy.[3] From childhood Fox was of a serious, religious disposition. There is no record of any formal schooling but he learned to read and write. "When I came to eleven years of age", he said, "I knew pureness and righteousness; for, while I was a child, I was taught how to walk to be kept pure. The Lord taught me to be faithful, in all things, and to act faithfully two ways; viz., inwardly to God, and outwardly to man." [4]

As he grew up, his relatives "thought to have made me a priest" but he was instead apprenticed to a local shoemaker and grazier, George Gee of Mancetter.[5] This suited his contemplative temperament and he became well known for his diligence among the wool traders who had dealings with his master. A constant obsession for Fox was the pursuit of "simplicity" in life, meaning humility and the abandonment of luxury, and the short time he spent as a shepherd was important to the formation of this view. Toward the end of his life he wrote a letter for general circulation pointing out that Abel, Noah, Abraham, Jacob, Moses and David were all keepers of sheep or cattle and therefore that a learned education should not be seen as a necessary qualification for ministry.[6]

George Fox knew people who were "professors" (followers of the standard religion), but by the age of nineteen he had begun to look down on their behaviour, in particular their drinking of alcohol. He records that, in prayer one night after leaving two acquaintances at a drinking session, he heard an inner voice saying, "Thou seest how young people go together into vanity, and old people into the earth; thou must forsake all, young and old, keep out of all, and be as a stranger unto all." [7]

[edit] First travels

Driven by his "inner voice", Fox left Drayton-in-the-Clay in September 1643, moving toward London in a state of mental torment and confusion. The English Civil War had begun and troops were stationed in many towns through which he

passed.[3] In Barnet, he was torn by depression (perhaps from the temptations of the resort town near London). He alternately shut himself in his room for days at a time or went out alone into the countryside. After almost a year he returned to Drayton, where he engaged Nathaniel Stephens, the clergyman of his hometown, in long discussions on religious matters.[8] Stephens considered Fox a gifted young man but the two disagreed on so many issues that he later called Fox mad and spoke against him.[9]

Over the next few years Fox continued to travel around the country as his particular religious beliefs took shape. At times he actively sought the company of clergy but found no comfort from them as they seemed unable to help with the matters troubling him. One, in Warwickshire, advised him to take tobacco (which Fox disliked) and sing psalms; another, in Coventry, lost his temper when Fox accidentally stood on a flower in his garden; a third suggested bloodletting.[10] He became fascinated by the Bible, which he studied assiduously.[11] He hoped to find among the "English Dissenters" a spiritual understanding absent from the established church but fell out with one group, for example, because he maintained that women had souls:[12]

as I had forsaken the priests, so I left the separate preachers also, and those esteemed the most experienced people; for I saw there was none among them all that could speak to my condition. And when all my hopes in them and in all men were gone, so that I had nothing outwardly to help me, nor could tell what to do, then, oh, then, I heard a voice which said, "There is one, even Christ Jesus, that can speak to thy condition"; and when I heard it my heart did leap for joy. Then the Lord let me see why there was none upon the earth that could speak to my condition, namely, that I might give Him all the glory; for all are concluded under sin, and shut up in unbelief as I had been, that Jesus Christ might have the pre-eminence who enlightens, and gives grace, and faith, and power. Thus when God doth work, who shall let (i.e. prevent) it? And this I knew experimentally.[13][14]

He thought intensely about the Temptation of Christ, which he compared to his own spiritual condition, but drew strength from his conviction that God would support and preserve him.[15] In prayer and meditation he came to a greater understanding of the nature of his faith and what it required from him; this process he called "opening". He also came to what he deemed a deep inner understanding of standard Christian beliefs. Among his ideas were:

Rituals can be safely ignored, as long as one experiences a true spiritual conversion.

The qualification for ministry is given by the Holy Spirit, not by ecclesiastical study. This implies that anyone has the right to minister, assuming the Spirit guides them, including women and children.[3] God "dwelleth in the hearts of his obedient people": religious experience is not confined to a church building. Indeed, Fox refused to apply the word "church" to a building, using instead the name "steeple-house", a usage maintained by many Quakers today. Fox would just as soon worship in fields and orchards, believing that God's presence could be felt anywhere.[16] Though Fox used the Bible to support his views, Fox reasoned that, because God was within the faithful, believers could follow their own inner guide rather than rely on a strict reading of Scripture or the word of clerics.[3][17] Fox also made no clear distinction between Father, Son and Holy Spirit.[3]

[edit] Religious Society of Friends

In 1647 Fox began to preach publicly:[18] in market-places, fields, appointed meetings of various kinds or even sometimes "steeple-houses" after the service. His powerful preaching began to attract a small following. It is not clear at what point the Society of Friends was formed but there was certainly a group of people who often travelled together. At first, they called themselves "Children of the Light" or "Friends of the Truth", and later simply "Friends". Fox seems to have had no desire to found a sect but only to proclaim what he saw as the pure and genuine principles of Christianity in their original simplicity, though he afterward showed great prowess as a religious legislator in the

organization he gave to the new society.

There were a great many rival Christian denominations holding very diverse opinions; the atmosphere of dispute and confusion gave Fox an opportunity to put forward his own beliefs through his personal sermons. Fox's preaching was grounded in scripture but was mainly effective because of the intense personal experience he was able to project.[3] He was scathing about immorality, deceit and the exacting of tithes and urged his listeners to lead lives without sin,[19] avoiding the Ranter's antinomian view that a believer becomes automatically sinless. By 1651 he had gathered other talented preachers around him and continued to roam the country despite a harsh reception from some listeners, who would whip and beat them to drive them away.[20] The worship of Friends in the form of silent waiting seems to have been well-established by this time,[21] though it is not recorded how this came to be.

[edit] Imprisonment

Fox complained to judges about decisions he considered morally wrong, as in his letter on the case of a woman due to be executed for theft.[22] He campaigned against the paying of tithes, which funded the established church and often went into the pockets of absentee landlords or religious colleges far away from the paying parishioners. In his view, as God was everywhere and anyone could preach, the established church was unnecessary and a university qualification irrelevant for a preacher.[3] Conflict with civil authority was inevitable. Fox was imprisoned several times, the first at Nottingham in 1649.[23] At Derby in 1650 he was imprisoned for blasphemy; a judge mocked Fox's exhortation to "tremble at the word of the Lord", calling him and his followers "Quakers".[24] Following his refusal to fight against the return of the monarchy (or to take up arms for any reason), his sentence was doubled.[25] The refusal to swear oaths or take up arms came to be a much more important part of his public statements. Refusal to take oaths meant that Quakers could be prosecuted under laws compelling subjects to pledge allegiance, as well as making testifying in court problematic.[3] In a letter of 1652 (That which is set up by the sword), he urged Friends not to use "carnal weapons" but "spiritual weapons", saying "let the waves [the power of nations] break over your heads".

In 1652, Fox preached for several hours under a walnut tree at Balby, where his disciple Thomas Aldham was instrumental in setting up the first meeting in the Doncaster area.[26] In June that year Fox felt that God led him to ascend Pendle Hill where he had a vision of many souls coming to Christ. From there he travelled to Sedbergh in Westmorland, where he had heard a group of Seekers were meeting, and preached to over a thousand people on Firbank Fell, convincing many, including Francis Howgill, to accept that Christ might speak to people directly.[27] At the end of the month he stayed at Swarthmoor Hall, near Ulverston, the home of Thomas Fell, vice-chancellor of the Duchy of Lancaster, and his wife, Margaret. At around this time the ad hoc meetings of Friends began to be formalized and a monthly meeting was set up in County Durham.[3] Margaret became a Quaker and, although Thomas did not convert, his familiarity with the Friends proved influential when Fox was arrested for blasphemy in October. Fell was one of three presiding judges, and had the charges dismissed on a technicality.

Fox remained at Swarthmoor until summer 1653 then left for Carlisle where he was arrested again for blasphemy.[3] It was even proposed to put him to death but Parliament requested his release rather than have "a young manÂ ... die for religion".[28] Further imprisonments came at London in 1654, Launceston in 1656, Lancaster in 1660, Leicester in 1662, Lancaster again and Scarborough in 1664â ^66 and Worcester in 1673â ^75. Charges usually included causing a disturbance and travelling without a pass. Quakers fell foul of irregularly enforced laws forbidding unauthorized worship while actions motivated by belief in social equalityâ ~refusing to use or acknowledge titles, take hats off in court or bow to those who considered themselves socially superiorâ ~were seen as disrespectful.[29] While imprisoned at Launceston Fox wrote, "Christ our Lord and master saith 'Swear not at all, but let your communications be yea, yea,

and nay, nay, for whatsoever is more than these cometh of evil.'Â ... the Apostle James saith, 'My brethren, above all things swear not, neither by heaven, nor by earth, nor by any other oath. Lest ye fall into condemnation.'"[30]

In prison George Fox continued writing and preaching, feeling that imprisonment brought him into contact with people who needed his helpâ ~the jailers as well as his fellow prisoners. He also sought to set an example by his actions there, turning the other cheek when being beaten and refusing to show his captors any dejected feelings.

[edit] Encounters with Oliver Cromwell

Parliamentarians grew suspicious of monarchist plots and fearful that the group travelling with Fox aimed to overthrow the government: by this time his meetings were regularly attracting crowds of over a thousand. In early 1655 he was arrested at Whetstone, Leicestershire and taken to London under armed guard. In March[31] he was brought before the Lord Protector, Oliver Cromwell. After affirming that he had no intention of taking up arms Fox was able to speak with Cromwell for most of the morning about the Friends and advised him to listen to God's voice and obey it so that, as Fox left, Cromwell "with tears in his eyes said, 'Come again to my house; for if thou and I were but an hour of a day together, we should be nearer one to the other'; adding that he wished [Fox] no more ill than he did to his own soul."[32]

This episode was later recalled as an example of "speaking truth to power", a preaching technique by which subsequent Quakers hoped to influence the powerful.[33] Although not used until the 20th century, the phrase is related to the ideas of plain speech and simplicity which Fox practiced, but motivated by the more worldly goal of eradicating war, injustice and oppression.

Fox petitioned Cromwell over the course of 1656, asking him to alleviate the persecution of Quakers.[34] Later that year, they met for a second time at Whitehall. On a personal level, the meeting went well; despite disagreements between the two men, they had a certain rapport. Fox felt moved to invite Cromwell to "lay down his crown at the feet of Jesus"â ~which, however, Cromwell declined to do.[35] Fox met Cromwell again twice in March 1657.[36] Their last meeting was in 1658 at Hampton Court, though they could not speak for long or meet again because of the Protector's worsening illnessâ ~Fox even wrote that "he looked like a dead man".[37] Cromwell died in September of that year.

[edit] James Nayler

One early Quaker convert, the Yorkshireman James Nayler, arose as a prominent preacher in London around 1655. A breach began to form between Fox's and Nayler's followers. As Fox was held prisoner at Launceston, Nayler moved south-westwards towards Launceston intending to meet Fox and heal any rift. On the way he was arrested himself and held at Exeter. After Fox was released from Launceston gaol in 1656, he preached throughout the West Country. Arriving at Exeter late in September, Fox was reunited with Nayler. Nayler and his followers refused to remove their hats while Fox prayed, which Fox took as both a personal slight and a bad example. When Nayler refused to kiss Fox's hand, Fox told Nayler to kiss his foot instead. Nayler was offended and the two parted acrimoniously. Fox wrote, "there was now a wicked spirit risen amongst Friends".[38]

After Nayler's own release later the same year he rode into Bristol triumphantly playing the part of Jesus Christ in a re-enactment of Palm Sunday. He was arrested and taken to London, where Parliament defeated a motion to execute him by 96â ^82. Instead, they ordered that he be pilloried and whipped through both London and Bristol, branded on his forehead with the letter B (for blasphemer), bored through the tongue with a red-hot iron and imprisoned in solitary confinement with hard labour.[39] Nayler was released in 1659, but he was a broken man. On meeting Fox in London, he fell to his knees and begged Fox's forgiveness. Shortly afterward, Nayler was attacked by thieves while travelling home to his family, and died.[3]

[edit] Suffering and growth

The persecutions of these yearsâ ~with about a thousand Friends in prison by

1657â ~hardened George Fox's opinions of traditional religious and social practices. In his preaching, he often emphasized the Quaker rejection of baptism by water; this was a useful way of highlighting how the focus of Friends on inward transformation differed from what he saw as the superstition of outward ritual. It was also deliberately provocative to adherents of those practices, providing opportunities for Fox to argue with them on matters of scripture. This pattern was also found in his court appearances: when a judge challenged him to remove his hat, Fox riposted by asking where in the Bible such an injunction could be found.

The Society of Friends became increasingly organized towards the end of the decade. Large meetings were held, including a three-day event in Bedfordshire, the precursor of the present Britain Yearly Meeting system.[40] Fox commissioned two Friends to travel around the country collecting the testimonies of imprisoned Quakers, as evidence of their persecution; this led to the establishment in 1675 of Meeting for Sufferings, which has continued to the present day.[41]

The 1650s, when the Friends were most confrontational, was one of the most creative periods of their history. During the Commonwealth, Fox had hoped that the movement would become the major church in England. Disagreements, persecution and increasing social turmoil, however, led Fox to suffer from a severe depression, which left him deeply troubled at Reading, Berkshire, for ten weeks in 1658 or 1659.[42] In 1659, he sent parliament his most politically radical pamphlet, Fifty nine Particulars laid down for the Regulating things, but the year was so chaotic that it never considered them; the document was not reprinted until the 21st century.[3]

[edit] The Restoration

With the restoration of the monarchy, Fox's dreams of establishing the Friends as the dominant religion seemed at an end. He was again accused of conspiracy, this time against Charles II, and fanaticismâ ~a charge he resented. He was imprisoned in Lancaster for five months, during which he wrote to the king offering advice on governance: Charles should refrain from war and domestic religious persecution, and discourage oath-taking, plays, and maypole games. These last suggestions reveal Fox's Puritan leanings, which continued to influence Quakers for centuries after his death. Once again, Fox was released after demonstrating that he had no military ambitions.

At least on one point, Charles listened to Fox. The seven hundred Quakers who had been imprisoned under Richard Cromwell were released, though the government remained uncertain about the group's links with other, more violent, movements. A revolt by the Fifth Monarchists in January 1661 led to the suppression of that sect and the repression of other nonconformists, including Quakers.[43] In the aftermath of this attempted coup, Fox and eleven other Quakers issued a broadside proclaiming what became known among Friends in the 20th century as the "peace testimony": they committed themselves to oppose all outward wars and strife as contrary to the will of God. Not all his followers accepted this statement; Isaac Penington, for example, dissented for a time arguing that the state had a duty to protect the innocent from evil, if necessary by using military force. Despite the testimony, persecution against Quakers and other dissenters continued.[3]

Penington and others, such as John Perrot and John Pennyman, were uneasy at Fox's increasing power within the movement. Like Nayler before them, they saw no reason why men should remove their hats for prayer, arguing that men and women should be treated as equals and if, as according to the apostle Paul, women should cover their heads, then so could men. Perrot and Penington lost the argument. Perrot emigrated to the New World, and Fox retained leadership of the movement.[3]

Parliament enacted laws which forbade non-Anglican religious meetings of more than five people, essentially making Quaker meetings illegal. Fox counseled his followers to openly violate laws that attempted to suppress the movement, and many Friends, including women and children, were jailed over the next two and a half decades. Meanwhile, Quakers in New England had been banished (and some

executed), and Charles was advised by his councillors to issue a mandamus condemning this practice and allowing them to return.[44] Fox was able to meet some of the New England Friends when they came to London, stimulating his interest in the colonies. Fox was unable to travel there immediately: he was imprisoned again in 1664 for his refusal to swear the oath of allegiance, and on his release in 1666 was preoccupied with organizational mattersâ ~he normalized the system of monthly and quarterly meetings throughout the country, and extended it to Ireland.

Visiting Ireland also gave him the opportunity to preach against what he saw as the excesses of the Roman Catholic Church, in particular the use of ritual. More recent Quaker commentators have noted points of contact between the denominations: both claim the actual presence of God in their meetings, and both allow the collective opinion of the church to augment Biblical teaching. Fox, however, did not perceive this, brought up as he was in a wholly Protestant environment hostile to "Popery".

Fox married Margaret Fell of Swarthmoor Hall, a lady of high social position and one of his early converts, on 27 October 1669 at a meeting in Bristol. She was ten years his senior and had eight children (all but one of them Quakers) by her first husband, Thomas Fell, who had died in 1658. She was herself very active in the movement, and had campaigned for equality and the acceptance of women as preachers. As there were no priests at Quaker weddings to perform the ceremony, the union took the form of a civil marriage approved by the principals and the witnesses at a meeting. Ten days after the marriage, Margaret returned to Swarthmoor to continue her work there while George went back to London.[45] Their shared religious work was at the heart of their life together, and they later collaborated on a great deal of the administration the Society required. Shortly after the marriage, Margaret was imprisoned at Lancaster;[46] George remained in the south-east of England, becoming so ill and depressed that for a time he lost his sight.[47]

[edit] Travels in America and Europe

By 1671 Fox had recovered and Margaret had been released by order of the King. Fox resolved to visit the English settlements in America and the West Indies, remaining there for two years, possibly to counter any remnants of Perrot's teaching there.[3] After a voyage of seven weeks, during which dolphins were caught and eaten, the party arrived in Barbados on 3 October 1671.[48] From there, Fox sent an epistle to Friends spelling out the role of women's meetings in the Quaker marriage ceremony, a point of controversy when he returned home. One of his proposals suggested that the prospective couple should be interviewed by an all-female meeting prior to the marriage to determine whether there were any financial or other impediments. Though women's meetings had been held in London for the last ten years, this was an innovation in Bristol and the north-west of England, which many there felt went too far.[3]

Fox wrote a letter to the governor and assembly of the island in which he refuted charges that Quakers were stirring up the slaves to revolt and tried to affirm the orthodoxy of Quaker beliefs. After a stay in Jamaica, Fox's first landfall on the North American continent was at Maryland, where he participated in a four-day meeting of local Quakers. He remained there while various of his English companions travelled to the other colonies, because he wished to meet some Native Americans who were interested in Quaker waysâ ~though he relates that they had "a great dispute" among themselves about whether to participate in the meeting. Fox was impressed by their general demeanour, which he said was "courteous and loving".[49] He resented the suggestion (from a man in North Carolina) that "the Light and Spirit of GodÂ ... was not in the Indians", a proposition which Fox refuted.[50] Fox left no record of encountering slaves on the mainland.

Elsewhere in the colonies, Fox helped to establish organizational systems for the Friends, along the same lines as he had done in Britain.[51] He also preached to many non-Quakers, some but not all of whom were converted.

Following extensive travels around the various American colonies, George Fox returned to England in June 1673 confident that his movement was firmly



established there. Back in England, however, he found his movement sharply divided among provincial Friends (such as William Rogers, John Wilkinson and John Story) who resisted establishment of women's meetings and the power of those who resided in or near London. With William Penn and Robert Barclay as allies of Fox, the challenge to Fox's leadership was eventually put down.[3] But in the midst of the dispute, Fox was imprisoned again for refusing to swear oaths after being captured at Armscote, Worcestershire.[52] His mother died shortly after hearing of his arrest and Fox's health began to suffer.[53] Margaret Fell petitioned the king for his release,[54] which was granted,[55] but Fox felt too weak to take up his travels immediately. Recuperating at Swarthmoor, he began dictating what would be published after his death as his journal and devoted his time to his written output: letters, both public and private, as well as books and essays.[56] Much of his energy was devoted to the topic of oaths, having become convinced of its importance to Quaker ideas. By refusing to swear, he felt that he could bear witness to the value of truth in everyday life, as well as to God, who he associated with truth and the inner light.

For three months in 1677 and a month in 1684, Fox visited the Friends in the Netherlands, and organized their meetings for discipline. The first trip was the more extensive, taking him into what is now Germany, proceeding along the coast to Friedrichstadt and back again over several days. Meanwhile, Fox was participating in a dispute among Friends in Britain over the role of women in meetings, a struggle which took much of his energy and left him exhausted. Returning to England, he stayed in the south in order to try to end the dispute. He followed the foundation of the colony of Pennsylvania, where Penn had given him over 1,000 acres (4.0Â km<sup>2</sup>) of land, with interest.[3] Persecution continued, with Fox arrested briefly in October 1683. Fox's health was becoming worse, but he continued his activitiesâ ~writing to leaders in Poland, Denmark, Germany, and elsewhere about his beliefs, and their treatment of Quakers.

[edit] Last years

In the last years of his life, Fox continued to participate in the London Meetings, and still made representations to Parliament about the sufferings of Friends. The new King, James II, pardoned religious dissenters jailed for failure to attend the established church, leading to the release of about 1500 Friends. Though the Quakers lost influence after the Glorious Revolution, which deposed James II, the Act of Toleration 1689 put an end to the uniformity laws under which Quakers had been persecuted, permitting them to assemble freely.

Two days after preaching, as usual, at the Gracechurch Street Meeting House in London, George Fox died between 9 and 10 p.m. on 13 January 1691. He was interred in the Nonconformists' burying ground at Bunhill Fields in London three days later in the presence of thousands of mourners.[58]

[edit] Journal and letters

His journal was first published in 1694, after editing by Thomas Ellwoodâ ~a friend and associate of John Miltonâ ~with a preface by William Penn. Like most similar works of its time the journal was not written contemporaneously to the events it describes, but rather compiled many years later, much of it dictated. Parts of the journal were not in fact by Fox at all but are constructed by its editors from diverse sources and written as if by him.[59] The dissent within the movement and the contributions of others to the development of Quakerism are largely excluded from the narrative. Fox portrays himself as always in the right and always vindicated by God's interventions on his behalf.[3] As a religious autobiography, Rufus Jones compared it to such works as Augustine's Confessions and John Bunyan's Grace Abounding to the Chief of Sinners. It is, though, an intensely personal work with little dramatic power that only succeeds in appealing to readers after substantial editing. Historians have used it as a primary source because of its wealth of detail on ordinary life in the 17th century, and the many towns and villages which Fox visited.[60]

Hundreds of Fox's lettersâ ~mostly intended for wide circulation, along with a few private communicationsâ ~were also published. Written from the 1650s onwards, with such titles as Friends, seek the peace of all men or To Friends, to know

one another in the light, they give enormous insight into the detail of Fox's beliefs, and show his determination to spread them. These writings, in the words of Henry Cadbury, Professor of Divinity at Harvard University and a leading Quaker, "contain a few fresh phrases of his own, [but] are generally characterized by an excess of scriptural language and today they seem dull and repetitious".[61] Others point out that "Fox's sermons, rich in biblical metaphor and common speech, brought hope in a dark time."[62] Fox's aphorisms have found an audience beyond Quakers, with many other church groups using them to illustrate principles of Christianity.

Fox is described by Ellwood as "graceful in countenance, manly in personage, grave in gesture, courteous in conversation". Penn says he was "civil beyond all forms of breeding". We are told that he was "plain and powerful in preaching, fervent in prayer", "a discerner of other men's spirits, and very much master of his own", skilful to "speak a word in due season to the conditions and capacities of most, especially to them that were weary, and wanted soul's rest"; "valiant in asserting the truth, bold in defending it, patient in suffering for it, immovable as a rock".[63]

[edit] Legacy

Fox's influence on the Society of Friends was of course tremendous, and his beliefs have largely been carried forward by that group. Perhaps his most significant achievement, other than his predominant influence in the early movement, was his leadership in overcoming the twin challenges of government prosecution after the Restoration and internal disputes that threatened its stability during the same period. Not all of his beliefs were welcome to all Quakers: his Puritan-like opposition to the arts[64] and rejection of theological study, forestalled development of these practices among Quakers for some time.

The name of George Fox is often invoked by traditionalist Friends who dislike modern liberal attitudes to the Society's Christian origins. At the same time, Quakers and others can relate to Fox's religious experience, and even those who disagree with him regard him as a pioneer.

Walt Whitman, who was raised by parents inspired by Quaker thought, later wrote: "George Fox stands for something tooâ ~a thoughtâ ~the thought that wakes in silent hoursâ ~perhaps the deepest, most eternal thought latent in the human soul. This is the thought of God, merged in the thoughts of moral right and the immortality of identity. Great, great is this thoughtâ ~aye, greater than all else."[65]

George Fox University in Oregon, founded as Pacific College in 1891, was renamed for him in 1949. He also has a building named after him at Lancaster University. James Harcourt played Fox in the 1941 film Penn of Pennsylvania. Fox's relationship with Margaret Fell is novelized in Jan de Hartog's *The Peaceable Kingdom: An American Saga*.

[edit] See also

[edit] Notes and sources

^ This picture, reputedly by Peter Lely, is in the collection of Swarthmore College. Its authenticity is questioned (see for example, Fenn, W. W. (April 1926). *The American Historical Review*, Vol.31 No.3 pp.513-515), together with all other supposed portraits of George Fox.

^ Fox in Nickalls, p.1

^ a b c d e f g h i j k l m n o p q r s Ingle (2004)

^ Fox in Nickalls, p.1â ^2 and Jones, chapter 1

^ Nickalls, p.2 and Ingle (2004)

^ Marsh 1847, p. 364

^ Fox in Nickalls, p.3 and Jones, chapter 1

^ Fox in Nickalls, p.5

^ Fox in Nickalls, p.48

^ Fox in Nickalls, pp.5â ^6

^ Fox in e.g. Nickalls, p.9

^ Fox in Nickalls, pp.8â ^9, 11

^ Quaker Faith and Practice Â§19.02  
 ^ Fox in Nickalls, p.11  
 ^ Fox in Nickalls, p.12  
 ^ Fox in e.g. Nickalls, pp.8, 24, 40, 85, 126  
 ^ See e.g. Fox in Nickalls, pp.145, 159  
 ^ Fox in Nickalls, pp.18â ^19  
 ^ Fox in e.g. Nickalls, p.91  
 ^ See e.g. Fox in Nickalls, pp.44, 48, 97â ^98, 120, 127â ^131  
 ^ Fox in Nickalls, p.79  
 ^ Fox in Nickalls, p.66  
 ^ Fox in Nickalls, pp.40â ^43  
 ^ Fox in Nickalls, pp.52â ^58 and Jones, chapter 4  
 ^ Fox in Nickalls, pp.64â ^65  
 ^ Doncaster Friends site: Retrieved 30 September 2011.  
 ^ Nickalls, pp.103â ^108  
 ^ Fox in Nickalls, pp.159â ^164 and Jones, chapter 7  
 ^ Fox in e.g. Nickalls, pp.36â ^37, 243â ^244  
 ^ Fox in e.g. Nickalls, pp.244â ^245  
 ^ Ingle (2004) says 9 March; Nickalls, p.199 says 6 March.  
 ^ Fox in Jones, chapter 8 and Nickalls, p.199  
 ^ Tolles, Frederick Barnes (1956). The Ward Lecture 1956: Quakerism and Politics. Quaker Pamphlets.  
 ^ Fox in Nickalls, pp.220â ^221, 254  
 ^ Fox in Nickalls, p.274 and Jones, chapter 10  
 ^ Fox in Nickalls, p.289  
 ^ Fox in Jones, chapter 12 and Nickalls, p.350  
 ^ Ingle (2004) and Fox in Nickalls, p.268  
 ^ Jones, footnote 125, chapter 10  
 ^ Fox in Nickalls, p.339  
 ^ Quaker Faith and Practice Â§7  
 ^ Nickalls, pp.353â ^355 and Ingle (2004)  
 ^ Fox in Nickalls, pp.394â ^395 and Jones, chapter 14  
 ^ Fox in Nickalls, pp.411â ^414  
 ^ Margaret wrote in her testimony, published in Ellwood's 1694 edition of Fox's journal, "we were very willing, both of us, to live apart for some years upon God's account and his Truth's service, and to deny ourselves of that comfort which we might have had in being together, for the sake and service of the Lord and his Truth. And if any took occasion, or judged hard of us because of that, the Lord will judge them; for we were innocent."  
 ^ Fox in Nickalls, p.557  
 ^ Fox in Nickalls, pp.569â ^571  
 ^ Diary of John Hull, quoted in Nickalls, pp.580â ^592  
 ^ Fox in Nickalls, p.618; Jones, chapter 18, using alternate sources, has "a great debate" and "carried themselves very courteously and lovingly".  
 ^ Fox in Jones, chapter 18; Nickalls, p.642, has more complicated wording but the same meaning.  
 ^ Fox in Nickalls, p.621  
 ^ Though now in Warwickshire, until the re-arrangement of county boundaries in the twentieth century Armscote was in an outlying part of Worcestershire.  
 ^ Fox in Nickalls, pp.666â ^676  
 ^ Fox in Nickalls, p.701  
 ^ Fox in Nickalls, p.705  
 ^ Cadbury, Henry J. (1952) "George Fox's Later Years" in Nickalls, pp.713â ^756  
 ^ "Eleventh month 1690" is "January 1691" in modern reckoning. In the Old Style calendar used at the time, the new year started on 25 March, and Quakers numbered the months to avoid using "heathen" names.  
 ^ Robert Barrow's account quoted in Nickalls, p.760 estimates four thousand; Ellwood says "a very great number"; Ingle (2004) says "thousands"  
 ^ See for example, Nickalls, pp.536, 580, 594  
 ^ Jones, Rufus M. (1908) "Preface" in Jones's version of Fox's journal

^ Cadbury, Henry J. (1967). "Fox, George". Collier's Encyclopedia. Crowell Collier and Macmillan, Inc. Vol.10 p.243  
^ George Fox University (19 March 2008). "Spiritual Leadership of George Fox". Retrieved 12 May 2008.  
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^ Fox in e.g. Nickalls, pp.37â ^38  
^ Whitman, Walt (1892). Essay in November. Prose Works. Philadelphia: David McKay

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#### [edit] External links

#### Persondata

Name

Fox, George

Alternative names

Short description

English Dissenter

Date of birth

July 1624

Place of birth

Leicestershire, England

Date of death

13 January 1691

Place of death

London

Mary Toft (nÃœe Denyer; c. 1701â ^1763), also spelled Tofts, was an English woman from Godalming, Surrey, who in 1726 became the subject of considerable controversy when she tricked doctors into believing that she had given birth to rabbits.

In 1726 Toft became pregnant, but following her reported fascination with the sighting of a rabbit, she miscarried. Her claim to have given birth to various animal parts prompted the arrival of John Howard, a local surgeon, who investigated the matter. He delivered several pieces of animal flesh and duly notified other prominent physicians, which brought the case to the attention of Nathaniel St. AndrÃ©, surgeon to the Royal Household of King George I. St.Ã AndrÃ© concluded that Toft's case was genuine but the king also sent surgeon Cyriacus

Ahlers, who remained sceptical. By then quite famous, Toft was brought to London and studied at length, where under intense scrutiny and producing no more rabbits she confessed to the hoax, and was subsequently imprisoned as a fraud.

The resultant public mockery created panic within the medical profession and ruined the careers of several prominent surgeons. The affair was satirised on many occasions, not least by the pictorial satirist and social critic William Hogarth, who was notably critical of the medical profession's gullibility. Toft was eventually released without charge and returned home.

[edit] Account

The story first came to the public's attention in late October 1726, when reports began to reach London.[1] It was reported in the *Mist's Weekly Journal*, on 19<sup>th</sup> November 1726:

From Guildford comes a strange but well-attested Piece of News. That a poor Woman who lives at Godalmin [sic], near that Town, was about a Month past delivered by Mr John Howard, an Eminent Surgeon and Man-Midwife, of a creature resembling a Rabbit but whose Heart and Lungs grew without [outside] its Belly, about 14 Days since she was delivered by the same Person, of a perfect Rabbit: and in a few Days after of 4 more; and on Friday, Saturday, Sunday, the 4th, 5th, and 6th instant, of one in each day: in all nine, they died all in bringing into the World. The woman hath made Oath, that two Months ago, being working in a Field with other Women, they put up a Rabbit, who running from them, they pursued it, but to no Purpose: This created in her such a Longing to it, that she (being with Child) was taken ill and miscarried, and from that Time she hath not been able to avoid thinking of Rabbits. People after all, differ much in their Opinion about this Matter, some looking upon them as great Curiosities, fit to be presented to the Royal Society, etc. others are angry at the Account, and say, that if it be a Fact, a Veil should be drawn over it, as an Imperfection in human Nature.

â ~Weekly Journal, 19<sup>th</sup> November 1726[2]

The 'poor Woman', Mary Toft, was twenty-four or twenty-five years old. She was baptised Mary Denyer on 21<sup>st</sup> February 1703, the daughter of John and Jane Denyer. In 1720 she married Joshua Toft, a journeyman clothier and together the couple had three children, Mary, Anne and James.[3][4] As an 18th-century English peasant, circumstances dictated that when in 1726 Toft again became pregnant, she continue working in the fields.[5] She complained of painful complications early in the pregnancy and in early August egested several pieces of flesh, one "as big as my arm". This may have been the result of an abnormality of the developing placenta, which would have caused the embryo to stop developing and blood clots and flesh to be ejected.[6][7][8] Toft went into labour on 27<sup>th</sup> September. Her neighbour was called and watched as she produced several animal parts. This neighbour then showed the pieces to her mother and to her mother-in-law, Ann Toft, who by chance was a midwife. Ann Toft sent the flesh to John Howard, a Guildford-based man-midwife of thirty years experience.[6][9]

Initially, Howard dismissed the notion that Toft had given birth to animal parts, but the next day, despite his reservations, he went to see her. Ann Toft showed him more pieces of the previous night's exertions, but on examining Mary, he found nothing. When Mary again went into labour, appearing to give birth to several more animal parts, Howard returned to continue his investigations. According to a contemporary account of 9<sup>th</sup> November, over the next few days he delivered "three legs of a Cat of a Tabby Colour, and one leg of a Rabbet: the guts were as a Cat's and in them were three pieces of the Back-Bone of an Eelâ ... The cat's feet supposed were formed in her imagination from a cat she was fond of that slept on the bed at night." Toft seemingly became ill once more and over the next few days delivered more pieces of rabbit.[6][8]

As the story became more widely known, on 4<sup>th</sup> November Henry Davenant, a member of the court of King George I, went to see for himself what was happening. He

examined the samples Howard had collected and returned to London, ostensibly a believer. Howard had Toft moved to Guildford, where he offered to deliver rabbits in the presence of anyone who doubted her story.[10][11] Some of the letters he wrote to Davenant to notify him of any progress in the case came to the attention of Nathaniel St. André, since 1723 a Swiss surgeon to the Royal Household.[12] St. André would ultimately detail the contents of one of these letters in his pamphlet, A short narrative of an extraordinary delivery of rabbits (1727):

SIR,

Since I wrote to you, I have taken or deliver'd the poor Woman of three more Rabbits, all three half grown, one of them a dunn Rabbet; the last leap'd twenty three Hours in the Uterus before it dy'd. As soon as the eleventh Rabbet was taken away, up leap'd the twelfth Rabbet, which is now leaping. If you have any curious Person that is pleas'd to come along, may see another leap in her Uterus, and shall take it from her if he pleases; which will be a great Satisfaction to the Curious: If she had been with Child, she has but ten Days more to go, so I do not know how many Rabbits may be behind; I have brought the Woman to Guildford for better Convenience.

I am, SIR, Your humble Servant,

JOHN HOWARD.[13]

[edit] Investigation

By the middle of November the British Royal Family were so interested in the story that they sent St. André and Samuel Molyneux, secretary to the Prince of Wales, to investigate. Apparently, they were not disappointed; arriving on 15 November they were taken by Howard to see Toft, who within hours delivered a rabbit's torso.[1] St. André's account details his examination of the rabbit. To check if it had breathed air, he placed a piece of its lung in water to see if it would float which it did. St. André then performed a medical examination on Toft, and concluded that the rabbits were bred in her Fallopian tubes. In the doctors' absence, Toft later that day reportedly delivered the torso of another rabbit, which the two also examined.[11][14] They again returned that evening to find Toft again displaying violent contractions. A further medical examination followed, and St. André delivered some rabbit skin, followed a few minutes later by a rabbit's head. Both men inspected the egested pieces of flesh, noting that some resembled the body parts of a cat.[15]

Fascinated, the king then sent surgeon Cyriacus Ahlers to Guildford. Ahlers arrived on 20 November and found Toft exhibiting no signs of pregnancy. He may have already suspected the affair was a hoax and observed that Toft seemed to press her knees and thighs together, as if to prevent something from "dropping down". He thought Howard's behaviour just as suspicious, as the man-midwife would not let him help deliver the rabbits although Ahlers was not a man-midwife and in an earlier attempt had apparently put Toft through considerable pain.[16] Convinced the affair was a hoax, he lied, telling those involved that he believed Toft's story, before making his excuses and returning to London, taking specimens of the rabbits with him. Upon closer study, he reportedly found evidence of them having been cut with a man-made instrument, and noted pieces of straw and grain in their droppings.[1][17]

On 21 November Ahlers reported his findings to the king and later to "several Persons of Note and Distinction".[18] Howard wrote to Ahlers the next day, asking for the return of his specimens.[17] Ahlers' suspicions began to worry both Howard and St. André, and apparently the king, as two days later St. André and a colleague were ordered back to Guildford.[16][19] Upon their arrival they met Howard, who told St. André that Toft had given birth to two more rabbits. She delivered several portions of what was presumed to be a placenta but she was by then quite ill, and suffering from a constant pain in the right side of her abdomen.[16][20] In a pre-emptive move against Ahlers, St. André collected affidavits from several witnesses, which in effect cast doubt on Ahlers' honesty, and on 26 November gave an anatomical demonstration before the king to

support Toft's story.[19][21] According to his pamphlet, neither St.Â Andr  nor Molyneux suspected any fraudulent activity.[22]

St.Â Andr  was ordered by the king to travel back to Guildford and to bring Toft to London, so that further investigations could be carried out. He was accompanied by Richard Manningham, a well-known obstetrician who was knighted in 1721, and the second son of Thomas Manningham, Bishop of Chichester.[16] He examined Toft and found the right side of her abdomen slightly enlarged. Manningham also delivered what he thought was a hog's bladder  although St.Â Andr  and Howard disagreed with his identification  but became suspicious as it smelled of urine. Nevertheless, those involved agreed to say nothing in public and on their return to London on 29  November lodged Toft in Lacey's Bagnio, in Leicester Fields.[19][23][24]

[edit] Examination

Printed in the early days of newspapers, the story became a national sensation, although some publications were sceptical, the Norwich Gazette viewing the affair simply as female gossip.[27] Rabbit stew and jugged hare disappeared from the dinner table, while as unlikely as the story sounded, many physicians felt compelled to see Toft for themselves. The political writer John Hervey later told his friend Henry Fox that:

Every creature in town, both men and women, have been to see and feel her: the perpetual emotions, noises and rumblings in her Belly are something prodigious; all the eminent physicians, surgeons and man-midwives in London are there Day and Night to watch her next production.

  John Hervey, 2nd Baron Hervey,  [3][28]

Under St.Â Andr 's strict control Toft was studied by a number of eminent physicians and surgeons, including John Maubray. In *The Female Physician* Maubray had proposed women could give birth to a creature he named a Sooterkin. He was a proponent of maternal impression, a widely held belief that conception and pregnancy could be influenced by what the mother dreamt, or saw,[29] and warned pregnant women that over-familiarity with household pets could cause their children to resemble those pets. He was reportedly happy to attend Toft, pleased that her case appeared to vindicate his theories,[30] but man-midwife James Douglas, like Manningham, presumed that the affair was a hoax and despite St.Â Andr 's repeated invitations, kept his distance. Douglas was one of the country's most respected anatomists and a well-known man-midwife, whereas St.Â Andr  was often considered to be a member of the court only because of his ability to speak the king's native German.[31] St.Â Andr  therefore desperately wanted the two to attend Toft; after George I's accession to the throne the Whigs had become the dominant political faction, and Manningham and Douglas' Whig affiliations and medical knowledge might have elevated his status as both doctor and philosopher.[24] Douglas thought that a woman giving birth to rabbits was as likely as a rabbit giving birth to a human child, but despite his scepticism he went to see her. When Manningham informed him of the suspected hog's bladder, and after he examined Toft, he refused to engage St.Â Andr  on the matter:[32]

To be able to determine, to the Satisfaction and Conviction of all sorts of Persons, other Arguments were necessary, than Anatomy, or any other Branch of Physick [sic], could furnish. Of these the greatest Number are not Judges. It was therefore undoubtedly very natural for me to desire that People would suspend any farther Judgement for a little Time, till such Proofs could be brought of the Imposture as they requir'd.

Under constant supervision, Toft went into labour several times, to no avail.[34]

[edit] Confession

The hoax was uncovered on 4  December. Thomas Onslow, 2nd Baron Onslow, had begun an investigation of his own and discovered that for the past month Toft's

husband, Joshua, had been buying young rabbits. Convinced he had enough evidence to proceed, in a letter to physician Hans Sloane he wrote that the affair had "almost alarmed England" and that he would soon publish his findings.[3][35] The same day, Thomas Howard, a porter at the bagnio, confessed to Justice of the Peace Sir Thomas Clarges that he had been bribed by Toft's sister-in-law, Margaret, to sneak a rabbit into Toft's chamber. When arrested and questioned Mary denied the accusation, while Margaret, under Douglas's interrogation, claimed that she had obtained the rabbit for eating only.[36]

I told my sister of my having sent for a rabbit and I desire[d] her to give it to the porter to be carryed [sic] away which my sister did saying she would not have it known for 1000 p[oun]d[s].

Manningham examined Toft and thought something remained in the cavity of her uterus, and so he successfully persuaded Clarges to allow her to remain at the bagnio.[36] Douglas, who had by then visited Toft, questioned her on three or four occasions, each time for several hours. After several days of this Manningham threatened to perform a painful operation on her, and on 7<sup>th</sup> December, in the presence of Manningham, Douglas, John Montagu and Frederick Calvert, Toft finally confessed.[3][37] Following her miscarriage and while her cervix permitted access, an accomplice had inserted into her womb the claws and body of a cat, and the head of a rabbit. They had also invented a story in which Toft claimed that during her pregnancy and while working in a field, she had been startled by a rabbit, and had since become obsessed with rabbits. For later parturitions, animal parts had been inserted into her vagina.[38][39]

Pressured again by Manningham and Douglas (it was the latter who took her confession), she made a further admission on 8<sup>th</sup> December and another on 9<sup>th</sup> December, before being sent to Tothill Fields Bridewell, charged on a statute of Edward III as a "vile cheat and imposter".[34][37][40] In her earlier, unpublished confessions, she blamed the entire affair on a range of other participants, from her mother-in-law to John Howard. She also claimed that a travelling woman told her how to insert the rabbits into her body, and how such a scheme would ensure that she would "never want as long as I liv'd".[7] The British Journal reported that on 7<sup>th</sup> January 1727 she appeared at the Courts of Quarter Sessions at Westminster, charged "for being an abominable cheat and imposter in pretending to be delivered of several monstrous births".[41] Margaret Toft had remained staunch, and refused to comment further. Mist's Weekly Journal of 24<sup>th</sup> December 1726 reported that "the nurse has been examined as to the person's concerned with her, but either was kept in the dark as to the imposition, or is not willing to disclose what she knows; for nothing can be got from her; so that her resolution shocks others."[42]

[edit] Aftermath

Following the hoax the medical profession's gullibility became the target of a great deal of public mockery. William Hogarth published *Cunicularii, or The Wise Men of Godliman in Consultation* (1726), which portrays Toft in the throes of labour, surrounded by the tale's chief participants. Figure "F" is Toft, "E" is her husband. "A" is St.<sup>th</sup> Andr<sup>th</sup>, and "D" is Howard.[25][45][46] In Dennis Todd's *Three Characters in Hogarth's Cunicularii and Some Implications* the author concludes that figure "G" is Mary Toft's sister-in-law, Margaret Toft. Toft's confession of 7<sup>th</sup> December demonstrates her insistence that her sister-in-law played no part in the hoax, but Manningham's 1726 *An Exact Diary of what was observ'd during a Close Attendance upon Mary Toft, the pretended Rabbet-Breeder of Godalming in Surrey* offers eyewitness testimony of her complicity.[47] Hogarth's print was not the only image that ridiculed the affair. George Vertue published *The Surrey-Wonder, and The Doctors in Labour, or a New Wim-Wam in Guildford* (12 plates), a broadsheet published in 1727 which satirises St.<sup>th</sup> Andr<sup>th</sup>, was also popular at the time.[48]

The timing of Toft's confession proved awkward for St.<sup>th</sup> Andr<sup>th</sup>, who on 3<sup>rd</sup> December had published his forty-page pamphlet *A Short Narrative of an Extraordinary Delivery of Rabbets*. [46] On this document the surgeon had staked



his reputation, and although it offers a more empirical account of the Toft case than earlier more fanciful publications about reproduction in general, ultimately it was derided.[49] Ahlers, his scepticism justified, published Some observations concerning the woman of Godlyman in Surrey, which details his account of events and his suspicion of the complicity of both St. Andr  and Howard.[50]

St. Andr  recanted his views on 9  December 1726. In 1729, following the death of Samuel Molyneux from poisoning, he married Molyneux's widow, Elizabeth. This did little to impress his peers.[51][52] Molyneux's cousin accused him of the poisoning, a charge that St. Andr  defended by suing for defamation, but the careers of St. Andr  and his wife were permanently damaged. Elizabeth lost her attendance on Queen Caroline, and St. Andr  was publicly humiliated at court. Living on Elizabeth's considerable wealth, they retired to the country, where St. Andr  died in 1776, aged  96.[53][54] Manningham, desperate to exculpate himself, published a diary of his observations of Mary Toft, together with an account of her confession of the fraud, on 12  December. In it he suggested that Douglas had been fooled by Toft, and concerned with his image Douglas replied by publishing his own account.[40][55] Using the pseudonym 'Lover of Truth and Learning', in 1727 Douglas also published The Sooterkin Dissected. A letter to Maubray, Douglas was scathingly critical of his Sooterkin theory, calling it "a mere fiction of your [Maubray's] brain".[56] The damage done to the medical profession was such that several doctors not connected with the tale felt compelled to print statements that they had not believed Toft's story.[46] On 7  January 1727 John Howard and Toft appeared before the bench, where Howard was fined  800 ( 94.8  thousand today).[57] He returned to Surrey and continued his practice, and died in 1755.[41][44][52]

Crowds reportedly mobbed Tothill Fields Bridewell for months, hoping to catch a glimpse of the now infamous Toft. By this time she had become quite ill, and while incarcerated had her portrait drawn by John Laguerre. She was ultimately discharged on 8  April 1727, as it was unclear as to what charge should have been made against her.[58] The Toft family made no profit from the affair, and Mary Toft returned to Surrey. She had a daughter in February 1727, and reappeared briefly in 1740 when she was imprisoned for receiving stolen goods, but her death was reported in 1763.[44][59][60]

The case was cited by Robert Walpole's opponents as symbolising the age, which they perceived as greedy, corrupt and deceitful. One author, writing to the Prince of Wales's mistress, suggested the story was a political portent of the approaching death of the prince's father. On 7  January 1727 Mist's Weekly Journal satirised the matter, making several allusions to political change, and comparing the affair to the events of 1641 when Parliament began its revolution against King Charles I of England.[61] The scandal provided the writers of Grub Street with enough material to produce pamphlets, squibs, broadsides and ballads for several months.[62] With publications such as St. Andr 's Miscarriage (1727) and The anatomist dissected: or the man-midwife finely brought to bed (1727) satirists scorned the objectivity of men-midwives, and critics of Toft's attendants questioned their integrity, undermining their profession with sexual puns and allusions.[63] The case raised questions about England's status as an "enlightened" nation  ~Voltaire used the case in his brief essay Singularit s de la nature to describe how the Protestant English were still influenced by an ignorant Church.[64]

Toft did not escape the ire of the satirists, who concentrated mainly on sexual innuendo. Some took advantage of a common 18th-century word for a rabbit track  ~prick  ~and others were scatological in nature. However, Much Ado about Nothing; or, A Plain Refutation of All that Has Been Written or Said Concerning the Rabbit-Woman of Godalming (1727) is one of the more cutting satires on Toft. The document supposes to be the confession of 'Merry Tuft', "... in her own Stile and Spelling". Poking fun at her illiteracy, it makes a number of obscene suggestions hinting at her promiscuity  ~"I wos a Wuman as had grate nattural parts, and a large Capassiti, and kapible of being kunserned in depe Kuntrivansis."[66][67] The document also ridicules several of the physicians

involved in the affair, and reflects the general view portrayed by the satirists that Toft was a weak woman and the least complicit of "the offenders" (regardless of her guilt). The notion contrasts with that expressed of her before the hoax was revealed and may indicate an overall strategy to disempower Toft completely. This is reflected in one of the most notable satires of the affair, Alexander Pope and William Pulteney's anonymous satirical ballad *The Discovery; or, The Squire Turn'd Ferret*.<sup>[68]</sup> Published in 1726 and aimed at Samuel Molyneux, it rhymes "hare" with "hair", and "coney" with "cunny". The ballad opens with the following verse:<sup>[69]</sup><sup>[70]</sup>

Most true it is, I dare to say,  
 E'er since the Days of Eve,  
 The weakest Woman sometimes may  
 The wisest Man deceive.

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St.Â AndrÃ's Miscarriage, 1727

The Wonder of Wonders, Ipswich, 1726

[edit] External links

Persondata

Name

Toft, Mary

Alternative names

Short description

English medical hoaxer

Date of birth

c. 1701

Place of birth

Date of death

1763

Place of death

Uranium

92U

Appearance

silvery gray metallic; corrodes to a spalling black oxide coat in air

General properties

Name, symbol, number

uranium, U, 92

Pronunciation

/jÊ Ě reĚ\*niĚ m/ew-RAY-nee-Ě m

Metallic category

actinide

Group, period, block

n/a,Â 7, f

Standard atomic weight

238.02891(3)

Electron configuration

[Rn] 5f3 6d1 7s2

2, 8, 18, 32, 21, 9, 2

History

Discovery

Martin Heinrich Klaproth (1789)

First isolation

EugÃ"ne-Melchior PÃ@ligot (1841)

Physical properties

Phase

solid

Density (near r.t.)

19.1 gÂ.cmâ ´3

Liquid density at m.p.

17.3 gÂ.cmâ ´3

Melting point

1405.3Â K,â 1132.2Â Â°C,â 2070Â Â°F

Boiling point

4404Â K,â 4131Â Â°C,â 7468Â Â°F

Heat of fusion

9.14 kJÂ.molâ ´1

Heat of vaporization

417.1 kJÂ.molâ ´1

Molar heat capacity

27.665 JÂ.molâ ´1Â.Kâ ´1

Vapor pressure

P (Pa)

1  
 10  
 100  
 1 k  
 10 k  
 100 k  
 at T (K)  
 2325  
 2564  
 2859  
 3234  
 3727  
 4402  
 Atomic properties  
 Oxidation states  
 6, 5, 4, 3[1], 2, 1  
 (weakly basic oxide)  
 Electronegativity  
 1.38 (Pauling scale)  
 Ionization energies  
 1st: 597.6 kJ·mol<sup>-1</sup>  
 2nd: 1420 kJ·mol<sup>-1</sup>  
 Atomic radius  
 156 pm  
 Covalent radius  
 196±7 pm  
 Van der Waals radius  
 186 pm  
 Miscellanea  
 Crystal structure  
 orthorhombic  
 Magnetic ordering  
 paramagnetic  
 Electrical resistivity  
 (0 °C) 0.280 μΩ·m  
 Thermal conductivity  
 27.5 W·m<sup>-1</sup>·K<sup>-1</sup>  
 Thermal expansion  
 (25 °C) 13.9 μm·m<sup>-1</sup>·K<sup>-1</sup>  
 Speed of sound (thin rod)  
 (20 °C) 3155 m·s<sup>-1</sup>  
 Young's modulus  
 208 GPa  
 Shear modulus  
 111 GPa  
 Bulk modulus  
 100 GPa  
 Poisson ratio  
 0.23  
 CAS registry number  
 7440-61-1  
 Most stable isotopes  
 Main article: Isotopes of uranium  
 Å · r

Uranium is a silvery-white metallic chemical element in the actinide series of the periodic table, with symbol U and atomic number 92. A uranium atom has 92 protons and 92 electrons, of which 6 are valence electrons. Uranium is weakly radioactive because all its isotopes are unstable. The most common isotopes of uranium are uranium-238 (which has 146 neutrons) and uranium-235 (which has 143 neutrons). Uranium has the second highest atomic weight of the primordially

occurring elements, lighter only than plutonium.[3] Its density is about 70% higher than that of lead, but not as dense as gold or tungsten. It occurs naturally in low concentrations of a few parts per million in soil, rock and water, and is commercially extracted from uranium-bearing minerals such as uraninite.

In nature, uranium is found as uranium-238 (99.2739% ^99.2752%), uranium-235 (0.7198% ^0.7202%), and a very small amount of uranium-234 (0.0050% ^0.0059%).[4] Uranium decays slowly by emitting an alpha particle. The half-life of uranium-238 is about 4.47 billion years and that of uranium-235 is 704 million years,[5] making them useful in dating the age of the Earth.

Many contemporary uses of uranium exploit its unique nuclear properties. Uranium-235 has the distinction of being the only naturally occurring fissile isotope. Uranium-238 is fissionable by fast neutrons, and is fertile, meaning it can be transmuted to fissile plutonium-239 in a nuclear reactor. Another fissile isotope, uranium-233, can be produced from natural thorium and is also important in nuclear technology. While uranium-238 has a small probability for spontaneous fission or even induced fission with fast neutrons, uranium-235 and to a lesser degree uranium-233 have a much higher fission cross-section for slow neutrons. In sufficient concentration, these isotopes maintain a sustained nuclear chain reaction. This generates the heat in nuclear power reactors, and produces the fissile material for nuclear weapons. Depleted uranium (238U) is used in kinetic energy penetrators and armor plating.[6]

Uranium is used as a colorant in uranium glass, producing orange-red to lemon yellow hues. It was also used for tinting and shading in early photography. The 1789 discovery of uranium in the mineral pitchblende is credited to Martin Heinrich Klaproth, who named the new element after the planet Uranus. Eugène-Melchior Péclet was the first person to isolate the metal and its radioactive properties were discovered in 1896 by Antoine Becquerel. Research by Enrico Fermi and others starting in 1934 led to its use as a fuel in the nuclear power industry and in Little Boy, the first nuclear weapon used in war. An ensuing arms race during the Cold War between the United States and the Soviet Union produced tens of thousands of nuclear weapons that used uranium metal and uranium-derived plutonium-239. The security of those weapons and their fissile material following the breakup of the Soviet Union in 1991 is an ongoing concern for public health and safety.[7] See Nuclear proliferation.

#### Characteristics

When refined, uranium is a silvery white, weakly radioactive metal, which is harder than most elements. It is malleable, ductile, slightly paramagnetic, strongly electropositive and is a poor electrical conductor.[8][9] Uranium metal has very high density, being approximately 70% denser than lead, but slightly less dense than gold.

Uranium metal reacts with almost all nonmetallic elements and their compounds, with reactivity increasing with temperature.[10] Hydrochloric and nitric acids dissolve uranium, but non-oxidizing acids other than hydrochloric acid attack the element very slowly.[8] When finely divided, it can react with cold water; in air, uranium metal becomes coated with a dark layer of uranium oxide.[9] Uranium in ores is extracted chemically and converted into uranium dioxide or other chemical forms usable in industry.

Uranium-235 was the first isotope that was found to be fissile. Other naturally occurring isotopes are fissionable, but not fissile. Upon bombardment with slow neutrons, its uranium-235 isotope will most of the time divide into two smaller nuclei, releasing nuclear binding energy and more neutrons. If too many of these neutrons are absorbed by other uranium-235 nuclei, a nuclear chain reaction occurs that results in a burst of heat or (in special circumstances) an explosion. In a nuclear reactor, such a chain reaction is slowed and controlled by a neutron poison, absorbing some of the free neutrons. Such neutron absorbent materials are often part of reactor control rods (see nuclear reactor physics for a description of this process of reactor control).

As little as 15 lb (7 kg) of uranium-235 can be used to make an atomic bomb.[11] The first nuclear bomb used in war, Little Boy, relied on uranium

fission, while the very first nuclear explosive (The gadget) and the bomb that destroyed Nagasaki (Fat Man) were plutonium bombs.

Uranium metal has three allotropic forms:[12]

#### Applications

##### Military

The major application of uranium in the military sector is in high-density penetrators. This ammunition consists of depleted uranium (DU) alloyed with 1-2% other elements. At high impact speed, the density, hardness, and pyrophoricity of the projectile enable destruction of heavily armored targets. Tank armor and other removable vehicle armor are also hardened with depleted uranium plates. The use of DU became politically and environmentally contentious after the use of DU munitions by the US, UK and other countries during wars in the Persian Gulf and the Balkans raised questions of uranium compounds left in the soil (see Gulf War Syndrome).[11]

Depleted uranium is also used as a shielding material in some containers used to store and transport radioactive materials. While the metal itself is radioactive, its high density makes it more effective than lead in halting radiation from strong sources such as radium.[8] Other uses of DU include counterweights for aircraft control surfaces, as ballast for missile re-entry vehicles and as a shielding material.[9] Due to its high density, this material is found in inertial guidance systems and in gyroscopic compasses.[9] DU is preferred over similarly dense metals due to its ability to be easily machined and cast as well as its relatively low cost.[13] Counter to popular belief[citation needed], the main risk of exposure to DU is chemical poisoning by uranium oxide rather than radioactivity (uranium being only a weak alpha emitter).

During the later stages of World War II, the entire Cold War, and to a lesser extent afterwards, uranium-235 has been used as the fissile explosive material to produce nuclear weapons. Initially, two major types of fission bombs were built: a relatively simple device that uses uranium-235 and a more complicated mechanism that uses plutonium-239 derived from uranium-238. Later, a much more complicated and far more powerful type of fission/fusion bomb (thermonuclear weapon) was built, that uses a plutonium-based device to cause a mixture of tritium and deuterium to undergo nuclear fusion. Such bombs are jacketed in a non-fissile (unenriched) uranium case, and they derive more than half their power from the fission of this material by fast neutrons from the nuclear fusion process.[14]

##### Civilian

The main use of uranium in the civilian sector is to fuel nuclear power plants. One kilogram of uranium-235 can theoretically produce about 80 terajoules of energy ( $8 \times 10^{13}$  joules), assuming complete fission; as much energy as 3000 tonnes of coal.[6]

Commercial nuclear power plants use fuel that is typically enriched to around 3% uranium-235.[6] The CANDU and Magnox designs are the only commercial reactors capable of using unenriched uranium fuel. Fuel used for United States Navy reactors is typically highly enriched in uranium-235 (the exact values are classified). In a breeder reactor, uranium-238 can also be converted into plutonium through the following reaction:[9]
$$^{238}\text{U} \xrightarrow{n, \gamma} ^{239}\text{U} \xrightarrow{\beta^-} ^{239}\text{Np} \xrightarrow{\beta^-} ^{239}\text{Pu}.$$

Before the discovery of radioactivity, uranium was primarily used in small amounts for yellow glass and pottery glazes, such as uranium glass and in Fiestaware.

The discovery and isolation of radium in uranium ore (pitchblende) by Marie Curie sparked the development of uranium mining to extract the radium, which was used to make glow-in-the-dark paints for clock and aircraft dials.[15] This left a prodigious quantity of uranium as a waste product, since it takes three tonnes of uranium to extract one gram of radium. This waste product was diverted to the glazing industry, making uranium glazes very inexpensive and abundant. Besides the pottery glazes, uranium tile glazes accounted for the bulk of the use, including common bathroom and kitchen tiles which can be



produced in green, yellow, mauve, black, blue, red and other colors.

Uranium was also used in photographic chemicals (especially uranium nitrate as a toner),[9] in lamp filaments, to improve the appearance of dentures, and in the leather and wood industries for stains and dyes. Uranium salts are mordants of silk or wool. Uranyl acetate and uranyl formate are used as electron-dense "stains" in transmission electron microscopy, to increase the contrast of biological specimens in ultrathin sections and in negative staining of viruses, isolated cell organelles and macromolecules.

The discovery of the radioactivity of uranium ushered in additional scientific and practical uses of the element. The long half-life of the isotope uranium-238 (4.51Å109 years) makes it well-suited for use in estimating the age of the earliest igneous rocks and for other types of radiometric dating, including uranium-thorium dating, uranium-lead dating and uranium-uranium dating. Uranium metal is used for X-ray targets in the making of high-energy X-rays.[9]

#### History

##### Prehistoric naturally occurring fission

In 1972 French physicist Francis Perrin discovered fifteen ancient and no longer active natural nuclear fission reactors in three separate ore deposits at the Oklo mine in Gabon, West Africa, collectively known as the Oklo Fossil Reactors. The ore deposit is 1.7 billion years old; then, uranium-235 constituted about 3% of the total uranium on Earth.[16] This is high enough to permit a sustained nuclear fission chain reaction to occur, provided other supporting conditions exist. The capacity of the surrounding sediment to contain the nuclear waste products has been cited by the U.S. federal government as supporting evidence for the feasibility to store spent nuclear fuel at the Yucca Mountain nuclear waste repository.[16]

##### Pre-discovery use

The use of uranium in its natural oxide form dates back to at least the year 79 CE, when it was used to add a yellow color to ceramic glazes.[9] Yellow glass with 1% uranium oxide was found in a Roman villa on Cape Posillipo in the Bay of Naples, Italy by R. T. Gunther of the University of Oxford in 1912.[17] Starting in the late Middle Ages, pitchblende was extracted from the Habsburg silver mines in Joachimsthal, Bohemia (now Jáchymov in the Czech Republic) and was used as a coloring agent in the local glassmaking industry.[18] In the early 19th century, the world's only known sources of uranium ore were these mines.

##### Discovery

The discovery of the element is credited to the German chemist Martin Heinrich Klaproth. While he was working in his experimental laboratory in Berlin in 1789, Klaproth was able to precipitate a yellow compound (likely sodium diuranate) by dissolving pitchblende in nitric acid and neutralizing the solution with sodium hydroxide.[18] Klaproth assumed the yellow substance was the oxide of a yet-undiscovered element and heated it with charcoal to obtain a black powder, which he thought was the newly discovered metal itself (in fact, that powder was an oxide of uranium).[18][19] He named the newly discovered element after the planet Uranus, (named after the primordial Greek god of the sky), which had been discovered eight years earlier by William Herschel.[20]

In 1841, Eugène-Melchior Péligot, Professor of Analytical Chemistry at the Conservatoire National des Arts et Métiers (Central School of Arts and Manufactures) in Paris, isolated the first sample of uranium metal by heating uranium tetrachloride with potassium.[18][21] Uranium was not seen as being particularly dangerous during much of the 19th century, leading to the development of various uses for the element. One such use for the oxide was the aforementioned but no longer secret coloring of pottery and glass.

Antoine Henri Becquerel discovered radioactivity by using uranium in 1896.[10] Becquerel made the discovery in Paris by leaving a sample of a uranium salt, K<sub>2</sub>UO<sub>2</sub>(SO<sub>4</sub>)<sub>2</sub> (potassium uranyl sulfate), on top of an unexposed photographic plate in a drawer and noting that the plate had become "fogged".[22] He determined that a form of invisible light or rays emitted by uranium had

exposed the plate.

#### Fission research

A team led by Enrico Fermi in 1934 observed that bombarding uranium with neutrons produces the emission of beta rays (electrons or positrons from the elements produced; see beta particle).[23] The fission products were at first mistaken for new elements of atomic numbers 93 and 94, which the Dean of the Faculty of Rome, Orso Mario Corbino, christened ausonium and hesperium, respectively.[24][25][26][27] The experiments leading to the discovery of uranium's ability to fission (break apart) into lighter elements and release binding energy were conducted by Otto Hahn and Fritz Strassmann[23] in Hahn's laboratory in Berlin. Lise Meitner and her nephew, physicist Otto Robert Frisch, published the physical explanation in February 1939 and named the process "nuclear fission".[28] Soon after, Fermi hypothesized that the fission of uranium might release enough neutrons to sustain a fission reaction. Confirmation of this hypothesis came in 1939, and later work found that on average about 2.5 neutrons are released by each fission of the rare uranium isotope uranium-235.[23] Further work found that the far more common uranium-238 isotope can be transmuted into plutonium, which, like uranium-235, is also fissionable by thermal neutrons. These discoveries led numerous countries to begin working on the development of nuclear weapons and nuclear power.

On 2 December 1942, as part of the Manhattan Project, another team led by Enrico Fermi was able to initiate the first artificial self-sustained nuclear chain reaction, Chicago Pile-1. Working in a lab below the stands of Stagg Field at the University of Chicago, the team created the conditions needed for such a reaction by piling together 400Â short tons (360Â metric tons) of graphite, 58Â short tons (53Â metric tons) of uranium oxide, and six short tons (5.5 metric tons) of uranium metal.[23]

#### Bombs

Two major types of atomic bombs were developed by the United States during World War II: a uranium-based device (codenamed "Little Boy") whose fissile material was highly enriched uranium, and a plutonium-based device (see Trinity test and "Fat Man") whose plutonium was derived from uranium-238. The uranium-based Little Boy device became the first nuclear weapon used in war when it was detonated over the Japanese city of Hiroshima on 6 August 1945. Exploding with a yield equivalent to 12,500Â tonnes of TNT, the blast and thermal wave of the bomb destroyed nearly 50,000 buildings and killed approximately 75,000 people (see Atomic bombings of Hiroshima and Nagasaki).[22] Initially it was believed that uranium was relatively rare, and that nuclear proliferation could be avoided by simply buying up all known uranium stocks, but within a decade large deposits of it were discovered in many places around the world.[29]

#### Reactors

The X-10 Graphite Reactor at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, formerly known as the Clinton Pile and X-10 Pile, was the world's second artificial nuclear reactor (after Enrico Fermi's Chicago Pile) and was the first reactor designed and built for continuous operation. Argonne National Laboratory's Experimental Breeder Reactor I, located at the Atomic Energy Commission's National Reactor Testing Station near Arco, Idaho became the first nuclear reactor to create electricity on 20 December 1951.[30] Initially, four 150-watt light bulbs were lit by the reactor, but improvements eventually enabled it to power the whole facility (later, the town of Arco became the first in the world to have all its electricity come from nuclear power generated by BORAX-III, another reactor designed and operated by Argonne National Laboratory).[31][32] The world's first commercial scale nuclear power station, Obninsk in the Soviet Union, began generation with its reactor AM-1 on 27 June 1954. Other early nuclear power plants were Calder Hall in England which began generation on 17 October 1956[33] and the Shippingport Atomic Power Station in Pennsylvania which began on 26 May 1958. Nuclear power was used for the first time for propulsion by a submarine, the USS Nautilus, in

1954.[23][34]

Contamination and the Cold War legacy

Above-ground nuclear tests by the Soviet Union and the United States in the 1950s and early 1960s and by France into the 1970s and 1980s[13] spread a significant amount of fallout from uranium daughter isotopes around the world.[35] Additional fallout and pollution occurred from several nuclear accidents.[36][37]

Uranium miners have a higher incidence of cancer. An excess risk of lung cancer among Navajo uranium miners, for example, has been documented and linked to their occupation.[38] The Radiation Exposure Compensation Act, a 1990 law in the USA, required \$100,000 in "compassion payments" to uranium miners diagnosed with cancer or other respiratory ailments.[39]

During the Cold War between the Soviet Union and the United States, huge stockpiles of uranium were amassed and tens of thousands of nuclear weapons were created using enriched uranium and plutonium made from uranium. Since the break-up of the Soviet Union in 1991, an estimated 600 short tons (540 metric tons) of highly enriched weapons grade uranium (enough to make 40,000 nuclear warheads) have been stored in often inadequately guarded facilities in the Russian Federation and several other former Soviet states.[11] Police in Asia, Europe, and South America on at least 16 occasions from 1993 to 2005 have intercepted shipments of smuggled bomb-grade uranium or plutonium, most of which was from ex-Soviet sources.[11] From 1993 to 2005 the Material Protection, Control, and Accounting Program, operated by the federal government of the United States, spent approximately US \$550 million to help safeguard uranium and plutonium stockpiles in Russia.[11] This money was used for improvements and security enhancements at research and storage facilities. Scientific American reported in February 2006 that in some of the facilities security consisted of chain link fences which were in severe states of disrepair. According to an interview from the article, one facility had been storing samples of enriched (weapons grade) uranium in a broom closet before the improvement project; another had been keeping track of its stock of nuclear warheads using index cards kept in a shoe box.[40]

Occurrence

Biotic and abiotic

Uranium is a naturally occurring element that can be found in low levels within all rock, soil, and water. Uranium is the 51st element in order of abundance in the Earth's crust. Uranium is also the highest-numbered element to be found naturally in significant quantities on Earth and. Along with all elements having atomic weights higher than that of iron, it is only naturally formed in supernovae.[41] The decay of uranium, thorium, and potassium-40 in the Earth's mantle is thought to be the main source of heat[42][43] that keeps the outer core liquid and drives mantle convection, which in turn drives plate tectonics.

Uranium's average concentration in the Earth's crust is (depending on the reference) 2 to 4 parts per million,[8][13] or about 40 times as abundant as silver.[10] The Earth's crust from the surface to 25 km (15 mi) down is calculated to contain 1017 kg (2.2 × 10<sup>17</sup> lb) of uranium while the oceans may contain 1013 kg (2.2 × 10<sup>13</sup> lb).[8] The concentration of uranium in soil ranges from 0.7 to 11 parts per million (up to 15 parts per million in farmland soil due to use of phosphate fertilizers), and its concentration in sea water is 3 parts per billion.[13]

Uranium is more plentiful than antimony, tin, cadmium, mercury, or silver, and it is about as abundant as arsenic or molybdenum.[9][13] Uranium is found in hundreds of minerals including uraninite (the most common uranium ore), carnotite, autunite, uranophane, torbernite, and coffinite.[9] Significant concentrations of uranium occur in some substances such as phosphate rock deposits, and minerals such as lignite, and monazite sands in uranium-rich ores[9] (it is recovered commercially from sources with as little as 0.1% uranium[10]).

Some bacteria such as *S. putrefaciens* and *G. metallireducens* have been shown

to reduce U(VI) to U(IV).[44]

Some organisms, such as the lichen *Trapelia involuta* or microorganisms such as the bacterium *Citrobacter*, can absorb concentrations of uranium that are up to 300 times higher than in their environment.[45] *Citrobacter* species absorb uranyl ions when given glycerol phosphate (or other similar organic phosphates). After one day, one gram of bacteria can encrust themselves with nine grams of uranyl phosphate crystals; this creates the possibility that these organisms could be used in bioremediation to decontaminate uranium-polluted water.[18][46]

In nature, uranium(VI) forms highly soluble carbonate complexes at alkaline pH. This leads to an increase in mobility and availability of uranium to groundwater and soil from nuclear wastes which leads to health hazards. However, it is difficult to precipitate uranium as phosphate in the presence of excess carbonate at alkaline pH. A *Sphingomonas* sp. strain BSAR-1 has been found to express a high activity alkaline phosphatase (PhoK) that has been applied for bioprecipitation of uranium as uranyl phosphate species from alkaline solutions. The precipitation ability was enhanced by overexpressing PhoK protein in *E. coli*. [47]

Plants absorb some uranium from soil. Dry weight concentrations of uranium in plants range from 5 to 60 parts per billion, and ash from burnt wood can have concentrations up to 4 parts per million.[18] Dry weight concentrations of uranium in food plants are typically lower with one to two micrograms per day ingested through the food people eat.[18]

#### Production and mining

Main article: Uranium mining

The worldwide production of uranium in 2010 amounted to 53,663 tonnes, of which 17,803 t (33.2%) was mined in Kazakhstan. Other important uranium mining countries are Canada (9,783 t), Australia (5,900 t), Namibia (4,496 t), Niger (4,198 t) and Russia (3,562 t).[48]

Uranium ore is mined in several ways: by open pit, underground, in-situ leaching, and borehole mining (see uranium mining).[6] Low-grade uranium ore mined typically contains 0.01 to 0.25% uranium oxides. Extensive measures must be employed to extract the metal from its ore.[49] High-grade ores found in Athabasca Basin deposits in Saskatchewan, Canada can contain up to 23% uranium oxides on average.[50] Uranium ore is crushed and rendered into a fine powder and then leached with either an acid or alkali. The leachate is subjected to one of several sequences of precipitation, solvent extraction, and ion exchange. The resulting mixture, called yellowcake, contains at least 75% uranium oxides U<sub>3</sub>O<sub>8</sub>. Yellowcake is then calcined to remove impurities from the milling process before refining and conversion.[51]

Commercial-grade uranium can be produced through the reduction of uranium halides with alkali or alkaline earth metals.[9] Uranium metal can also be prepared through electrolysis of K<sub>2</sub>UF<sub>6</sub> or UF<sub>4</sub>, dissolved in molten calcium chloride (CaCl<sub>2</sub>) and sodium chloride (NaCl) solution.[9] Very pure uranium is produced through the thermal decomposition of uranium halides on a hot filament.[9]

#### Resources and reserves

It is estimated that 5.5 million tonnes of uranium exists in ore reserves that are economically viable at US\$59 per lb of uranium,[52] while 35 million tonnes are classed as mineral resources (reasonable prospects for eventual economic extraction).[53] Prices went from about \$10/lb in May 2003 to \$138/lb in July 2007. This has caused a big increase in spending on exploration,[52] with US\$200 million being spent world wide in 2005, a 54% increase on the previous year.[53] This trend continued through 2006, when expenditure on exploration rocketed to over \$774 million, an increase of over 250% compared to 2004. The OECD Nuclear Energy Agency said exploration figures for 2007 would likely match those for 2006.[52]

Australia has 31% of the world's known uranium ore reserves[54] and the world's largest single uranium deposit, located at the Olympic Dam Mine in South Australia.[55] There is a significant reserve of uranium in Bakouma a

sub-prefecture in the prefecture of Mbomou in Central African Republic.

Some nuclear fuel comes from nuclear weapons being dismantled,[56] such as from the Megatons to Megawatts Program.

An additional 4.6 billion tonnes of uranium are estimated to be in sea water (Japanese scientists in the 1980s showed that extraction of uranium from sea water using ion exchangers was technically feasible).[57][58] There have been experiments to extract uranium from sea water,[59] but the yield has been low due to the carbonate present in the water. In 2012, ORNL researchers announced the successful development of a new absorbent material dubbed HiCap, which vastly outperforms previous best adsorbents, which perform surface retention of solid or gas molecules, atoms or ions. "We have shown that our adsorbents can extract five to seven times more uranium at uptake rates seven times faster than the world's best adsorbents," said Chris Janke, one of the inventors and a member of ORNL's Materials Science and Technology Division. HiCap also effectively removes toxic metals from water, according to results verified by researchers at Pacific Northwest National Laboratory.[60][61]

#### Supply

Main article: Uranium market

In 2005, seventeen countries produced concentrated uranium oxides, with Canada (27.9% of world production) and Australia (22.8%) being the largest producers and Kazakhstan (10.5%), Russia (8.0%), Namibia (7.5%), Niger (7.4%), Uzbekistan (5.5%), the United States (2.5%), Argentina (2.1%), Ukraine (1.9%) and China (1.7%) also producing significant amounts.[63] Kazakhstan continues to increase production and may have become the world's largest producer of uranium by 2009 with an expected production of 12,826 tonnes, compared to Canada with 11,100 t and Australia with 9,430 t.[64][65] The ultimate available uranium is believed to be sufficient for at least the next 85 years,[53] although some studies indicate underinvestment in the late twentieth century may produce supply problems in the 21st century.[66] Uranium deposits seem to be log-normal distributed. There is a 300-fold increase in the amount of uranium recoverable for each tenfold decrease in ore grade.[67] In other words, there is little high grade ore and proportionately much more low grade ore available.

#### Compounds

Oxidation states and oxides

##### Oxides

Calcined uranium yellowcake as produced in many large mills contains a distribution of uranium oxidation species in various forms ranging from most oxidized to least oxidized. Particles with short residence times in a calciner will generally be less oxidized than those with long retention times or particles recovered in the stack scrubber. Uranium content is usually referenced to U3O8, which dates to the days of the Manhattan project when U3O8 was used as an analytical chemistry reporting standard.

Phase relationships in the uranium-oxygen system are complex. The most important oxidation states of uranium are uranium(IV) and uranium(VI), and their two corresponding oxides are, respectively, uranium dioxide (UO2) and uranium trioxide (UO3).[68] Other uranium oxides such as uranium monoxide (UO), diuranium pentoxide (U2O5), and uranium peroxide (UO4·2H2O) also exist.

The most common forms of uranium oxide are triuranium octaoxide (U3O8) and UO2.[69] Both oxide forms are solids that have low solubility in water and are relatively stable over a wide range of environmental conditions. Triuranium octaoxide is (depending on conditions) the most stable compound of uranium and is the form most commonly found in nature. Uranium dioxide is the form in which uranium is most commonly used as a nuclear reactor fuel.[69] At ambient temperatures, UO2 will gradually convert to U3O8. Because of their stability, uranium oxides are generally considered the preferred chemical form for storage or disposal.[69]

#### Aqueous chemistry

Salts of many oxidation states of uranium are water-soluble and may be studied in aqueous solutions. The most common ionic forms are U3+ (brown-red), U4+ (green), UO+

$U^{2+}$  (unstable), and  $UO_2^{2+}$

$U^{2+}$  (yellow), for  $U(III)$ ,  $U(IV)$ ,  $U(V)$ , and  $U(VI)$ , respectively.[70] A few solid and semi-metallic compounds such as  $UO$  and  $US$  exist for the formal oxidation state uranium(II), but no simple ions are known to exist in solution for that state. Ions of  $U^{3+}$  liberate hydrogen from water and are therefore considered to be highly unstable. The  $UO_2^{2+}$

$UO_2^{2+}$  ion represents the uranium(VI) state and is known to form compounds such as uranyl carbonate, uranyl chloride and uranyl sulfate.  $UO_2^{2+}$

$UO_2^{2+}$  also forms complexes with various organic chelating agents, the most commonly encountered of which is uranyl acetate.[70]

Unlike the uranyl salts of uranium and polyatomic ion uranium-oxide cationic forms, the uranates, salts containing a polyatomic uranium-oxide anion, are generally not water-soluble.

#### Carbonates

The interactions of carbonate anions with uranium(VI) cause the Pourbaix diagram to change greatly when the medium is changed from water to a carbonate containing solution. While the vast majority of carbonates are insoluble in water (students are often taught that all carbonates other than those of alkali metals are insoluble in water), uranium carbonates are often soluble in water. This is because a  $U(VI)$  cation is able to bind two terminal oxides and three or more carbonates to form anionic complexes.

#### Effects of pH

The uranium fraction diagrams in the presence of carbonate illustrate this further: when the pH of a uranium(VI) solution increases, the uranium is converted to a hydrated uranium oxide hydroxide and at high pHs it becomes an anionic hydroxide complex.

When carbonate is added, uranium is converted to a series of carbonate complexes if the pH is increased. One effect of these reactions is increased solubility of uranium in the pH range 6 to 8, a fact which has a direct bearing on the long term stability of spent uranium dioxide nuclear fuels.

#### Hydrides, carbides and nitrides

Uranium metal heated to 250 to 300  $^{\circ}C$  (482 to 572  $^{\circ}F$ ) reacts with hydrogen to form uranium hydride. Even higher temperatures will reversibly remove the hydrogen. This property makes uranium hydrides convenient starting materials to create reactive uranium powder along with various uranium carbide, nitride, and halide compounds.[72] Two crystal modifications of uranium hydride exist: an  $\alpha$  form that is obtained at low temperatures and a  $\beta$  form that is created when the formation temperature is above 250  $^{\circ}C$ . [72]

Uranium carbides and uranium nitrides are both relatively inert semimetallic compounds that are minimally soluble in acids, react with water, and can ignite in air to form  $U_3O_8$ . [72] Carbides of uranium include uranium monocarbide ( $UC$ ), uranium dicarbide ( $UC_2$ ), and diuranium tricarbide ( $U_2C_3$ ). Both  $UC$  and  $UC_2$  are formed by adding carbon to molten uranium or by exposing the metal to carbon monoxide at high temperatures. Stable below 1800  $^{\circ}C$ ,  $U_2C_3$  is prepared by subjecting a heated mixture of  $UC$  and  $UC_2$  to mechanical stress.[73] Uranium nitrides obtained by direct exposure of the metal to nitrogen include uranium mononitride ( $UN$ ), uranium dinitride ( $UN_2$ ), and diuranium trinitride ( $U_2N_3$ ). [73]

#### Halides

All uranium fluorides are created using uranium tetrafluoride ( $UF_4$ );  $UF_4$  itself is prepared by hydrofluorination of uranium dioxide.[72] Reduction of  $UF_4$  with hydrogen at 1000  $^{\circ}C$  produces uranium trifluoride ( $UF_3$ ). Under the right conditions of temperature and pressure, the reaction of solid  $UF_4$  with gaseous uranium hexafluoride ( $UF_6$ ) can form the intermediate fluorides of  $U_2F_9$ ,  $U_4F_{17}$ , and  $UF_5$ . [72]

At room temperatures,  $UF_6$  has a high vapor pressure, making it useful in the gaseous diffusion process to separate the comparably rare uranium-235 from the common uranium-238 isotope. This compound can be prepared from uranium dioxide and uranium hydride by the following process:[72]

$UO_2 + 4 HF \rightarrow UF_4 + 2 H_2O$  (500  $^{\circ}C$ , endothermic)

$UF_4 + F_2 \rightarrow UF_6$  (350  $^{\circ}C$ , endothermic)

The resulting UF<sub>6</sub>, a white solid, is highly reactive (by fluorination), easily sublimates (emitting a vapor that behaves as a nearly ideal gas), and is the most volatile compound of uranium known to exist.[72]

One method of preparing uranium tetrachloride (UCl<sub>4</sub>) is to directly combine chlorine with either uranium metal or uranium hydride. The reduction of UCl<sub>4</sub> by hydrogen produces uranium trichloride (UCl<sub>3</sub>) while the higher chlorides of uranium are prepared by reaction with additional chlorine.[72] All uranium chlorides react with water and air.

Bromides and iodides of uranium are formed by direct reaction of, respectively, bromine and iodine with uranium or by adding UH<sub>3</sub> to those element's acids.[72] Known examples include: UBr<sub>3</sub>, UBr<sub>4</sub>, UI<sub>3</sub>, and UI<sub>4</sub>. Uranium oxyhalides are water-soluble and include UO<sub>2</sub>F<sub>2</sub>, UOCl<sub>2</sub>, UO<sub>2</sub>Cl<sub>2</sub>, and UO<sub>2</sub>Br<sub>2</sub>. Stability of the oxyhalides decrease as the atomic weight of the component halide increases.[72]

#### Isotopes

##### Natural concentrations

Natural uranium consists of three major isotopes: uranium-238 (99.28% natural abundance), uranium-235 (0.71%), and uranium-234 (0.0054%). All three are radioactive, emitting alpha particles, with the exception that all three of these isotopes have small probabilities of undergoing spontaneous fission, rather than alpha emission.

Uranium-238 is the most stable isotope of uranium, with a half-life of about 4.468 × 10<sup>9</sup> years, roughly the age of the Earth. Uranium-235 has a half-life of about 7.13 × 10<sup>8</sup> years, and uranium-234 has a half-life of about 2.48 × 10<sup>5</sup> years.[74] For natural uranium, about 49% of its alpha rays are emitted by each of 238U atom, and also 49% by 234U (since the latter is formed from the former) and about 2.0% of them by the 235U. When the Earth was young, probably about one-fifth of its uranium was uranium-235, but the percentage of 234U was probably much lower than this.

Uranium-238 is usually an α emitter (occasionally, it undergoes spontaneous fission), decaying through the "Uranium Series" of nuclear decay, which has 18 members, all of which eventually decay into lead-206, by a variety of different decay paths.[10]

The decay series of 235U, which is called the actinium series has 15 members, all of which eventually decay into lead-207.[10] The constant rates of decay in these decay series makes the comparison of the ratios of parent to daughter elements useful in radiometric dating.

Uranium-234 is a member of the "Uranium Series", and it decays to lead-206 through a series of relatively short-lived isotopes.

Uranium-233 is made from thorium-232 by neutron bombardment, usually in a nuclear reactor, and 233U is also fissile.[9] Its decay series ends with thallium-205.

Uranium-235 is important for both nuclear reactors and nuclear weapons, because it is the only uranium isotope existing in nature on Earth in any significant amount that is fissile. This means it can be split into two or three fragments (fission products) by thermal neutrons.[10]

Uranium-238 is not fissile, but is a fertile isotope, because after neutron activation it can produce plutonium-239, another fissile isotope. Indeed, the 238U nucleus can absorb one neutron to produce the radioactive isotope uranium-239. 239U decays by beta emission to neptunium-239, also a beta-emitter, that decays in its turn, within a few days into plutonium-239. 239Pu was used as fissile material in the first atomic bomb detonated in the "Trinity test" on 15 July 1945 in New Mexico.[23]

#### Enrichment

In nature, uranium is found as uranium-238 (99.2742%) and uranium-235 (0.7204%). Isotope separation concentrates (enriches) the fissionable uranium-235 for nuclear weapons and most nuclear power plants, except for gas cooled reactors and pressurised heavy water reactors. Most neutrons released by a fissioning atom of uranium-235 must impact other uranium-235 atoms to sustain the nuclear chain reaction. The concentration and amount of uranium-235 needed

to achieve this is called a 'critical mass'.

To be considered 'enriched', the uranium-235 fraction should be between 3% and 5%.[75] This process produces huge quantities of uranium that is depleted of uranium-235 and with a correspondingly increased fraction of uranium-238, called depleted uranium or 'DU'. To be considered 'depleted', the uranium-235 isotope concentration should be no more than 0.3%.[76] The price of uranium has risen since 2001, so enrichment tailings containing more than 0.35% uranium-235 are being considered for re-enrichment, driving the price of depleted uranium hexafluoride above \$130 per kilogram in July, 2007 from \$5 in 2001.[76]

The gas centrifuge process, where gaseous uranium hexafluoride (UF<sub>6</sub>) is separated by the difference in molecular weight between <sup>235</sup>UF<sub>6</sub> and <sup>238</sup>UF<sub>6</sub> using high-speed centrifuges, is the cheapest and leading enrichment process.[22] The gaseous diffusion process had been the leading method for enrichment and was used in the Manhattan Project. In this process, uranium hexafluoride is repeatedly diffused through a silver-zinc membrane, and the different isotopes of uranium are separated by diffusion rate (since uranium 238 is heavier it diffuses slightly slower than uranium-235).[22] The molecular laser isotope separation method employs a laser beam of precise energy to sever the bond between uranium-235 and fluorine. This leaves uranium-238 bonded to fluorine and allows uranium-235 metal to precipitate from the solution.[6] An alternative laser method of enrichment is known as atomic vapor laser isotope separation (AVLIS) and employs visible tunable lasers such as dye lasers.[77] Another method used is liquid thermal diffusion.[8]

#### Human exposure

A person can be exposed to uranium (or its radioactive daughters such as radon) by inhaling dust in air or by ingesting contaminated water and food. The amount of uranium in air is usually very small; however, people who work in factories that process phosphate fertilizers, live near government facilities that made or tested nuclear weapons, live or work near a modern battlefield where depleted uranium weapons have been used, or live or work near a coal-fired power plant, facilities that mine or process uranium ore, or enrich uranium for reactor fuel, may have increased exposure to uranium.[78][79] Houses or structures that are over uranium deposits (either natural or man-made slag deposits) may have an increased incidence of exposure to radon gas.

Most ingested uranium is excreted during digestion. Only 0.5% is absorbed when insoluble forms of uranium, such as its oxide, are ingested, whereas absorption of the more soluble uranyl ion can be up to 5%.[18] However, soluble uranium compounds tend to quickly pass through the body whereas insoluble uranium compounds, especially when inhaled by way of dust into the lungs, pose a more serious exposure hazard. After entering the bloodstream, the absorbed uranium tends to bioaccumulate and stay for many years in bone tissue because of uranium's affinity for phosphates.[18] Uranium is not absorbed through the skin, and alpha particles released by uranium cannot penetrate the skin.

Incorporated uranium becomes uranyl ions, which accumulate in bone, liver, kidney, and reproductive tissues. Uranium can be decontaminated from steel surfaces[80] and aquifers.[81]

#### Effects and precautions

Normal functioning of the kidney, brain, liver, heart, and other systems can be affected by uranium exposure, because, besides being weakly radioactive, uranium is a toxic metal.[18][82][83] Uranium is also a reproductive toxicant.[84][85] Radiological effects are generally local because alpha radiation, the primary form of <sup>238</sup>U decay, has a very short range, and will not penetrate skin. Uranyl (UO<sup>2+</sup>

2) ions, such as from uranium trioxide or uranyl nitrate and other hexavalent uranium compounds, have been shown to cause birth defects and immune system damage in laboratory animals.[86] While the CDC has published one study that no human cancer has been seen as a result of exposure to natural or depleted uranium,[87] exposure to uranium and its decay products, especially radon, are widely known and significant health threats.[13] Exposure to strontium-90, iodine-131, and other fission products is unrelated to uranium exposure, but



may result from medical procedures or exposure to spent reactor fuel or fallout from nuclear weapons.[88] Although accidental inhalation exposure to a high concentration of uranium hexafluoride has resulted in human fatalities, those deaths were associated with generation of highly toxic hydrofluoric acid and uranyl fluoride rather than with uranium itself.[89] Finely divided uranium metal presents a fire hazard because uranium is pyrophoric; small grains will ignite spontaneously in air at room temperature.[9]

Uranium metal is commonly handled with gloves as a sufficient precaution.[90] Uranium concentrate is handled and contained so as to ensure that people do not inhale or ingest it.[90]

Compilation of 2004 review on uranium toxicity[82]

Body system

Human studies

Animal studies

In vitro

Renal

Elevated levels of protein excretion, urinary catalase and diuresis

Damage to proximal convoluted tubules, necrotic cells cast from tubular epithelium, glomerular changes (renal failure)

No studies

Brain/CNS

Decreased performance on neurocognitive tests

Acute cholinergic toxicity; Dose-dependent accumulation in cortex, midbrain, and vermis; Electrophysiological changes in hippocampus

No studies

DNA

Increased reports of cancers[39][91][92][93][94][95]

Increased mutagenicity (in mice) and induction of tumors

Binucleated cells with micronuclei, Inhibition of cell cycle kinetics and proliferation; Sister chromatid induction, tumorigenic phenotype

Bone/muscle

No studies

Inhibition of periodontal bone formation; and alveolar wound healing

No studies

Reproductive

Uranium miners have more first born female children

Moderate to severe focal tubular atrophy; vacuolization of Leydig cells

No studies

Lungs/respiratory

No adverse health effects reported

Severe nasal congestion and hemorrhage, lung lesions and fibrosis, edema and swelling, lung cancer

No studies

Gastrointestinal

Vomiting, diarrhea, albuminuria

No studies

No studies

Liver

No effects seen at exposure dose

Fatty livers, focal necrosis

No studies

Skin

No exposure assessment data available

Swollen vacuolated epidermal cells, damage to hair follicles and sebaceous glands

No studies

Tissues surrounding embedded DU fragments

Elevated uranium urine concentrations

Elevated uranium urine concentrations, perturbations in biochemical and neuropsychological testing

No studies

Immune system

Chronic fatigue, rash, ear and eye infections, hair and weight loss, cough. May be due to combined chemical exposure rather than DU alone

No studies

No studies

Eyes

No studies

Conjunctivitis, irritation inflammation, edema, ulceration of conjunctival sacs

No studies

Blood

No studies

Decrease in RBC count and hemoglobin concentration

No studies

Cardiovascular

Myocarditis resulting from the uranium ingestion, which ended 6 months after ingestion

No effects

No studies

See also

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Full reference information for multi-page works cited

External links

Troy McClure is a fictional character in the American animated sitcom *The Simpsons*. He was voiced by Phil Hartman and first appears in the second season episode "Homer vs. Lisa and the 8th Commandment".[1] McClure is a washed-up actor, usually shown doing low-level work, such as hosting infomercials and educational films. He appears as the central character in "A Fish Called Selma", in which he marries Selma Bouvier to aid his failing career and quash rumors about his personal life. McClure also 'hosts' "The Simpsons 138th Episode Spectacular" and "The Simpsons Spin-Off Showcase".

McClure was partially based on B movie actors Troy Donahue and Doug McClure as well as Hartman himself. Following Hartman's death on May 28, 1998, the character was retired, making his final appearance in the tenth season in "Bart the Mother". McClure is often cited as one of the series' most popular

characters; in 2006 IGN ranked him first on their list of the "Top 25 Simpsons Peripheral Characters".

[edit] Role in The Simpsons

Troy McClure is a stereotypical Hollywood has-been.[2] He was a star in the early 1970s, but his career went downhill due to rumors of a paraphilia involving fish. In most of his appearances in the show, he hosts short video clips that other characters watch on television or in a public place. He often presents educational videos[3][4] and infomercials.[5] McClure introduces himself by saying, "Hi, I'm Troy McClure. You may remember me from such [films, educational videos, voiceovers, etc.] as...", mentioning two titles that are similar to his current performance. For example, in the episode "Bart the Mother", McClure introduces a film about birds by saying, "Hi, I'm Troy McClure. You may remember me from such nature films as Earwigs: Eww! and Man vs. Nature: The Road to Victory."[6]

McClure's most prominent role occurs in the seventh-season episode "A Fish Called Selma". In the episode, McClure begins a relationship with Selma Bouvier, whom he meets when she gives him an eye test at the Department of Motor Vehicles. The relationship revives his career, leading him to star in *Stop the Planet of the Apes*, *I Want to Get Off!*, a stage musical version of the film *Planet of the Apes*. To further boost McClure's career, McClure's agent suggests that he get married. Unaware of McClure's motivation, Selma accepts his proposal, and moves into McClure's house, a Modernist building which resembles the Chemosphere. At his bachelor party, a drunken McClure tells Homer Simpson that the marriage is just a sham to help his career. Homer says nothing at the wedding, but later offhandedly mentions McClure's admission to Marge, who then informs her sister. Selma decides to remain with McClure anyway, but she becomes disturbed when McClure's agent advises the pair to have a child (since "all the big parts these days are going to family men"). Having a child will secure McClure's casting as McBain's sidekick in *McBain IV: Fatal Discharge*, but Selma is unwilling to bring a child into a loveless relationship and decides to leave McClure. McClure ultimately gets the role, but turns it down in order to direct and star in his own pet project, a 20th Century Fox film called *The Contrabulous Fabtraption of Professor Horatio Hufnagel*. [7]

In addition to his in-story appearances, McClure appears as host of "The Simpsons 138th Episode Spectacular" and "The Simpsons Spin-Off Showcase". The first is a behind the scenes look at The Simpsons, answering questions and featuring extra "never before seen" material.[8] The second is an episode presenting three possible spin-offs from The Simpsons.[9]

[edit] In other media

McClure was made into an action figure as part of the World of Springfield toy line, and was released in the "Celebrity Series 1" wave.[10] He also features briefly in the video game *Virtual Springfield*, introducing the town of Springfield to the player.[11]

[edit] Character

[edit] Creation

McClure was based on the typical "washed up" Hollywood actor. B movie actors Troy Donahue and Doug McClure served as inspiration for his name and certain character aspects.[1][12] Writer Mike Reiss later met Doug McClure's daughter, who revealed that her father had found the homage funny. His children would call their father "Troy McClure" when his back was turned.[1] According to show creator Matt Groening, Phil Hartman was cast in the role due to his ability to pull "the maximum amount of humor" out of any line he was given.[12] McClure's visual appearance is similar to that of Hartman himself.[13] When he was designed, McClure was given an extra line under his eyes to suggest that the character had gotten a facelift.[14]

In a very brief appearance in the season 2 episode "Bart's Dog Gets an F", Troy was voiced by Dan Castellaneta.[15]

[edit] Development

According to executive producer Al Jean, the writers often used McClure as a "panic button" and added the character when they felt an episode needed more

humor.[16] McClure's character is most developed in "A Fish Called Selma", which provides a more in-depth look into his private life and backstory.[2] Show runners Bill Oakley and Josh Weinstein were fans of Phil Hartman, and wished to make an episode entirely about McClure in order to give Hartman as much to do as possible. From this came the idea of McClure's marriage to Selma Bouvier, as she was "always marrying people".[2] Animator Mark Kirkland was particularly pleased that McClure was the star of the episode. He enjoyed interpreting Hartman's voice-over performances, and the episode allowed him and the other animators to "open [McClure] up visually as a character".[2] Throughout "A Fish Called Selma", it is hinted that McClure has strange sexual behavior. The writers did not initially know what the "unsavory" sexual preference would be, but eventually decided on a fish fetish, using a suggestion from executive producer James L. Brooks. Josh Weinstein described the fish fetish concept as "so perverted and strange, it was over the top".[2]

[edit] Retirement

After Hartman's death in 1998,[17] rather than replace him with a new voice actor, the production staff retired McClure, along with Hartman's other recurring character, Lionel Hutz, from the show.[12] McClure last appeared in the season ten episode "Bart the Mother", which was dedicated to Hartman.[18] Before his death, Hartman had often expressed an interest in starring in a live-action film about McClure, which would be penned by some of the show's writers.[19] He noted that he was "looking forward to his live-action movie, publicizing [McClure's] Betty Ford appearances." [20] Matt Groening later told *Empire* that the idea never "got further than enthusiasm", but "would have been really fun".[21]

[edit] Reception and cultural influence

Even after his retirement, Troy McClure remains a popular supporting character. IGN ranked McClure first in their 2006 list of the "Top 25 Simpsons Peripheral Characters", calling him "a wonderfully bizarre and entertaining character that showcases the best of what small roles on *The Simpsons* can be".[22] In a 2007 article on *Simpsons* guest stars, Adam Finley of *TV Squad* wrote that McClure was "responsible for some of the funniest moments in *Simpsons* history".[23] Hartman ranked first on AOL's list of their favorite 25 *Simpsons* guest stars.[24] Chris Turner argues in *Planet Simpson* that McClure and Lionel Hutz "together...represent the most significant contribution to the show outside of its permanent cast", adding that "the show's Golden Age is hard to imagine without them". He continues, "The smarmy Hollywood type...has been done to death, but Hartman's version breathed new life into it with each appearance. McClure has become the apotheosis of the stereotype, a gut-achingly funny reinterpretation whose trademark introduction...has become a shorthand way to describe any grossly artificial media figure." [25]

McClure's most prominent episode, "A Fish Called Selma", is often regarded as one of the best episodes in the show's history, and is a favorite of many staff members.[2] *Entertainment Weekly* placed the episode eighth on their top 25 *The Simpsons* episode list,[26] and IGN named the episode the best of the seventh season, calling it the "obvious pick". They also deemed McClure's *Planet of the Apes* musical the best moment of the episode and "maybe even the whole show".[27]

McClure was one of Phil Hartman's best known-roles. He often used his McClure voice to entertain the audience between takes while taping episodes of *NewsRadio*. He remarked, "My favorite fans are Troy McClure fans." [28] He added "It's the one thing that I do in my life that's almost an avocation. I do it for the pure love of it." [29] When Hartman was murdered in 1998, many obituaries mentioned his work as McClure as one of the highlights of his career.[30][31][32][33] The BBC said that "[Hartman's] voice was known to millions" because of McClure and Lionel Hutz.[34]

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[edit] External links

Not to be confused with Indium.

Iridium

77Ir

Appearance

silvery white

General properties

Name, symbol, number

iridium, Ir, 77

Pronunciation

/ÉrÉdiÉ m/i-RID-ee-É m

Metallic category

transition metal

Group, period, block

9, 6, d

Standard atomic weight

192.217

Electron configuration

[Xe] 4f14 5d7 6s2

2, 8, 18, 32, 15, 2

History

Discovery

Smithson Tennant (1803)

First isolation

Smithson Tennant (1803)

Physical properties

Phase

solid

Density (near r.t.)

22.56 g·cm<sup>−3</sup>

Liquid density at m.p.

19 g·cm<sup>−3</sup>

Melting point

2739 K, 2466 °C, 4471 °F

Boiling point

4701 K, 4428 °C, 8002 °F

Heat of fusion

41.12 kJ·mol<sup>-1</sup>

Heat of vaporization

563 kJ·mol<sup>-1</sup>

Molar heat capacity

25.10 J·mol<sup>-1</sup>·K<sup>-1</sup>

Vapor pressure

P (Pa)

1

10

100

1 k

10 k

100 k

at T (K)

2713

2957

3252

3614

4069

4659

Atomic properties

Oxidation states

-3, -1, 0, 1, 2, 3, 4, 5, 6

Electronegativity

2.20 (Pauling scale)

Ionization energies

1st: 880 kJ·mol<sup>-1</sup>

2nd: 1600 kJ·mol<sup>-1</sup>

Atomic radius

136 pm

Covalent radius

141±6 pm

Miscellanea

Crystal structure

face-centered cubic

Magnetic ordering

paramagnetic[1]

Electrical resistivity

(20 °C) 47.1 nΩ·m

Thermal conductivity

147 W·m<sup>-1</sup>·K<sup>-1</sup>

Thermal expansion

6.4 μm/(m·K)

Speed of sound (thin rod)

(20 °C) 4825 m·s<sup>-1</sup>

Young's modulus

528 GPa

Shear modulus

210 GPa

Bulk modulus

320 GPa

Poisson ratio

0.26

Mohs hardness

6.5

Vickers hardness

1760 MPa

Brinell hardness

1670 MPa

CAS registry number

7439-88-5

Most stable isotopes

Main article: Isotopes of iridium

Â· r

Iridium is the chemical element with atomic number 77, and is represented by the symbol Ir. A very hard, brittle, silvery-white transition metal of the platinum family, iridium is the second-densest element (after osmium) and is the most corrosion-resistant metal, even at temperatures as high as 2000Â° C. Although only certain molten salts and halogens are corrosive to solid iridium, finely divided iridium dust is much more reactive and can be flammable.

Iridium was discovered in 1803 among insoluble impurities in natural platinum. Smithson Tennant, the primary discoverer, named the iridium for the goddess Iris, personification of the rainbow, because of the striking and diverse colors of its salts. Iridium is one of the rarest elements in the Earth's crust, with annual production and consumption of only three tonnes. 191Ir and 193Ir are the only two naturally occurring isotopes of iridium as well as the only stable isotopes; the latter is the more abundant of the two.

The most important iridium compounds in use are the salts and acids it forms with chlorine, though iridium also forms a number of organometallic compounds used in industrial catalysis, and in research. Iridium metal is employed when high corrosion resistance at high temperatures is needed, as in high-end spark plugs, crucibles for recrystallization of semiconductors at high temperatures, and electrodes for the production of chlorine in the chloralkali process. Iridium radioisotopes are used in some radioisotope thermoelectric generators.

Iridium is found in meteorites with an abundance much higher than its average abundance in the Earth's crust. For this reason the unusually high abundance of iridium in the clay layer at the Cretaceous–Paleogene boundary gave rise to the Alvarez hypothesis that the impact of a massive extraterrestrial object caused the extinction of dinosaurs and many other species 65Â million years ago. It is thought that the total amount of iridium in the planet Earth is much higher than that observed in crustal rocks, but as with other platinum group metals, the high density and tendency of iridium to bond with iron caused most iridium to descend below the crust when the planet was young and still molten.

[edit] Characteristics

[edit] Physical properties

A member of the platinum group metals, iridium is white, resembling platinum, but with a slight yellowish cast. Because of its hardness, brittleness, and very high melting point, solid iridium is difficult to machine, form, or work, and thus powder metallurgy is commonly employed instead.[2] It is the only metal to maintain good mechanical properties in air at temperatures above 1600Â° C.[3] Iridium has a very high boiling point (10th among all elements) and becomes a superconductor at temperatures below 0.14Â K.[4]

Iridium's modulus of elasticity is the second-highest among the metals, only being surpassed by osmium.[3] This, together with a high shear modulus and a very low figure for Poisson's ratio (the relationship of longitudinal to lateral strain), indicate the high degree of stiffness and resistance to deformation that have rendered its fabrication into useful components a matter of great difficulty. Despite these limitations and iridium's high cost, a number of applications have developed where mechanical strength is an essential factor in some of the extremely severe conditions encountered in modern technology.[3]

The measured density of iridium is only slightly lower (by about 0.12%) than that of osmium, the densest element known.[5][6] There had been some ambiguity regarding which of the two elements was denser, due to the small size of the difference in density and difficulties in measuring it accurately,[7] but, with increased accuracy in factors used for calculating density X-ray crystallographic data yielded densities of 22.56Â g/cm<sup>3</sup> for iridium and 22.59Â g/cm<sup>3</sup> for osmium.[8]

[edit] Chemical properties

Iridium is the most corrosion-resistant metal known:[9] it is not attacked by almost any acid, aqua regia, molten metals or silicates at high temperatures. It can, however, be attacked by some molten salts, such as sodium cyanide and potassium cyanide,[9] as well as oxygen and the halogens (particularly fluorine)[10] at higher temperatures.[11]

[edit] Compounds

Oxidation states[note 1]

âˆ’3

[Ir(CO)<sub>3</sub>]<sub>3</sub>âˆ’

âˆ’1

[Ir(CO)<sub>3</sub>(PPh<sub>3</sub>)]âˆ’

0

Ir<sub>4</sub>(CO)<sub>12</sub>

+1

[Ir(CO)Cl(PPh<sub>3</sub>)<sub>2</sub>]

+2

IrCl<sub>2</sub>

+3

IrCl<sub>3</sub>

+4

IrO<sub>2</sub>

+5

Ir<sub>4</sub>F<sub>20</sub>

+6

IrF<sub>6</sub>

Iridium forms compounds in oxidation states between âˆ’3 to +6; the most common oxidation states are +3 and +4.[2] Well-characterized examples of the highest oxidation state are rare, but include IrF<sub>6</sub> and two mixed oxides Sr<sub>2</sub>MgIrO<sub>6</sub> and Sr<sub>2</sub>CaIrO<sub>6</sub>.<sup>[2][12]</sup> In addition, it was reported in 2009 that iridium(VIII) oxide (IrO<sub>4</sub>) was prepared under matrix isolation conditions (6 K in Ar) by UV irradiation of an iridium-peroxo complex. This species, however, is not expected to be stable as a bulk solid at higher temperatures.[13]

Iridium dioxide, IrO<sub>2</sub>, a brown powder, is the only well-characterized oxide of iridium.[2] A sesquioxide, Ir<sub>2</sub>O<sub>3</sub>, has been described as a blue-black powder which is oxidized to IrO<sub>2</sub> by HNO<sub>3</sub>.<sup>[10]</sup> The corresponding disulfides, diselenides, sesquisulfides and sesquiselenides are known and IrS<sub>3</sub> has also been reported.[2] Iridium also forms iridates with oxidation states +4 and +5, such as K<sub>2</sub>IrO<sub>3</sub> and KIrO<sub>3</sub>, which can be prepared from the reaction of potassium oxide or potassium superoxide with iridium at high temperatures.[14]

While no binary hydrides of iridium, IrxHy are known, complexes are known that contain IrH<sub>4</sub>âˆ’

5 and IrH<sub>3</sub>âˆ’

6, where iridium has the +1 and +3 oxidation states, respectively.[15] The ternary hydride Mg<sub>6</sub>Ir<sub>2</sub>H<sub>11</sub> is believed to contain both the IrH<sub>4</sub>âˆ’

5 and the 18-electron IrH<sub>5</sub>âˆ’

4 anion.[16]

No monohalides or dihalides are known, whereas trihalides, IrX<sub>3</sub>, are known for all of the halogens.[2] For oxidation states +4 and above, only the tetrafluoride, pentafluoride and hexafluoride are known.[2] Iridium hexafluoride, IrF<sub>6</sub>, is a volatile and highly reactive yellow solid, composed of octahedral molecules. It decomposes in water and is reduced to IrF<sub>4</sub>, a crystalline solid, by iridium black.[2] Iridium pentafluoride has similar properties but it is actually a tetramer, Ir<sub>4</sub>F<sub>20</sub>, formed by four corner-sharing octahedra.[2]

Hexachloroiridic(IV) acid, H<sub>2</sub>IrCl<sub>6</sub>, and its ammonium salt are the most important iridium compounds from an industrial perspective.[17] They are involved in the purification of iridium and used as precursors for most other iridium compounds, as well as in the preparation of anode coatings. The IrCl<sub>2</sub>âˆ’<sub>6</sub> ion has an intense dark brown color, and can be readily reduced to the

lighter-colored  $\text{IrCl}_3 \cdot 6\text{H}_2\text{O}$

6 and vice versa.[17] Iridium trichloride,  $\text{IrCl}_3$ , which can be obtained in anhydrous form from direct oxidation of iridium powder by chlorine at  $650^\circ\text{C}$ , [17] or in hydrated form by dissolving  $\text{Ir}_2\text{O}_3$  in hydrochloric acid, is often used as a starting material for the synthesis of other  $\text{Ir(III)}$  compounds.[2] Another compound used as a starting material is ammonium hexachloroiridate(III),  $(\text{NH}_4)_3\text{IrCl}_6$ . Iridium(III) complexes are diamagnetic (low-spin) and generally have an octahedral molecular geometry.[2]

Organoiridium compounds contain iridium-carbon bonds where the metal is usually in lower oxidation states. For example, oxidation state zero is found in tetrairidium dodecacarbonyl,  $\text{Ir}_4(\text{CO})_{12}$ , which is the most common and stable binary carbonyl of iridium.[2] In this compound, each of the iridium atoms is bonded to the other three, forming a tetrahedral cluster. Some organometallic  $\text{Ir(I)}$  compounds are notable enough to be named after their discoverers. One is Vaska's complex,  $\text{IrCl}(\text{CO})[\text{P}(\text{C}_6\text{H}_5)_3]_2$ , which has the unusual property of binding to the dioxygen molecule,  $\text{O}_2$ . [18] Another one is Crabtree's catalyst, a homogeneous catalyst for hydrogenation reactions.[19] These compounds are both square planar,  $d^8$  complexes, with a total of 16 valence electrons, which accounts for their reactivity.[20]

[edit] Isotopes

Iridium has two naturally occurring, stable isotopes,  $^{191}\text{Ir}$  and  $^{193}\text{Ir}$ , with natural abundances of 37.3% and 62.7%, respectively.[21] At least 34 radioisotopes have also been synthesized, ranging in mass number from 164 to 199.  $^{192}\text{Ir}$ , which falls between the two stable isotopes, is the most stable radioisotope, with a half-life of 73.827 days, and finds application in brachytherapy[22] and in industrial radiography, particularly for non-destructive testing of welds in steel in the oil and gas industries; iridium-192 sources have been involved in a number of radiological accidents. Three other isotopes have half-lives of at least a day— $^{188}\text{Ir}$ ,  $^{189}\text{Ir}$ ,  $^{190}\text{Ir}$ . [21] Isotopes with masses below 191 decay by some combination of  $\beta^+$  decay,  $\beta^-$  decay, and proton emission, with the exceptions of  $^{189}\text{Ir}$ , which decays by electron capture, and  $^{190}\text{Ir}$ , which decays by positron emission. Synthetic isotopes heavier than 191 decay by  $\beta^-$  decay, although  $^{192}\text{Ir}$  also has a minor electron capture decay path.[21] All known isotopes of iridium were discovered between 1934 and 2001; the most recent is  $^{171}\text{Ir}$ . [23]

At least 32 metastable isomers have been characterized, ranging in mass number from 164 to 197. The most stable of these is  $^{192\text{m}}\text{Ir}$ , which decays by isomeric transition with a half-life of 241 years, [21] making it more stable than any of iridium's synthetic isotopes in their ground states. The least stable isomer is  $^{190\text{m}}\text{Ir}$  with a half-life of only 2  $\mu\text{s}$ . [21] The isotope  $^{191}\text{Ir}$  was the first one of any element to be shown to present a Mössbauer effect. This renders it useful for Mössbauer spectroscopy for research in physics, chemistry, biochemistry, metallurgy, and mineralogy.[24]

[edit] History

The discovery of iridium is intertwined with that of platinum and the other metals of the platinum group. Native platinum used by ancient Ethiopians[25] and by South American cultures[26] always contained a small amount of the other platinum group metals, including iridium. Platinum reached Europe as platina ("small silver"), found in the 17th century by the Spanish conquerors in a region today known as the department of Chocó in Colombia.[27] The discovery that this metal was not an alloy of known elements, but instead a distinct new element, did not occur until 1748.[28]

Chemists who studied platinum dissolved it in aqua regia (a mixture of hydrochloric and nitric acids) to create soluble salts. They always observed a small amount of a dark, insoluble residue.[3] Joseph Louis Proust thought that the residue was graphite.[3] The French chemists Victor Collet-Descotils, Antoine François de Fourcroy, and Louis Nicolas Vauquelin also observed the black residue in 1803, but did not obtain enough for further experiments.[3]

In 1803, British scientist Smithson Tennant (1761–1815) analyzed the insoluble

residue and concluded that it must contain a new metal. Vauquelin treated the powder alternately with alkali and acids[9] and obtained a volatile new oxide, which he believed to be of this new metal which he named ptene, from the Greek word πτενός (ptēnos) for winged.[29][30] Tennant, who had the advantage of a much greater amount of residue, continued his research and identified the two previously undiscovered elements in the black residue, iridium and osmium.[3][9] He obtained dark red crystals (probably of  $\text{Na}_2[\text{IrCl}_6] \cdot n\text{H}_2\text{O}$ ) by a sequence of reactions with sodium hydroxide and hydrochloric acid.[30] He named iridium after Iris (Ἥρα ἰρις), the Greek winged goddess of the rainbow and the messenger of the Olympian gods, because many of the salts he obtained were strongly colored.[note 2][31] Discovery of the new elements was documented in a letter to the Royal Society on June 21, 1804.[3][32]

British scientist John George Children was the first to melt a sample of iridium in 1813 with the aid of "the greatest galvanic battery that has ever been constructed" (at that time).[3] The first to obtain high purity iridium was Robert Hare in 1842. He found that it had a density of around  $21.8 \text{ g/cm}^3$  and noted that the metal is nearly unmalleable and very hard. The first melting in appreciable quantity was done by Henri Sainte-Claire Deville and Jules Henri Debray in 1860. They required burning more than  $300 \text{ L}$  of pure  $\text{O}_2$  and  $\text{H}_2$  for each kilogram of iridium.[3]

These extreme difficulties in melting the metal limited the possibilities for handling iridium. John Isaac Hawkins was looking to obtain a fine and hard point for fountain pen nibs and in 1834 managed to create an iridium-pointed gold pen. In 1880 John Holland and William Lofland Dudley were able to melt iridium by adding phosphorus and patented the process in the United States; British company Johnson Matthey later stated that they had been using a similar process since 1837 and had already presented fused iridium at a number of World Fairs.[3] The first use of an alloy of iridium with ruthenium in thermocouples was made by Otto Feussner in 1933. These allowed for the measurement of high temperatures in air up to  $2000^\circ\text{C}$ . [3]

In 1957 Rudolf MÅssbauer, in what has been called one of the "landmark experiments in twentieth century physics", [33] discovered the resonant and recoil-free emission and absorption of gamma rays by atoms in a solid metal sample containing only  $^{191}\text{Ir}$ . [34] This phenomenon, known as the MÅssbauer effect (which has since been observed for other nuclei, such as  $^{57}\text{Fe}$ ), and developed as MÅssbauer spectroscopy, has made important contributions to research in physics, chemistry, biochemistry, metallurgy, and mineralogy. [24] MÅssbauer received the Nobel Prize in Physics in 1961, at the age 32, just three years after he published his discovery. [35]

[edit] Occurrence

Iridium is one of the least abundant elements in the Earth's crust, having an average mass fraction of  $0.001 \text{ ppm}$  in crustal rock; gold is 40 times more abundant, platinum is 10 times more abundant, and silver and mercury are 80 times more abundant. [2] Tellurium is about as abundant as iridium, and only three naturally occurring stable elements are less abundant: rhenium, ruthenium, and rhodium, iridium being 10 times more abundant than the last two. [2] In contrast to its low abundance in crustal rock, iridium is relatively common in meteorites, with concentrations of  $0.5 \text{ ppm}$  or more. [37] It is thought that the overall concentration of iridium on Earth is much higher than what is observed in crustal rocks, but because of the density and siderophilic ("iron-loving") character of iridium, it descended below the crust and into the Earth's core when the planet was still molten. [17]

Iridium is found in nature as an uncombined element or in natural alloys; especially the iridium-osmium alloys, osmiridium (osmium rich), and iridosmium (iridium rich). [9] In the nickel and copper deposits the platinum group metals occur as sulfides (i.e.  $(\text{Pt}, \text{Pd})\text{S}$ ), tellurides (i.e.  $\text{PtBiTe}$ ), antimonides  $(\text{PdSb})$ , and arsenides (i.e.  $\text{PtAs}_2$ ). In all of these compounds platinum is exchanged by a small amount of iridium and osmium. As with all of the platinum group metals, iridium can be found naturally in alloys with raw nickel or raw copper. [38]

Within the Earth's crust, iridium is found at highest concentrations in three types of geologic structure: igneous deposits (crustal intrusions from below), impact craters, and deposits reworked from one of the former structures. The largest known primary reserves are in the Bushveld igneous complex in South Africa,[39] though the large copper-nickel deposits near Norilsk in Russia, and the Sudbury Basin in Canada are also significant sources of iridium. Smaller reserves are found in the United States.[39] Iridium is also found in secondary deposits, combined with platinum and other platinum group metals in alluvial deposits. The alluvial deposits used by pre-Columbian people in the Chocó Department of Colombia are still a source for platinum-group metals. As of 2003 the world reserves had not been estimated.[9]

[edit] Cretaceous-Paleogene boundary presence

The Cretaceous-Paleogene boundary of 65 million years ago, marking the temporal border between the Cretaceous and Paleogene periods of geological time, was identified by a thin stratum of iridium-rich clay.[40] A team led by Luis Alvarez proposed in 1980 an extraterrestrial origin for this iridium, attributing it to an asteroid or comet impact.[40] Their theory, known as the Alvarez hypothesis, is now widely accepted to explain the demise of the dinosaurs. A large buried impact crater structure with an estimated age of about 65 million years was later identified under what is now the Yucatán Peninsula (the Chicxulub crater).[41][42] Dewey M. McLean and others argue that the iridium may have been of volcanic origin instead, as the Earth's core is rich in iridium, and active volcanoes such as Piton de la Fournaise, in the island of Réunion, are still releasing iridium.[43][44]

[edit] Production

Year

Consumption

(tonnes)

Price

(\$/ozt)[45]

2001

2.6

415.25

2002

2.5

294.62

2003

3.3

93.02

2004

3.60

185.33

2005

3.86

169.51

2006

4.08

349.45

2007

3.70

444.43

2008

3.10

448.34

2009

2.52

420.4

2010

10.40

642.15



Iridium is obtained commercially as a by-product from nickel and copper mining and processing. During electrorefining of copper and nickel, noble metals such as silver, gold and the platinum group metals as well as selenium and tellurium settle to the bottom of the cell as anode mud, which forms the starting point for their extraction.[45] To separate the metals, they must first be brought into solution. Several methods are available depending on the separation process and the composition of the mixture; two representative methods are fusion with sodium peroxide followed by dissolution in aqua regia, and dissolution in a mixture of chlorine with hydrochloric acid.[17][39]

After it is dissolved, iridium is separated from the other platinum group metals by precipitating  $(\text{NH}_4)_2\text{IrCl}_6$  or by extracting  $\text{IrCl}_2$  with organic amines.[46] The first method is similar to the procedure Tennant and Wollaston used for their separation. The second method can be planned as continuous liquid-liquid extraction and is therefore more suitable for industrial scale production. In either case, the product is reduced using hydrogen, yielding the metal as a powder or sponge that can be treated using powder metallurgy techniques.[47][48]

The price of iridium fluctuates considerably, as shown in the table, because of unstable supply, demand, speculation, and hoarding, amplified by the small size of the market and instability in the producing countries. The sharp decrease around 2003 has been related to the oversupply of Ir crucibles used for industrial growth of large single crystals.[45][49]

#### [edit] Applications

The demand for iridium surged from 2.5 tonnes in 2009 to 10.4 tonnes in 2010, mostly because of electronics-related applications that saw a rise from 0.2 to 6 tonnes - iridium crucibles are commonly used for growing large high-quality single crystals, demand for which has increased sharply. This increase in iridium consumption is predicted to saturate due to accumulating stocks of crucibles, as happened earlier in the 2000s. Other major applications include spark plugs that consumed 0.78 tonnes of Ir in 2007, electrodes for the chloralkali process (1.1 t in 2007) and chemical catalysts (0.75 t in 2007).[45][50]

#### [edit] Industrial and medical

The high melting point, hardness and corrosion resistance of iridium and its alloys determine most of its applications. Iridium and especially iridium-platinum alloys or osmium-iridium alloys have a low wear and are used, for example, for multi-pored spinnerets, through which a plastic polymer melt is extruded to form fibers, such as rayon.[51] Osmium-iridium is used for compass bearings and for balances.[9]

Corrosion and heat resistance makes iridium an important alloying agent. Certain long-life aircraft engine parts are made of an iridium alloy and an iridium-titanium alloy is used for deep-water pipes because of its corrosion resistance.[9] Iridium is also used as a hardening agent in platinum alloys. The Vickers hardness of pure platinum is 56 HV while platinum with 50% of iridium can reach over 500 HV.[52][53]

Devices that must withstand extremely high temperatures are often made from iridium. For example, high-temperature crucibles made of iridium are used in the Czochralski process to produce oxide single-crystals (such as sapphires) for use in computer memory devices and in solid state lasers.[54][55] The crystals, such as gadolinium gallium garnet and yttrium gallium garnet, are grown by melting pre-sintered charges of mixed oxides under oxidizing conditions at temperatures up to 2100 °C.[3] Its resistance to arc erosion makes iridium alloys ideal for electrical contacts for spark plugs.[55][56]

Iridium compounds are used as catalysts in the Cativa process for carbonylation of methanol to produce acetic acid.[57]

The radioisotope iridium-192 is one of the two most important sources of energy for use in industrial  $\gamma$ -radiography for non-destructive testing of metals.[58][59] Additionally,  $^{192}\text{Ir}$  is used as a source of gamma radiation for the treatment of cancer using brachytherapy, a form of radiotherapy where a sealed radioactive source is placed inside or next to the area requiring

treatment. Specific treatments include high dose rate prostate brachytherapy, biliary duct brachytherapy, and intracavitary cervix brachytherapy.[9]

[edit] Scientific

An alloy of 90% platinum and 10% iridium was used in 1889 to construct the International Prototype Metre and kilogram mass, kept by the International Bureau of Weights and Measures near Paris.[9] The meter bar was replaced as the definition of the fundamental unit of length in 1960 by a line in the atomic spectrum of krypton,[note 3][60] but the kilogram prototype is still the international standard of mass.[61]

Iridium has been used in the radioisotope thermoelectric generators of unmanned spacecraft such as the Voyager, Viking, Pioneer, Cassini, Galileo, and New Horizons. Iridium was chosen to encapsulate the plutonium-238 fuel in the generator because it can withstand the operating temperatures of up to 2000 Å Å°C and for its great strength.[3]

Another use concerns X-ray optics, especially X-ray telescopes.[62] The mirrors of the Chandra X-ray Observatory are coated with a layer of iridium 60 Å nm thick. Iridium proved to be the best choice for reflecting X-rays after nickel, gold, and platinum were also tested. The iridium layer, which had to be smooth to within a few atoms, was applied by depositing iridium vapor under high vacuum on a base layer of chromium.[63]

Iridium is used in particle physics for the production of antiprotons, a form of antimatter. Antiprotons are made by shooting a high-intensity proton beam at a conversion target, which needs to be made from a very high density material. Although tungsten may be used instead, iridium has the advantage of better stability under the shock waves induced by the temperature rise due to the incident beam.[64]

Carbon-<sup>1</sup>hydrogen bond activation (C-<sup>1</sup>H activation) is an area of research on reactions that cleave carbon-<sup>1</sup>hydrogen bonds, which were traditionally regarded as unreactive. The first reported successes at activating C-<sup>1</sup>H bonds in saturated hydrocarbons, published in 1982, used organometallic iridium complexes that undergo an oxidative addition with the hydrocarbon.[65][66]

Iridium complexes are being investigated as catalysts for asymmetric hydrogenation. These catalysts have been used in the synthesis of natural products and able to hydrogenate certain difficult substrates, such as unfunctionalized alkenes, enantioselectively (generating only one of the two possible enantiomers).[67][68]

Iridium forms a variety of complexes of fundamental interest in triplet harvesting.[69][70][71]

[edit] Historical

Iridium-<sup>1</sup>osmium alloys were used to tip fountain pen nibs. The first major use of iridium was in 1834 in nibs mounted on gold.[3] Since 1944, the famous Parker 51 fountain pen was fitted with a nib tipped by a ruthenium and iridium alloy (with 3.8% iridium). The tip material in modern fountain pens is still conventionally called "iridium," although there is seldom any iridium in it; other metals such as tungsten have taken its place.[72]

An iridium-<sup>1</sup>platinum alloy was used for the touch holes or vent pieces of cannon. According to a report of the Paris Exhibition of 1867, one of the pieces being exhibited by Johnson and Matthey "has been used in a Withworth gun for more than 3000 rounds, and scarcely shows signs of wear yet. Those who know the constant trouble and expense which are occasioned by the wearing of the vent-pieces of cannon when in active service, will appreciate this important adaptation".[73]

The pigment iridium black, which consists of very finely divided iridium, is used for painting porcelain an intense black; it was said that "all other porcelain black colors appear grey by the side of it".[74]

[edit] Precautions

Iridium in bulk metallic form is not biologically important or hazardous to health due to its lack of reactivity with tissues; there are only about 20 Å parts per trillion of iridium in human tissue.[9] However, finely divided iridium powder can be hazardous to handle, as it is an irritant and may ignite

in air.[39] Very little is known about the toxicity of iridium compounds because they are used in very small amounts, but soluble salts, such as the iridium halides, could be hazardous due to elements other than iridium or due to iridium itself.[22] However, most iridium compounds are insoluble, which makes absorption into the body difficult.[9]

A radioisotope of iridium,  $^{192}\text{Ir}$ , is dangerous like other radioactive isotopes. The only reported injuries related to iridium concern accidental exposure to radiation from  $^{192}\text{Ir}$  used in brachytherapy.[22] High-energy gamma radiation from  $^{192}\text{Ir}$  can increase the risk of cancer. External exposure can cause burns, radiation poisoning, and death. Ingestion of  $^{192}\text{Ir}$  can burn the linings of the stomach and the intestines.[75] $^{192}\text{Ir}$ ,  $^{192m}\text{Ir}$ , and  $^{194m}\text{Ir}$  tend to deposit in the liver, and can pose health hazards from both gamma and beta radiation.[37]

^ Most common oxidation states of iridium are in bold. The right column lists one representative compound for each oxidation state.

^ Iridium literally means "of rainbows".

^ The definition of the meter was changed again in 1983. The meter is currently defined as the distance traveled by light in a vacuum during a time interval of  $\frac{1}{299,792,458}$  of a second.

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[edit] External links

Edward Drinker Cope (July 28, 1840 â ^ April 12, 1897) was an American paleontologist and comparative anatomist, as well as a noted herpetologist and ichthyologist. He was a founder of the Neo-Lamarckism school of thought. Born to a wealthy Quaker family, Cope distinguished himself as a child prodigy interested in science; he published his first scientific paper at the age of nineteen. Though his father tried to raise Cope as a gentleman farmer, he eventually acquiesced to his son's scientific aspirations. Cope married his cousin and had one child; the family moved from Philadelphia to Haddonfield, New Jersey, although Cope would maintain a residence and museum in Philadelphia in his later years.

Cope had little formal scientific training, and he eschewed a teaching position for field work. He made regular trips to the American West prospecting in the 1870s and 1880s, often as a member of United States Geological Survey teams. A personal feud between Cope and paleontologist Othniel Charles Marsh led to a period of intense fossil-finding competition now known as the Bone Wars. Cope's financial fortunes soured after failed mining ventures in the 1880s, forcing him to sell off much of his fossil collection. He experienced a resurgence in his career toward the end of his life before dying of unidentified causes on April 12, 1897.

Though Cope's scientific pursuits nearly bankrupted him, his contributions helped to define the field of American paleontology. He was a prodigious writer, with 1,400Â papers published over his lifetime, although his rivals debated the accuracy of his rapidly published works. He discovered, described, and named more than 1,000Â vertebrate species including hundreds of fishes and dozens of dinosaurs. His proposals on the origin of mammalian molars and for the gradual enlargement of mammalian species over geologic time ("Cope's rule") are notable among his theoretical contributions.

[edit] Biography

[edit] Early life

Edward Drinker Cope was born on July 28, 1840, the eldest son of Alfred and Hanna Cope.[2] The death of his mother when he was three years old seemed to have had little effect on young Edward, as he mentioned in his letters that he had no recollection of her. His stepmother, Rebecca Biddle, filled the maternal role; Cope referred to her warmly, as well as his younger stepbrother, James Biddle Cope. Alfred, an orthodox member of the Religious Society of Friends or Quakers, operated a lucrative shipping business started by his father, Thomas P. Cope, in 1821. He was a philanthropist who gave money to the Society of Friends, the Philadelphia Zoological Gardens and the Institute for Colored Youth.[3]

Edward was born and raised in a large stone house called "Fairfield" in what is now suburban Philadelphia, Pennsylvania.[2] The 8 acres (3.2Â ha) of pristine and exotic gardens of the house offered a landscape that Edward was able to explore.[4] The Copes began teaching their children to read and write at a very young age, and took Edward on trips across New England and to museums, zoos,

and gardens. Cope's interest in animals became apparent at a young age, as did his natural artistic ability.[1]

Alfred intended to give his son the same education that he himself had received.[5] At age nine, Edward was sent to a day school in Philadelphia and in 1853 at the age of twelve, Edward was sent to the Friends' Boarding School or Westtown, near West Chester, Pennsylvania.[6] The school was founded in 1799 with fundraising by members of the Society of Friends (Quakers), and provided much of the Cope family's education.[5] The prestigious school was expensive, costing Alfred \$500 in tuition each year, and in his first year Edward studied algebra, chemistry, scripture, physiology, grammar, astronomy, and Latin.[7] Edward's letters home requesting a larger allowance show he was able to manipulate his father, and that he was, according to author and Cope biographer Jane Davidson, "a bit of a spoiled brat".[8] His letters suggest that he was lonely at the schoolâ ~it was the first time he had been away from his home for an extended period. Otherwise, Edward's studies progressed much like a typical boyâ ~he consistently had "less than perfect" or "not quite satisfactory" marks for conduct from his teachers, and did not work hard on his penmanship lessons, which may have contributed to his often illegible handwriting as an adult.[7]

Edward returned to Westtown in 1855, accompanied by two of his sisters. Biology began to interest him more that year, and he studied natural history texts in his spare time. While at the school he frequently visited the Academy of Natural Sciences. Edward often obtained bad marks due to quarreling and bad conduct. His letters to his father show that he chafed at farm work and betrayed flashes of the temper for which he would later become well known.[9] After sending Edward back to the farm for summer break in 1854 and 1855, Alfred did not return Edward to school after spring 1856. Instead Alfred attempted to turn his son into a gentleman farmer, which he considered a wholesome profession that would yield enough profit to lead a comfortable life,[10] and improve the undersized Edward's health.[11][n 1] Until 1863, Cope's letters to his father continually expressed his yearning for a more professional scientific career than that of a farmer, which he called "dreadfully boring".[10]

While working on farms, Edward continued his education on his own.[12] In 1858 he began working part-time at the Academy of Natural Sciences, reclassifying and cataloguing specimens, and published his first series of research results in January 1859. Cope began taking French and German classes with a former Westtown teacher. Though Alfred resisted his son's pursuit of a science career, he paid for his son's private studies.[12] Instead of working the farm his father bought for him, Edward rented out the land and used the income to further his scientific endeavors.[13]

Alfred finally gave in to Edward's wishes and paid for university classes. Cope attended the University of Pennsylvania in the 1861 and/or 1862 academic years,[14][n 2] studying comparative anatomy under Joseph Leidy, one of the most influential anatomists and paleontologists at the time.[15] Cope asked his father to pay for a tutor in both German and French, "not so much for their own sake," wrote Edward, "but as for their value in enabling me to read their books of a literary or scientific character." [16] During this period he had a job recataloging the herpetological collection at the Academy of Natural Sciences, which he became a member of at Leidy's urging.[17] Cope's job lasted two years and he visited the Smithsonian Institution on occasion, where he became acquainted with Spencer Baird, who was an expert in the fields of ornithology and ichthyology.[18] In 1861 he published his first paper on Salamandridae classification; over the next five years he published primarily on reptiles and amphibians.[19] Cope's membership in the Academy of Natural Sciences and American Philosophical Society gave him outlets to publish and announce his work; many of his early paleontological works were published by the Philosophical Society.[20]

[edit] European travels

In 1863â ~1864 during the American Civil War, Edward traveled through Europe, taking the opportunity to visit the most esteemed museums and societies of the



time. Initially, Edward seemed interested in helping out at a field hospital, but in letters to his father later on in the war this aspiration seemed to disappear; instead Edward considered working in the American South to assist freed African-Americans. Davidson suggests that Edward's correspondence with Leidy and Ferdinand Hayden, who worked as field surgeons during the war, might have informed Edward of the horrors of the occupation.[21] Edward was involved in a love affair; his father did not approve.[22] Whether Edward or the unnamed woman (whom he at one point intended to marry) broke off the relationship is unknown, but he took the breakup poorly.[23] Biographer and paleontologist Henry Fairfield Osborn attributed Edward's sudden departure for Europe as a method of keeping him from being drafted into the Civil War.[24] Cope did write to his father from London on February 11, 1864, that, "I shall get home in time to catch and be caught by the new draft. I shall not be sorry for this, as I know certain persons who would be mean enough to say that I have gone to Europe to avoid the war." [25] Eventually Cope took the pragmatic approach and waited out the conflict.[21] He may have suffered from mild depression during this period, and often complained of boredom.[23][n 3]

Despite his torpor, Edward proceeded with his tour of Europe, and met with some of the most highly esteemed scientists of the world during his travels through France, Germany, Great Britain, Ireland, Austria, Italy, and Eastern Europe, most likely with introductory letters from Leidy and Spencer Baird.[26] In the winter of 1863, Edward met Othniel Charles Marsh while in Berlin. Marsh, age thirty-two, was attending the University of Berlin. He held two university degrees in comparison to Edward's lack of formal schooling past sixteen, but Edward had written 37 scientific papers in comparison to Marsh's two published works.[27] While they would later become rivals, on meeting the two men appeared to take a liking to each other. Marsh led Edward on a tour of the city, and they stayed together for days. After Edward left Berlin the two maintained correspondence, exchanging manuscripts, fossils, and photographs.[27] Edward burned many of his journals and letters from Europe upon his return to the United States. Friends intervened and stopped Cope from destroying some of his drawings and notes, in what author Url Lanham deemed a "partial suicide".[28]

[edit] Family and early career

Upon returning to Philadelphia in 1864 the Cope family made every effort to secure Edward a teaching post as the Professor of Zoology at Haverford College, a small Quaker school where the family had philanthropic ties.[29] The college awarded him an honorary master's degree so he could have the position. Cope even began to think about marriage and consulted his father in the matter, telling him of the girl he would like to marry: "an amiable woman, not over sensitive, with considerable energy, and especially one inclined to be serious and not inclined to frivolity and displayâ ~the more truly Christian of course the betterâ ~seems to be the most practically the most suitable for me, though intellect and accomplishments have more charm." [29] Cope thought of Annie Pim, a member of the Society of Friends, as less a lover than companion, declaring that "her amiability and domestic qualities generally, her capability of taking care of a house, etc., as well as her steady seriousness weigh far more with me than any of the traits which form the theme of poets!" Cope's family approved of his choice, and the marriage took place in July 1865 at Pim's farmhouse in Chester County, Pennsylvania.[30] The two had a single daughter, Julia Biddle Cope, born June 10, 1866.[31] Cope's return to the United States also marked an expansion of his scientific studies; in 1864 he described several fishes, a whale, and the amphibian *Amphibamus grandiceps* (his first paleontological contribution.) [19]

During the period between 1866 and 1867 Cope went on trips to western parts of the country.[31][32] Cope related to his father his scientific experiences; to his daughter he sent descriptions of animal life as part of her education. Cope found educating his students at Haverford "a pleasure" but wrote to his father that he "could not get any work done." [31][33] He resigned from his position at Haverford and moved his family to Haddonfield, in part to be closer to the

fossil beds of western New Jersey. Due to the time-consuming nature of his Haverford position Cope had not had time to attend to his farm and had let it out to others, but eventually found he was in need of more money to fuel his scientific habits.[34] Pleading with his father for money to pursue his career, he finally sold the farm in 1869.[35] Alfred apparently did not press his son to continue farming, and Edward focused on his scientific career.[36] He continued his continental travels, including trips to Virginia, Tennessee, and North Carolina.[37] He visited caves across the region. He stopped these cave explorations after an 1871 trip to the Wyandotte Caves in Indiana, but remained interested in the subject.[38] Cope had visited Haddonfield many times in the 1860s, paying periodical visits to the marl pits. The fossils he found in these pits became the focus of several papers, including a description in 1868 of *Elasmosaurus platyurus* and *Laelaps*. Marsh accompanied him on one of these excursions. Cope's proximity to the beds after moving to Haddonfield made more frequent trips possible. The Copes lived comfortably in a frame house backed by an apple orchard. Two maids tended the estate, which entertained a number of guests. Cope's only concern was for more money to spend on his scientific work.[39]

The 1870s were the golden years of Cope's career, marked by his most prominent discoveries and rapid flow of publications. Among his descriptions were the therapsid *Lystrosaurus* (1870),[40] the archosauromorph *Champsosaurus* (1876),[41] and the sauropod *Amphicoelias* (1878),[42] possibly the largest dinosaur ever discovered.[43] In the period of one year, from 1879 to 1880, Cope published 76 papers based on his travels through New Mexico and Colorado, and on the findings of his collectors in Texas, Kansas, Oregon, Colorado, Wyoming and Utah.[44] During the peak years, Cope published around 25 reports and preliminary observations each year. The hurried publications led to errors in interpretation and naming—many of his scientific names were later canceled or withdrawn. In comparison, Marsh wrote and published less frequently and more succinctly—his work's appearance in the widespread *American Journal of Science* led to faster reception abroad, and subsequently Marsh's reputations grew faster than Cope's.[45]

In autumn 1871 Cope began prospecting farther west to the fossil fields of Kansas. Leidy and Marsh had been to the region earlier, and Cope employed one of Marsh's guides, Benjamin Mudge, who was in want of a job.[46] Cope's companion Charles Sternberg described the lack of water and good food available to Cope and his helpers on these expeditions. Cope would suffer from a "severe attack of nightmare" in which "every animal of which we had found trace during the day played with him at night—... sometimes he would lose half the night in this exhausting slumber." Nevertheless Cope continued to lead the party from sunrise to sunset, sending letters to his wife and child describing his finds.[47] The severe desert conditions and Cope's habit of overworking himself till he was bedridden caught up with him and in 1872 he broke down from exhaustion.[48] Cope maintained a regular pattern of summers spent prospecting and winters writing up his findings from 1871 to 1879.[49]

Throughout the decade Cope traveled across the West, exploring rocks of the Eocene in 1872 and the Titanotheres Beds of Colorado in 1873.[50][51] In 1874 Cope was employed with the Wheeler Survey, a group of surveys led by George Montague Wheeler that mapped parts of the United States west of the 100th meridian. The survey traveled through New Mexico, whose Puerco formations, he wrote to his father, provided "the most important find in geology I have ever made".[52] The New Mexico bluffs contained millions of years of formation and subsequent deformation, and were in an area which had not been visited by Leidy or Marsh. Being part of the survey had other advantages; Cope was able to draw on fort commissaries and defray publishing costs. While there was no salary, his findings would be published in the annual reports that the surveys printed. Cope brought Annie and Julia along on one such survey and rented a house for them at Fort Bridger, but he spent more of his own money on these survey trips than he would have liked.[53]

Alfred died December 4, 1875,[54] and left Edward with an inheritance of

nearly a quarter of a million dollars. Alfred's death was a blow to Cope; his father was a constant confidant. The same year marked a suspension of much of Cope's field work and a new emphasis on writing up discoveries of the previous years. His chief publication of the time, *The Vertebrata of the Cretaceous Formations of the West*, was a collection of 303 pages and 54 illustrations. The memoir summarized his experiences prospecting in New Jersey and Kansas.[55] Cope now had the finances to hire multiple teams to search for fossils for him year-round and he advised the Philadelphia Centennial Exhibition on their fossil displays. Cope's studies of marine reptiles of Kansas closed in 1876, opening a new focus on terrestrial reptiles.[56] The same year, Cope moved from Haddonfield to 2100 and 2102 Pine Street in Philadelphia. He converted one of the two houses into a museum where he stored his growing collection of fossils.[49] Cope's expeditions took him across Kansas, Colorado, New Mexico, Wyoming, and Montana. Cope's initial journey into the Clarendon Beds of Upper Miocene and Lower Pliocene of Texas led to an affiliation with the Geological Survey of Texas. Cope's papers on the region constitute some of his most important paleontological contributions.[57] In 1877 he purchased half the rights to the *American Naturalist* to publish the papers he produced at a rate so high that Marsh questioned their dating.[58][n 4]

Cope returned to Europe in August 1878 in response to an invitation to join the British Association for the Advancement of Science's Dublin meeting. He was warmly welcomed in England and France and met with the distinguished paleontologists and archeologists of the period. Marsh's attempts to sully Cope's reputation had made little impact on anyone save paleontologist Thomas Henry Huxley, who according to Osborn "alone treated [Cope] with coolness".[59] Following the Dublin meeting, Cope spent two days with the French Association for the Advancement of Science. At each gathering Cope exhibited dinosaur restorations by Philadelphia colleague John A. Ryder and various charts and plates from geological surveys of the 1870s led by Ferdinand Vandever Hayden. He returned to London on October 12, meeting with anatomist Richard Owen, ichthyologist Albert Günther and paleontologist H. G. Seeley. While in Europe Cope purchased a great collection of fossils from Argentina. Cope never found time to describe the collection and many of the boxes remained unopened until Cope's death.[60]

[edit] Bone Wars

Cope's relations with Marsh turned into a competition for fossils between the two, known today as the Bone Wars. The conflict's seeds began upon the men's return to the United States in the 1860s. Cope introduced his colleague to the marl pit owner Albert Vorhees when the two visited the site. Marsh went behind Cope's back and made a private agreement with Vorhees: any fossils that Vorhees's men found were sent back to Marsh at New Haven.[61] When Marsh was at Haddonfield examining one of Cope's fossil finds—a complete skeleton of a large aquatic plesiosaur, *Elasmosaurus*, that had four flippers and a long neck—he commented that the fossil's head was on the wrong end, evidently stating that Cope had put the skull at the end of the vertebra of the tail. Cope was outraged and the two argued for some time until they agreed to have Leidy examine the bones and determine who was right. Leidy came, picked up the head of the fossil and put it on the other end. Cope was horrified since he had already published a paper on the fossil with the error at the American Philosophical Society. He immediately tried to buy back the copies, but some remained with their buyers (Marsh and Leidy kept theirs).[62] The whole ordeal might have passed easily enough had Leidy not exposed the cover-up at the next society meeting, not to alienate Cope but only in response to Cope's brief statement where he never admitted he was wrong. Cope and Marsh would never talk to each other amicably again, and by 1873 open hostility had broken out between them.[63]

The rivalry between the two increased towards the latter half of the 1870s. In 1877, Marsh received a letter from Arthur Lakes, a schoolteacher in Golden, Colorado. Lakes had been hiking in the mountains near the town of Morrison with

his friend, H. C. Beckwith, looking for fossilized leaves in the Dakota sandstone. Instead the pair found large bones embedded in the rock.[64] Lakes wrote that the bones were "apparently a vertebra and a humerus bone of some gigantic saurian." [65] While Lakes sent Marsh some 1,500 pounds of bone, he also sent Cope some of the specimens. Marsh published his finds first, and having been paid \$100 for the finds Lakes wrote to Cope that the samples should be forwarded to Marsh.[66] Cope was offended by the slight.[67] Meanwhile Cope received bones from school superintendent O.W. Lucas in March 1877 from Canon City; the remains were of a dinosaur even bigger than Lakes' that Marsh had described.[66]

Word that Lakes had notified Cope of his finds galvanized Marsh into action. When Marsh heard from Union Pacific Railroad workers W.E. Carlin and W.H. Reed about a vast boneyard northwest of Laramie in Como Bluff, Marsh sent his agent, Samuel Wendell Williston, to take charge of the digging.[68] Cope, in response, learned of Carlin and Reed's discoveries and sent his own men to find bones in the area.[69] The two scientists attempted to sabotage each other's progress. Cope was described as a genius and what Marsh lacked in intelligence, he easily made up for in connectionsâMarsh's uncle was George Peabody, a rich banker who supported Marsh with money, and a secure position at the Peabody Museum. Marsh lobbied John Wesley Powell to act against Cope and attempted to persuade Hayden to "muzzle" Cope's publishing.[70] Both men tried to spy on the other's whereabouts and attempted to offer their collectors more money in the hopes of recruiting them to their own side. Cope was able to recruit David Baldwin in New Mexico and Frank Williston in Wyoming from Marsh.[71] Cope and Marsh were extremely secretive as to the source of their fossils. When Osborn, at the time a student at Princeton, visited Cope to ask where to travel to look for fossils in the West, Cope politely refused to answer.[72]

When Cope arrived back in the United States after his tour of Europe in 1878, he had nearly two years of fossil findings from Lucas. Among these dinosaurs was *Camarasaurus*, one of the most recognizable dinosaur recreations of the time.[73] The summer of 1879 took Cope to Salt Lake City, San Francisco, and north to Oregon, where he was amazed at the rich flora and the blueness of the Pacific Ocean.[74] In 1879 the United States Congress consolidated the various government survey teams into the United States Geological Survey with Clarence King as its leader. This was discouraging to Cope because King named Marsh, an old college friend, as the chief paleontologist. The period of Cope's and Marsh's paleontological digs in the American West spanned from 1877 to 1892, by which time both men exhausted much of their financial resources.[69]

[edit] Later years

The 1880s proved disastrous for Cope.[75] Marsh's close association with the Geological Survey gave him the resources to employ 54 staff members over the course of ten years. His teaching position at Yale meant he had guaranteed access to the *American Journal of Science* for publication. Cope had his interest in the *Naturalist*, but it drained him of funds. After Hayden was removed from the Survey, Cope lost his source of government funding. His fortune was not enough to support his rivalry, so Cope invested in mining. Most of his properties were silver mines in New Mexico; one mine yielded an ore vein worth \$3 million in silver chloride. Cope visited the mines each summer from 1881 to 1885, taking the opportunity to supervise or collect other minerals.[76] For a while he made good money, but the mines stopped producing and by 1886 he had to give up his now-worthless stocks.[77] The same year he received a teaching position at the University of Pennsylvania.[78] He continued to travel west, but realized he would not be able to best Marsh in cornering the market for bones; he had to release the collectors he had hired and sell his collections. During this period he published 40 to 75 papers each year.[79] With the failure of his mines, Cope began searching for a job, but was turned down at the Smithsonian and American Museum of Natural History. He turned to giving lectures for hire and writing magazine articles. Each year he lobbied Congress for an appropriation with which to finish his work on "*Cope's Bible*", [80] a volume on Tertiary vertebrates, [81] but was continually turned

down. Rather than work with Powell and the Survey, Cope tried to inflame sentiment against them.[80]

At Marsh's urging, Powell pushed for Cope to return specimens he had unearthed during his employment under the government surveys. This was an outrage to Cope, who had used his own money while working as a volunteer.[82] In response, Cope went to the editor of the New York Herald and promised a scandalous headline. Since 1885,[83] Cope had kept an elaborate journal of mistakes and misdeeds that both Marsh and Powell had committed over the years. From scientific errors to publishing mistakes, he had them written down in a journal that he kept in the bottom drawer of his Pine Street desk.[84] Cope sought out Marsh's assistants, who complained of being denied access and credit by their employer and of being chronically underpaid.[85] Reporter William Hosea Ballou ran the first article on January 12, 1890, in what would become a series of newspaper debates between Marsh, Powell and Cope.[86] Cope attacked Marsh for plagiarism and financial mismanagement, and attacked Powell for his geological classification errors and misspending of government-allocated funds.[87] Marsh and Powell published their own side of the story and, in the end, little changed. No congressional hearing was created to investigate Powell's alleged misallocation of funds, while Cope and Marsh were not held responsible for any mistakes. Indirectly, however, the attacks may have been influential in Marsh's fall from power in the Survey.[88] Due to pressure from Powell over bad press, Marsh was removed from his position for the government surveys. Cope's relations with the president of the University of Pennsylvania soured, and the entire funding for paleontology in the government surveys was pulled.[89]

Cope took his sinking fortunes in stride.[75] In writing to Osborn about the articles, he laughed at the outcome, saying, "It will now rest largely with you whether or not I am supposed to be a liar and am actuated by jealousy and disappointment. I think Marsh is impaled on the horns of Monoclonius sphenocerus." [90] Cope was well aware of his enemies and was carefree enough to name a species after a combination of "Cope" and "hater", Anisonchus cophater.[91] Through his years of financial hardship he was able to continue publishing papers—his most productive years were 1884 and 1885, with 79 and 62 papers published, respectively. The 1880s marked the publication of two of the best-known fossil taxa described by Cope: the pelycosaur *Edaphosaurus* in 1882[92] and the early dinosaur *Coelophysis* in 1889.[93] In 1889 he succeeded Leidy, who had died the previous year, as professor of zoology at the University of Pennsylvania.[94] The small yearly stipend was enough for Cope's family to move back into one of the townhouses he had been forced to relinquish earlier.[95]

In 1892, Cope (then 52½ years old) was granted expense money for field work from the Texas Geological Survey.[95] With his finances improved, he was able to publish a massive work on the Batrachians of North America, which was the most detailed analysis and organization of the continent's frogs and amphibians ever mastered,[96] and the 1,115-page *The Crocodilians Lizards and Snakes of North America*. In the 1890s his publication rate increased to an average of 43½ articles a year.[96] His final expedition to the West took place in 1894, when he prospected for dinosaurs in South Dakota and visited sights in Texas and Oklahoma.[97] The same year, Julia was married to William H. Collins, a Haverford astronomy professor. The couple's ages—Julia was 28 and the groom 35—were past the conventions of Victorian marriage. After their European honeymoon, the couple returned to Haverford. While Annie moved to Haverford as well, Cope did not. His official reason was the long commute and late lectures he gave in Philadelphia. In private correspondence, however, Osborn wrote that the two had essentially separated,[98] though they remained on amiable terms.[99]

Cope sold his collections to the American Museum of Natural History in 1895; his set of 10,000½ American fossil mammals[100] sold for \$32,000, lower than Cope's asking price of \$50,000. The purchase was financed by the donations from New York's high society.[101] Cope sold three other collections for \$29,000. While his collection contained more than 13,000½ specimens, Cope's fossil hoard

was still much smaller than Marsh's collection, valued at over a million dollars.[97] The University of Pennsylvania bought part of Cope's ethnological artifact collection for \$5,500. The Academy of Natural Sciences, Philadelphia's foremost museum, did not bid on any of Cope's sales due to bad blood between Cope and the museum's leaders; as a result, many of Cope's major finds left the city.[101] Cope's proceeds from the sales allowed him to rehire Sternberg to prospect for fossils on his behalf.[102]

In 1896 Cope began suffering from a gastrointestinal illness he said was cystitis.[104] His wife cared for him in Philadelphia when she was able; at other times, Cope's university secretary, Anna Brown, tended to him. Cope at this time lived in his Pine Street museum and rested on a cot surrounded by his fossil finds. Cope often prescribed himself medications, including large amounts of morphine, belladonna, and formalin, a substance based on formaldehyde used to preserve specimens. Osborn was horrified by Cope's actions and made arrangements for surgery, but the plans were put on hold after a temporary improvement in Cope's health. Cope went to Virginia looking for fossils, became ill again, and returned to his home very weak.[105] Osborn visited Cope on April 5, inquiring about Cope's health, but the sick paleontologist pressed his friend for his views on the origin of mammals. Word of Cope's illness spread, and he was visited by friends and colleagues; even in a feverish condition Cope delivered lectures from his bed. Cope died on April 12, 1897, sixteen weeks short of his 57th birthday.[106]

Sternberg, still prospecting for Cope that spring, was woken by a liveryman who relayed word from Annie that Cope had died three days earlier. Sternberg wrote in his memoirs that "I had lost friends before, and I had known what it was to bury my own dead, even my firstborn son, but I had never sorrowed more deeply than I did over the news." [106] Cope's Quaker funeral consisted of six men: Osborn, his colleague William Berryman Scott, Cope's friend Persifor Frazer, son-in-law Collins, Horatio Wood and Harrison Allen. The six sat around Cope's coffin among the fossils and Cope's pets, a tortoise and a gila monster, for what Osborn called "a perfect Quaker silence" ... an interminable length of time." [105][106] Anticipating the quiet, Osborn had brought along a Bible and read an excerpt from the Book of Job, ending by saying, "These are the problems to which our friend devoted his life." [107]

The coffin was loaded on a hearse and carried to a gathering at Fairfield; much of the gathering was spent in silence. After the coffin was removed, the assembled began talking. Frazer recalled that each person remembered Cope differently, and that "Few men succeeded so well in concealing from anyone" ... all the sides of his multiform character." [107] Osborn, intending to follow the coffin to the graveyard, was instead pulled aside by Collins and taken to the reading of Cope's will. Osborn and Cope's brother-in-law John Garrett were named executors. Cope gave his family a choice of his books, with the remainder to be sold or donated to the University of Pennsylvania. After debts were handled, Cope left small bequests to friends and family. Anna Brown and Julia received \$5000 each, while the remainder went to Annie. Cope's estate was valued at \$75,327, not including additional revenue raised by sales of fossils to the American Museum of Natural History, for a total of \$84,600. [108] Some specimens preserved in alcohol made their way to the Academy of Natural Sciences, including a few gordian worms. [109]

Cope insisted through his will that there be no graveside service or burial; he had donated his body to science. He issued a final challenge to Marsh at his death: he had his skull donated to science so that his brain could be measured, hoping that his brain would be larger than that of his adversary; at the time, it was thought that brain size was the true measure of intelligence. Marsh never accepted the challenge, and Cope's skull is reportedly still preserved at the University of Pennsylvania. [110][111] His ashes were placed at the institute with those of Leidy, while his bones were extracted and kept in a locked drawer to be studied by anatomy students. [112][n 5]

Osborn listed Cope's cause of death as uremic poisoning, combined with a large prostate, but the true cause of death is unknown. [106] Many believed that Cope

had died of syphilis contracted from the women with whom he fraternized during his travels. In 1995 Davidson gained permission to have the skeleton examined by a medical doctor at the university. Dr. Morrie Kricun, a professor of radiology, concluded that there was no evidence of bony syphilis on Cope's skeleton.[113]

Public mentions of Cope's passing were relatively slight. The Naturalist ran four photographs, a six-page obituary by editor J. S. Kingsley, and a two-page remembrance by Frazer. The National Academy of Sciences' official memoir was submitted years later and written by Osborn. The American Journal of Science devoted six paragraphs to Cope's passing, and incorrectly gave his age as 46. Cope was survived by his rival Marsh, who was suffering poor health.[114]

[edit] Evolution

As a young man, Cope read Charles Darwin's *Voyage of a Naturalist*, which had little effect on him. The only comment about Darwin's book recorded by Cope was that Darwin discussed "too much geology" from the account of his voyage.[115] Due to his background in taxonomy and paleontology, Cope focused on evolution in terms of changing structure, rather than emphasizing geography and variation within populations as Darwin had. Over his lifetime Cope's views on evolution shifted.[116]

His original view, described in the paper "On the Origin of Genera" (1868), held that while Darwin's natural selection may affect the preservation of superficial characteristics in organisms, natural selection alone could not explain the formation of genera. Cope's suggested mechanism for this action was a "steady progressive development of organization" through what Cope termed "a continual crowding backward of the successive steps of individual development". In Cope's view, during embryological development an organism could complete their growth with a new stage of development beyond its parents, taking it to a higher level of organization. Later individuals would inherit this new level of development—thus evolution was a continuous advance of organization, sometimes slowly and other times suddenly; this view is known as the law of acceleration.[117]

Cope's beliefs later evolved to one with an increased emphasis on continual and utilitarian evolution with less involvement of a Creator.[118] He became one of the founders of the Neo-Lamarckism school of thought, which holds that individuals can pass on traits acquired in its lifetime to offspring.[119] Although the view has been shown incorrect, it was the prevalent theory among paleontologists in Cope's time.[120] In 1887, Cope published his own "Origin of the Fittest: Essays in Evolution", detailing his views on the subject.[121] He was a strong believer in the law of use and disuse—that an individual will slowly, over time, favor an anatomical part of its body so much that it will become stronger and larger as time progresses down the generations. The giraffe, for example, stretched its neck to reach taller trees and passed this acquired characteristic to its offspring in the new developmental phase that is added on to the fetus in the womb. This new stage of sharing of genetics would be added on after all gestation is completed and the offspring is ready to be conceived.[122]

Cope's *Theology of Evolution* (1887) argued that consciousness comes from the mind of the universe and governs evolution by directing animals to new goals.[123] According to (Sideris, 2003) "[Cope] argued that organisms respond to changes in their environments by an exercise of choice. Consciousness itself, he maintained, was the principal force in evolution. Cope credited God with having built into evolution a life force that propelled organisms toward even higher levels of consciousness." [124]

[edit] Personality and legacy

Julia assisted Osborn in writing a biography of her father, titled *Cope: Master Naturalist*. She would not comment on the name of the woman with whom her father had had an affair with prior to his first European travel. It is believed that Julia burned any of the scandalous letters and journals that Cope had kept but many of his friends were able to give their recollections of the scandalous nature of some of Cope's unpublished routines. Charles R. Knight, a

former friend called, "Cope's mouth the filthiest, from hearsay that in [Cope's] heyday no woman was safe within five miles of him." [126] As Julia was the major financier behind *The Master Naturalist*, she wanted to keep her father's name in good standing and refused to comment on any misdeeds her father may have committed. [126]

Cope was described by zoologist Henry Weed Fowler as "a man of medium height and build, but always impressive with his great energy and activity". To him, Fowler wrote, "[Cope] was both genial and always interesting, easily approachable, and both kindly and helpful." [127] His self-taught nature, however, meant that he was largely hostile to bureaucracy and politics. He had a famous temper; one friend called Cope a "militant paleontologist". [128] Despite his faults, he was generally well liked by his contemporaries. American paleontologist Alfred Romer wrote that, "[Cope's] little slips from virtue were those we might make ourselves, were we bolder". [129]

Cope was raised as a Quaker, and was taught that the Bible was literal truth. Although he never confronted his family about their religious views, Osborn writes that Cope was at least aware of the conflict between his scientific career and his religion. Osborn writes: "If Edward harbored intellectual doubts about the literalness of the Bible ... he did not express them in his letters to his family but there can be little question ... that he shared the intellectual unrest of the period." [130] Lanham writes that Cope's religious fervor (which seems to have subsided after his father's death) was embarrassing to even his devout Quaker associates. [120] Biographer Jane Davidson believes that Osborn overstated Cope's internal religious conflicts. She ascribes Cope's deference to his father's beliefs as an act of respect or a measure to retain his father's financial support. [131] Frazer's reminiscences about his friend suggest that Cope often told people what they wanted to hear, rather than Cope's true views. [21]

Cope's views on human races would today be considered racist, but his beliefs were used by scientists of the time as an excuse for imperialism. He believed that if, "a race was not white then it was inherently more ape-like". [132] He was not opposed to blacks because of the color of their skin but their "degrading vices," believing that the "inferior Negro should go back to Africa." [133] He did not blame blacks for their perceived "poor virtue", but wrote that, "A vulture will always eat carrion when surrounded on all hands by every kind of cleaner food. It is the nature of the bird." [134] Cope was against the modern view of women's rights, believing in the husband's role as protector; he was opposed to women's suffrage as he felt they would be unduly influenced by their husbands. [133]

In fewer than 40 years as a scientist Cope published over 1,400 scientific papers, a record that stands to this day. [135][136] These include three major volumes: *On the Origin of Genera* (1867), *The Vertebrata of the Tertiary Formations of the West* (1884) and "Essays in Evolution". He discovered a total of 56 new dinosaur species during the Bone Wars compared to Marsh's 80. [137] Although Cope is today known as a herpetologist and paleontologist, his contributions extended to ichthyology, in which he catalogued 300 species of fishes over three decades. [138] In total he discovered and described over 1,000 species of fossil vertebrates and published 600 separate titles. [139]

The salamander *Dicamptodon copei* (Nussbaum, 1970), [140] the dinosaur *Drinker nisti* (Bakker et al., 1990), [141] the lizard *Gambelia wislizenii copeii* (H. C. Yarrow, [142] and the Splash tetra *Copella arnoldi* (Regan, 1912) [143] are among the many species named for Cope. There are currently 21 fish species named *copei* distributed among 11 families. *Copeia* is the journal of the American Society of Ichthyologists and Herpetologists (ASIH), [144] founded in 1913 by John Treadwell Nichols. Cope's Pine Street home is recognized as a national landmark. [145]

[edit] See also

^ Davidson found no evidence in any of the surviving Cope correspondence and papers that Alfred intended Edward to become part of his shipping business. She



attributes Alfred's resistance to Edward's desire for a scientific career "old-fashionedness". (Davidson, 25).

^ The exact dates of Cope's studies at the University of Pennsylvania are not known. Cope kept his admission slip for the 1861â ^1862 school year his entire life, but assuming that these slips were collected by university professors this would suggest he never attended in the fall of 1861 (Davidson, 20).

^ Davidson writes that "[it may] seem to the reader, as it does the author, that Cope could have suffered some mild depression". She points to evidence including his letters where he complains of boredom, as well as betraying insights into the discrepancy between how he saw himself and how his colleagues described him (Davidson, 29).

^ At one point, Cope deliberately and falsely claimed that a paper on Permian vertebrates had been published three weeks earlier, in part to get back at Marsh, who had heard about Cope's discoveries at a meeting and hurriedly wrote a paper about his own finds while claiming that he was the first to do so (Romer, 204).

^ Cope was not alone in donating his brain; poet Walt Whitman did so, as did Powell and Leidy. Cope's brain weighed 1,545Â grams, more than those of Powell and Daniel Webster, but less than Leidy's. Whitman's brain had been dropped on the floor and was not measured (Jaffe, 364). Some sources (Psihoyos 1994) claim that Cope wanted his skeleton to become the Homo sapiens lectotype, but this is refuted by the Academy of Natural Sciences (Spamer, 111).

^ a b Davidson, 8.

^ a b Davidson, 7.

^ Scharf and Westcott, 2216.

^ Lanham, 60â ^63.

^ a b Davidson, 9.

^ Osborn, 40.

^ a b Davidson, 12.

^ Davidson, 11.

^ Davidson, 15.

^ a b Osborn, 100.

^ Lanham, 63.

^ a b Davidson, 17.

^ Lanham, 64.

^ Davidson, 20.

^ Osborn, 80.

^ Osborn, 101.

^ Davidson, 21.

^ Osborn, 107.

^ a b Gill, 835.

^ Davidson, 22.

^ a b c Davidson, 26â ^27.

^ Lanham, 66.

^ a b Davidson, 29â ^30.

^ Osborn, 106.

^ Osborn, 138.

^ Davidson, 29.

^ a b Jaffe, 11.

^ Lanham, 67.

^ a b Jaffe, 48.

^ Osborn, 142.

^ a b c Osborn, 143.

^ Osborn, 146.

^ Davidson, 31.

^ Osborn, 144.

^ Davidson, 33.

^ Osborn, 145.

^ Osborn, 151â ^154.  
^ Osborn, 155.  
^ Osborn, 157â ^158.  
^ Cope (1870).  
^ Cope (1876).  
^ Cope (1878).  
^ Carpenter, 131.  
^ Davidson, 43.  
^ Cope, 216.  
^ Osborn, 159â ^160.  
^ Osborn, 167.  
^ Jaffe, 583.  
^ a b Osborn, 168.  
^ Osborn, 183.  
^ Osborn, 194.  
^ Osborn, 200.  
^ Jaffe, 63.  
^ Gill, 837.  
^ Cope, 217.  
^ Osborn, 218.  
^ Osborn, 233.  
^ Davidson, 41.  
^ Osborn, 243.  
^ Osborn, 244.  
^ Gallagher, 35.  
^ Jaffe, 15.  
^ Thomson, 229.  
^ Lanham, 170â ^171.  
^ Wilford, 105.  
^ a b Lanham, 172.  
^ Wilford, 106.  
^ Lanham, 174â ^176.  
^ a b Bakker.  
^ Jaffe, 106.  
^ Jaffe, 257.  
^ Osborn, 579.  
^ Davidson, 42.  
^ Osborn, p. 269.  
^ a b Lanham, 231.  
^ Lanham, 233â ^237.  
^ Lanham, 238.  
^ Gill, 838.  
^ Lanham, 242.  
^ a b Lanham, 243â ^244.  
^ Romer, 205.  
^ Lanham, 249.  
^ Lanham, 245.  
^ Osborn, 585.  
^ Penick.  
^ Osborn, 403.  
^ Osborn, 404.  
^ Romer, 206.  
^ Jaffe, 329â ^334.  
^ Osborn, 408.  
^ Osborn, 583.  
^ Cope (1882).  
^ Cope (1889).  
^ Jaffe, 349.  
^ a b Lanham, 267.  
^ a b Jaffe, 350.

- ^ a b Lanham, 268.
- ^ Jaffe, 355.
- ^ Jaffe, 356.
- ^ American Museum of Natural History.
- ^ a b Jaffe, 356â ^357.
- ^ Jaffe, 358.
- ^ Fowler, 196.
- ^ Jaffe, 359.
- ^ a b Lanham, 269.
- ^ a b c d Jaffe, 361.
- ^ a b Jaffe, 362.
- ^ Jaffe, 363.
- ^ Montgomery, 95.
- ^ Dodson.
- ^ Associated Press.
- ^ Davidson, 160.
- ^ Davidson, 161.
- ^ Jaffe, 366.
- ^ Davidson, 16.
- ^ Bowler, 250.
- ^ Bowler, 251â ^253.
- ^ Bowler, 259.
- ^ Polly.
- ^ a b Lanham, 68.
- ^ Alroy.
- ^ Cope, 126.
- ^ Randy Moore, Mark Decker, Sehoya Cotner Chronology of the Evolution-Creationism Controversy 2010, p. 140
- ^ Environmental Ethics, Ecological Theology, and Natural Selection
- ^ Gill, 830.
- ^ a b Davidson, 106â ^109.
- ^ Fowler, 197.
- ^ Jaffe.
- ^ Romer, 202.
- ^ Davidson, 23.
- ^ Davidson, 24.
- ^ Davidson, 169.
- ^ a b Davidson, 176.
- ^ Davidson, 182.
- ^ Academy of Natural Sciences, "Bone Wars".
- ^ Jaffe, 338.
- ^ Colbert, 93
- ^ Academy of Natural Sciences, "History of the Ichthyology Department".
- ^ Haverford.
- ^ Nussbaum, 509.
- ^ Bakker et al.
- ^ (1882)
- ^ Regan, 1912
- ^ American Society of Ichthyologists and Herpetologists
- ^ Levins.

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[edit] Selected works

[edit] External links

Persondata

Name

Cope, Edward Drinker

Alternative names

Short description

American scientist

Date of birth

July 28, 1840

Place of birth

Philadelphia

Date of death

April 12, 1897

Place of death

Philadelphia