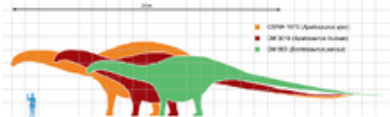


As the archetypal sauropod, *Brontosaurus* is one of the best-known dinosaurs and has been featured in film, advertising, and postage stamps, as well as many other types of media.

External links

Brontosaurus was a large, long-necked, quadrupedal animal with a long, whip-like tail, and forelimbs that were slightly shorter than its hindlimbs. The largest species, *B. excelsus*, weighed up to 15 t (17 short tons) and measured up to 22 m (72 ft) long from head to tail.^[6]

- †***Brontosaurus parvus***
(Peterson & Gilmore, 1902)



Comparison of three specimens and a human: Oklahoma specimen of *Apatosaurus ajax* (orange), *A. louisae* (red), and *Brontosaurus parvus* (green)

The skull of *Brontosaurus* has not been found, but was probably similar to the skull of the closely related *Apatosaurus*. Like those of other sauropods, the vertebrae of the neck were deeply bifurcated; that is, they carried paired spines, resulting in a wide and deep neck.^[7] The spine and tail consisted of 15 cervicals, ten dorsals, five sacrals, and about 82 caudals. The number of caudal

- †*Brontosaurus yahnahpin* (Filla & Redman, 1994)

Synonyms

- *Elosaurus* Peterson & Gilmore, 1902
- *Eobrontosaurus* Bakker, 1998
- *Apatosaurus excelsus* Riggs, 1903

vertebrae was noted to vary, even within a species. The cervical vertebrae were stouter than other *diplodocids*, though not as stout as in mature specimens of *Apatosaurus*. The dorsal ribs are not fused or tightly attached to their vertebrae, instead being loosely articulated.^[8] Ten dorsal ribs are on either side of the body.^[3] The large neck was filled with an extensive system of weight-saving air sacs. *Brontosaurus*, like its close relative *Apatosaurus*, had tall spines on its vertebrae, which made up more than half the height of the individual bones. The shape of the tail was unusual for *diplodocids*, being comparatively slender, due to the vertebral spines rapidly decreasing in height the farther they are from the hips. *Brontosaurus* spp. also had very long ribs compared to most other *diplodocids*, giving them unusually deep chests.^[9] As in other *diplodocids*, the last portion of the tail of *Brontosaurus* possessed a whip-like structure.^[8]



Restoration of *B. excelsus*.

The limb bones were also very robust.^[9] The arm bones are stout, with the humerus resembling that of *Camarasaurus*, and those of *B. excelsus* being nearly identical to those of *Apatosaurus ajax*. Charles Gilmore in 1936 noted that previous reconstructions erroneously proposed that the radius and ulna could cross, when in life they would have remained parallel.^[8] *Brontosaurus* had a single large claw on each forelimb, and the first three toes possessed claws on each foot.^[10] Even by 1936, it was recognized that no sauropod had more than one hand claw preserved, and this one claw is now accepted as the maximum

number throughout the entire group.^{[8][11]} The single front claw bone is slightly curved and squarely shortened on the front end. The hip bones included robust ilia and the fused pubes and ischia. The tibia and fibula bones of the lower leg were different from the slender bones of *Diplodocus*, but nearly indistinguishable from those of *Camarasaurus*. The fibula is longer than the tibia, although it is also more slender.^[8]

History

Initial discovery and the Felch Quarry skull

In 1879, Othniel Charles Marsh, a professor of paleontology at Yale University, announced the discovery of a large and fairly complete sauropod skeleton collected from Morrison Formation rocks at Como Bluff, Wyoming by William Harlow Reed. He identified it as belonging to an entirely new genus and species, which he named *Brontosaurus excelsus*,^[3] ^[12] meaning "thunder lizard", from the Greek *brontē*/βροντή meaning "thunder" and *sauros*/σαυρος meaning "lizard",^[13] and from the Latin *excelsus*, "noble" or "high".^[14] By this time, the Morrison Formation had become the center of the Bone Wars, a fossil-collecting rivalry between Marsh and another early paleontologist, Edward Drinker Cope. Because of this, the publications and descriptions of taxa by Marsh and Cope were rushed at the time.^[15] *Brontosaurus excelsus*' type specimen (YPM 1980) was one of the most complete sauropod skeletons known at the time, preserving many of the characteristic but fragile cervical vertebrae.^{[16][17]} Marsh believed that *Brontosaurus* was a member of the Atlantosauridae, a clade of sauropod dinosaurs named by him in 1877 that also comprised *Atlantosaurus* and *Apatosaurus*.^[16]

A year later in 1880, another partial postcranial *Brontosaurus* skeleton was collected in Como Bluff by Reed,^{[18][19]} including well preserved limb elements.^[17] Marsh named this second skeleton *Brontosaurus amplus* ("large thunder lizard") in 1881,^[19] but it was considered a synonym of *B. excelsus* in 2015^[17].



An 1896 diagram of the *B. excelsus* holotype skeleton by O.C. Marsh. The head is based on material now assigned to *Brachiosaurus* sp.



Hypothetical skull, sculpted in 1931, Yale Peabody Museum

Further south in Felch Quarry at Garden Park, Colorado, Marshall P. Felch collected a disarticulated partial skull (USNM V 5730) of a sauropod in August 1883 and sent the specimen to Yale.^{[20][21]} Marsh referred the skull to *B. excelsus*,^{[20][22]} later featuring it in a skeletal reconstruction of the *B. excelsus* type specimen in 1891^[22] and the illustration was featured again in Marsh's landmark publication, *The Dinosaurs of North America*, in 1896.^[16] At the Yale Peabody Museum, the skeleton of *Brontosaurus excelsus* was mounted in 1931 with a skull based on the Marsh reconstruction of the Felch Quarry skull.^[23] While at the time most museums were using *Camarasaurus* casts for skulls, the Peabody Museum sculpted a completely different skull based on Marsh's recon.^{[23][20]} The skull also included forward-pointing nasals, something truly different to any dinosaur, and fenestrae differing from the drawing and other

skulls, and the mandible was based on a *Camarasaurus*'.^[23] In 1998, the Felch Quarry skull that Marsh included in his 1896 skeletal restoration was suggested to belong to *Brachiosaurus* instead^[20] and this was supported in 2020 with a redescription of the *Brachiosaurid* material found at Felch Quarry.^[21]

Second Dinosaur Rush and skull issue

During a Carnegie Museum expedition in 1901 to Wyoming, William Harlow Reed collected another *Brontosaurus* skeleton, a partial postcranial skeleton of a young juvenile (CM 566), including partial limbs, intermingled with a fairly complete skeleton of an adult (UW 15556).^{[24][17]} The adult skeleton specifically was very well preserved, bearing many cervical and caudal vertebrae, and is the most complete definite specimen of *Brontosaurus parvus*.^[17] The skeletons were granted a new genus and species name, *Elosaurus parvus* ("little field lizard"), by Olof A. Peterson and Charles Gilmore in 1902.^[24] Both of the specimens came from the Brushy Basin Member of the Morrison Formation. The species was later transferred to *Apatosaurus* by several authors^{[17][25]} until it was placed in *Brontosaurus* in 2015 by Tschopp *et al.*^{[17][26]}



Skeleton of the AMNH apatosaurine (possibly *B. excelsus*, specimen AMNH 460) as remounted in 1995

Elmer Riggs, in the 1903 edition of *Geological Series of the Field Columbian Museum*, argued that *Brontosaurus* was not different enough from *Apatosaurus* to warrant its own genus, so he created the new combination *Apatosaurus excelsus* for it. Riggs stated that "In view of these facts the two genera may be regarded as synonymous. As the term 'Apatosaurus' has priority, 'Brontosaurus' will be regarded as a synonym".^[3] Nonetheless, before the mounting of the American Museum of Natural History specimen, Henry Fairfield Osborn chose to label the skeleton "Brontosaurus", though he was a strong opponent of Marsh and his taxa.^{[23][27]}



Obsolete mount of an apatosaurine referred to *B. excelsus* (specimen AMNH 460) with sculpted skull, completed in 1905, American Museum of Natural History

In 1905, the American Museum of Natural History (AMNH) unveiled the first-ever mounted skeleton of a sauropod, a composite specimen (mainly made of bones from AMNH 460) that they referred to as the species *Brontosaurus excelsus*. The AMNH specimen was very complete, only missing the feet (feet from the specimen AMNH 592 were added to the mount), lower leg, and shoulder bones (added from AMNH 222), and tail bones (added from AMNH 339).^[28] To complete the mount, the rest of the tail was fashioned to appear as Marsh believed it should, which had too few vertebrae. In addition, a sculpted model of what the museum felt the skull of this massive creature might look like was placed on the skeleton. This was not a delicate skull like that of *Diplodocus*, which would later turn out to be more accurate, but was based on "the biggest, thickest, strongest skull bones, lower jaws and tooth crowns from three different quarries".^{[8][3][29][30]} These skulls were likely those of *Camarasaurus*, the only other sauropod for which good skull material was known at the time. The mount construction was overseen by Adam Hermann, who failed to find *Brontosaurus*

skulls. Hermann was forced to sculpt a stand-in skull by hand. Henry Fairfield Osborn noted in a publication that the skull was "largely conjectural and based on that of *Morosaurus*" (now *Camarasaurus*).^[23]

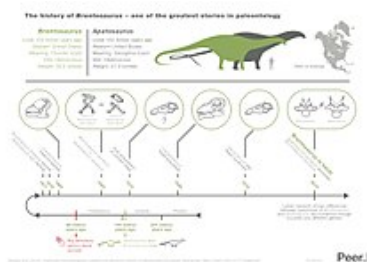
In 1909, an *Apatosaurus* skull was found, during the first expedition to what would become the Carnegie Quarry at Dinosaur National Monument, led by Earl Douglass. The skull was found a few meters away from a skeleton (specimen CM 3018) identified as the new species *Apatosaurus louisae*. The skull was designated CM 11162, and was very similar to the skull of *Diplodocus*. It was accepted as belonging to the *Apatosaurus* specimen by Douglass and Carnegie Museum director William H. Holland, although other scientists, most notably Osborn, rejected this identification. Holland defended his view in 1914 in an address to the Paleontological Society of America, yet he left the Carnegie Museum mount headless. While some thought Holland was attempting to avoid conflict with Osborn, others suspected that Holland was waiting until an articulated skull and neck were found to confirm the association of the skull and skeleton.^[23] After Holland's death in 1934, a cast of a *Camarasaurus* skull was placed on the mount by museum staff.^[27]

Skull correction, resurgent discoveries, and reassessment

No apatosaurine skull was mentioned in literature until the 1970s, when John Stanton McIntosh and David Berman redescribed the skulls of *Diplodocus* and *Apatosaurus* in 1975.^[30] They found that though he never published his opinion, Holland was almost certainly correct, that *Apatosaurus* (and *Brontosaurus*) had a *Diplodocus*-like skull.^[30] According to them, many skulls long thought to pertain to *Diplodocus* might instead be those of *Apatosaurus*.^[30] They reassigned multiple skulls to *Apatosaurus* based on associated and closely associated vertebrae.^[30] Though they supported Holland, *Apatosaurus* was noted to possibly have possessed a *Camarasaurus*-like skull, based on a disarticulated *Camarasaurus*-like tooth found at the precise site where an *Apatosaurus* specimen was found years before.^[30] On October 20, 1979, after the publications by McIntosh and Berman, the first skull of an *Apatosaurus* was mounted on a skeleton in a museum, that of the Carnegie.^[27] In 1995, the American Museum of Natural History followed suit, and unveiled their remounted skeleton (now labelled *Apatosaurus excelsus*) with a corrected tail and a new skull cast from *A. louisae*.^[28] In 1998, Robert T. Bakker referred a skull and mandible of an Apatosaurine from Como Bluff to *Brontosaurus excelsus* (TATE 099-01), though the skull is still undescribed.^[31] In 2011, the first specimen of *Apatosaurus* where a skull was found articulated with its cervical vertebrae was described. This specimen, CMC VP 7180, was found to differ in both skull and neck features from *A. louisae*, and the specimen was found to have a majority of features related to those of *A. ajax*.^[32]



Cast of the TATE 099-01 skull referred to *Brontosaurus excelsus* by Robert Bakker in 1998.



Infographic explaining the history of *Brontosaurus* and *Apatosaurus* according to Tschoop et al. 2015

Another specimen of an Apatosaurine now referred to *Brontosaurus* was discovered in 1993 by the Tate Geological Museum, also from the Morrison Formation of central Wyoming. The specimen consisted of a partial postcranial skeleton, including a complete manus and many vertebrae, and described by James Filla and Pat Redman a year later.^{[17][31]} Filla and Redman named the specimen *Apatosaurus yahnahpin* ("yahnahpin-wearing deceptive lizard"), but Robert T. Bakker gave it the genus name *Eobrontosaurus* in 1998.^[31] Bakker believed that *Eobrontosaurus* was the direct predecessor to *Brontosaurus*^[31], although later Tschoop *et al.*'s phylogenetic analysis placed *B. yahnahpin* as the basalmost species of *Brontosaurus*.^[17]

In 2008, a nearly complete postcranial skeleton of an Apatosaurine was collected in Utah by crews working for Brigham Young University (BYU 1252-18531) where some of the remains are currently on display.^[17] The skeleton is undescribed, but many of the features of the skeleton are shared with *Brontosaurus parvus*.^[17]

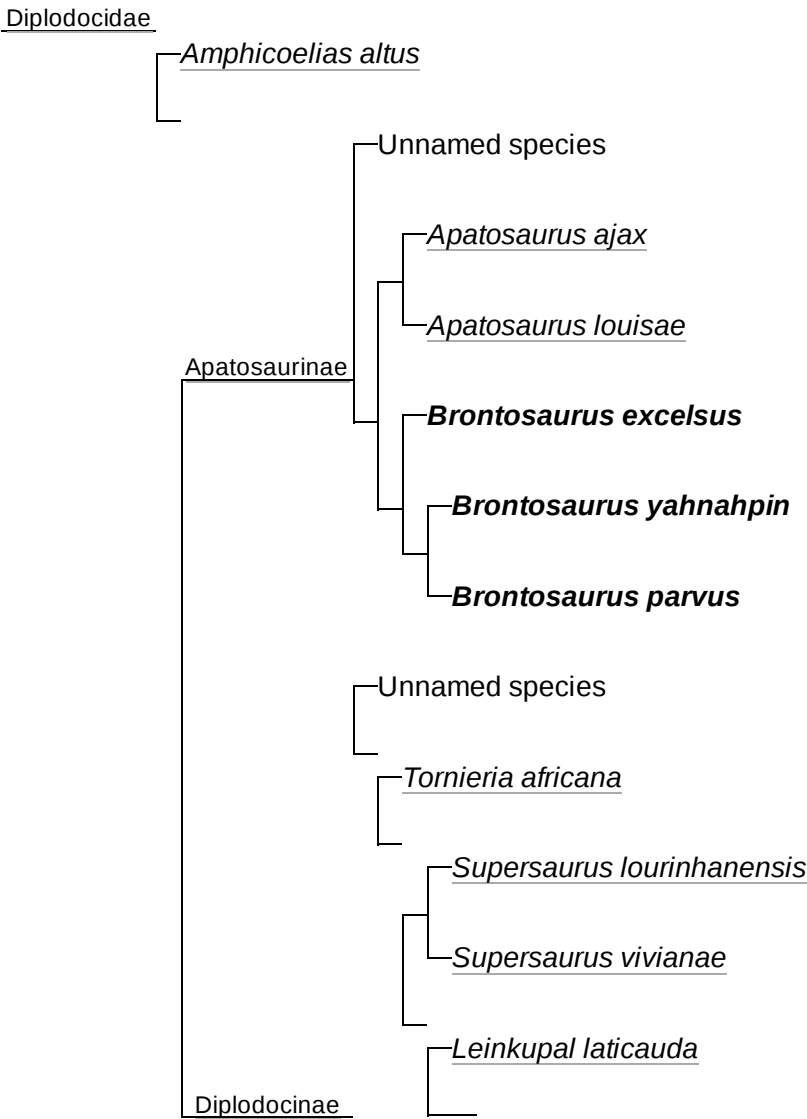
Almost all 20th-century paleontologists agreed with Riggs that all *Apatosaurus* and *Brontosaurus* species should be classified in a single genus. According to the rules of the ICZN (which governs the scientific names of animals), the name *Apatosaurus*, having been published first, had priority as the official name; *Brontosaurus* was considered a junior synonym and was therefore discarded from formal use.^{[33][34][35][36]} Despite this, at least one paleontologist—Robert T. Bakker—argued in the 1990s that *A. ajax* and *A. excelsus* are in fact sufficiently distinct that the latter continues to merit a separate genus.^[31] In 2015, an extensive study of diplodocid relationships by Emanuel Tschoop, Octavio Mateus, and Roger Benson concluded that *Brontosaurus* was indeed a valid genus of sauropod distinct from *Apatosaurus*. The scientists developed a statistical method to more objectively assess differences between fossil genera and species, and concluded that *Brontosaurus* could be "resurrected" as a valid name. They assigned two former *Apatosaurus* species, *A.*

parvus and *A. yahnahpin*, to *Brontosaurus*, as well as the type species *B. excelsus*.^[4] Paleontologist Michael D'Emic made a critique.^[37] Paleontologist Donald Prothero criticized the mass media reaction to this study as superficial and premature.^[38]

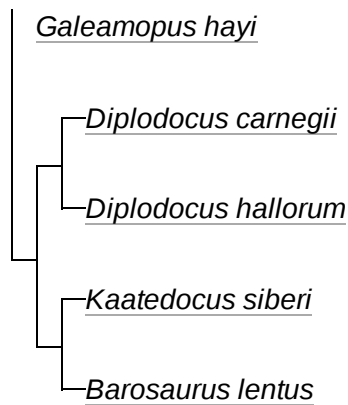
Classification

Brontosaurus is a member of the family *Diplodocidae*, a clade of gigantic sauropod dinosaurs. The family includes some of the longest and largest creatures ever to walk the earth, including *Diplodocus*, *Supersaurus*, and *Barosaurus*. *Brontosaurus* is also classified in the subfamily *Apatosaurinae*, which also includes *Apatosaurus* and one or more possible unnamed genera.^[4] Othniel Charles Marsh described *Brontosaurus* as being allied to *Atlantosaurus*, within the now defunct group *Atlantosauridae*.^{[3][39]} In 1878, Marsh raised his family to the rank of suborder, including *Apatosaurus*, *Brontosaurus*, *Atlantosaurus*, *Morosaurus* (=Camarasaurus), and *Diplodocus*. He classified this group within Sauropoda. In 1903, Elmer S. Riggs mentioned that the name Sauropoda would be a junior synonym of earlier names, and grouped *Apatosaurus* within *Opisthocoelia*.^[3] Most authors still use Sauropoda as the group name. ^[25]

Originally named by its discoverer Othniel Charles Marsh in 1879, *Brontosaurus* had long been considered a junior synonym of *Apatosaurus*; its type species, *Brontosaurus excelsus*, was reclassified as *A. excelsus* in 1903. However, an extensive study published in 2015 by a joint British-Portuguese research team concluded that *Brontosaurus* was a valid genus of sauropod distinct from *Apatosaurus*.^{[4][40][41]} Nevertheless, not all paleontologists agree with this division.^{[37][38]} The same study classified two additional species that had once been considered *Apatosaurus* and *Eobrontosaurus* as *Brontosaurus parvus* and *Brontosaurus yahnahpin* respectively.^[4] Cladogram of the *Diplodocidae* after Tschopp, Mateus, and Benson (2015):^[4]



Left front limb of *B. yahnahpin*, Morrison Natural History Museum



Species

- ***Brontosaurus excelsus***, the type species of *Brontosaurus*, was first named by Marsh in 1879. Many specimens, including the holotype specimen YPM 1980, have been assigned to the species. They include FMNH P25112, the skeleton mounted at the Field Museum of Natural History, which has since been found to represent an unknown species of apatosaurine. *Brontosaurus amplus*, occasionally assigned to *B. parvus*, is a junior synonym of *B. excelsus*. *B. excelsus* therefore only includes its type specimen and the type specimen of *B. amplus*.^{[4][25]} The largest of these specimens is estimated to have weighed up to 15 tonnes and measured up to 22 m (72 ft) long from head to tail.^[6] Both known definitive *B. excelsus* fossils have been reported from Reed's Quarry 10 of the Morrison Formation Brushy Basin member in Albany County, Wyoming, dated to the late Kimmeridgian age,^[4] about 152 million years ago.
- ***Brontosaurus parvus***, first described as *Elosaurus* in 1902 by Peterson and Gilmore, was reassigned to *Apatosaurus* in 1994, and to *Brontosaurus* in 2015. Specimens assigned to this species include the holotype, CM 566 (a partial skeleton of a juvenile found in Sheep Creek Quarry 4 in Albany County, WY), BYU 1252-18531 (a nearly complete skeleton found in Utah and mounted at Brigham Young University), and the partial skeleton UW 15556 (which had once been accidentally mixed together with the holotype). It dates to the middle Kimmeridgian.^[25] Adult specimens are estimated to have weighed up to 14 tonnes and measured up to 22 m (72 ft) long from head to tail.^[6]
- ***Brontosaurus yahnahpin*** is the oldest species, known from a single site from the lower Morrison Formation, Bertha Quarry, in Albany County, Wyoming, dating to about 155 million years ago.^{[5][42]} It grew up to 21 m (69 ft) long.^[43] The type species, *E. yahnahpin*, was described by James Filla and Patrick Redman in 1994 as a species of *Apatosaurus* (*A. yahnahpin*).^[44] The specific name is derived from Lakota *mah-koo yah-nah-pin*, "breast necklace", a reference to the pairs of sternal ribs that resemble the hair pipes traditionally worn by the tribe. The holotype specimen is TATE-001, a relatively complete postcranial skeleton found in Wyoming, in the lower Morrison Formation. More fragmentary remains have also been referred to the species. A re-evaluation by Robert T. Bakker in 1998 found it to be more primitive, so Bakker coined the new generic name *Eobrontosaurus*, derived from Greek *eos*, "dawn", and *Brontosaurus*.^[45]

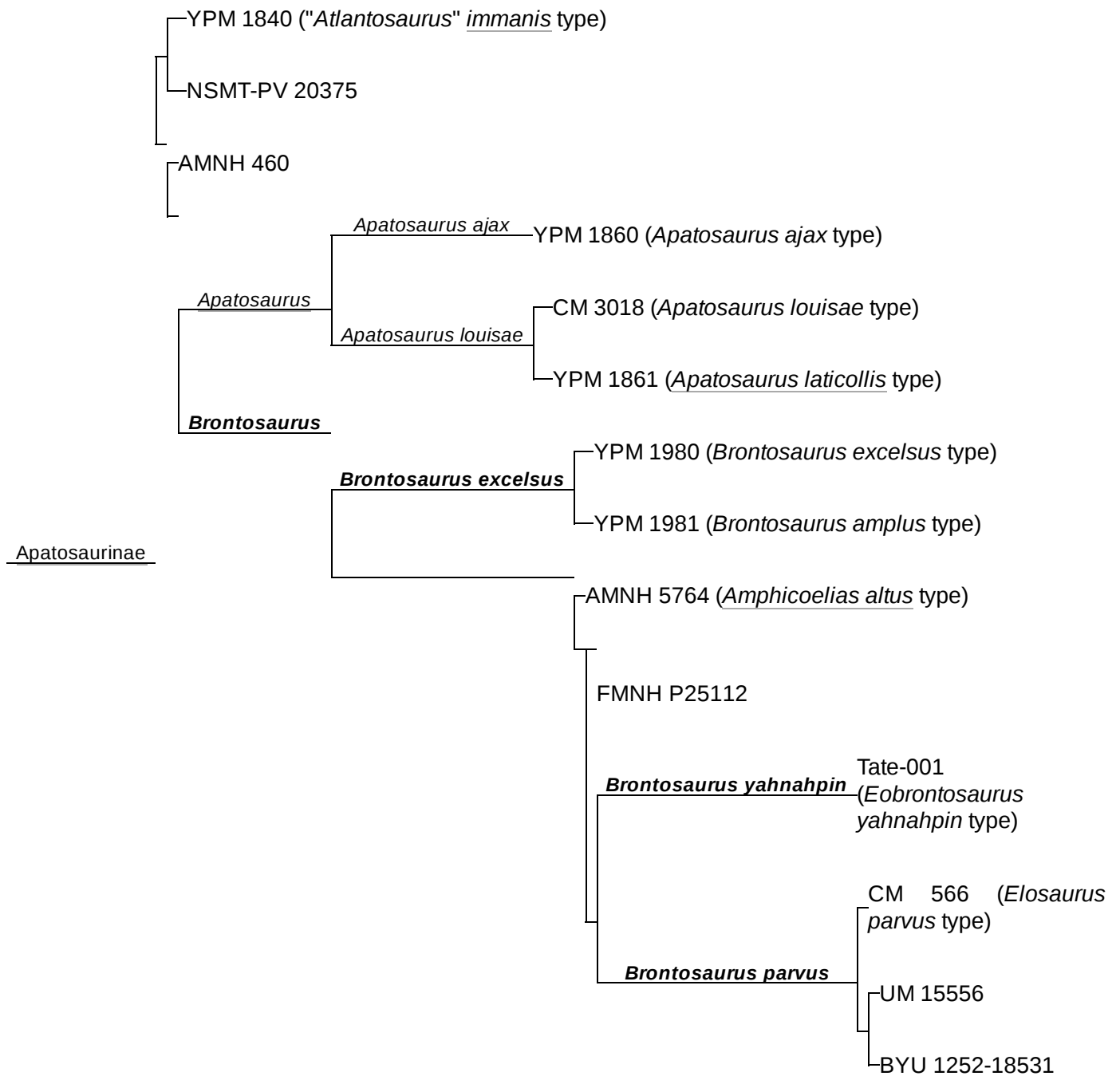


Mounted cast skeleton of *B. parvus* (UW 15556)

The cladogram below is the result of an analysis by Tschopp, Mateus, and Benson (2015). The authors analyzed most diplodocid type specimens separately to deduce which specimen belonged to which species and genus.^[4]



Tail vertebra of *B. excelsus*
specimen YPM 1980



Posture and locomotion



Cast of *B. parvus* specimen UWGM 15556 at [Tellus Science Museum](#)

Historically, sauropods like *Brontosaurus* were believed to be too massive to support their own weight on dry land, so theoretically they must have lived partly submerged in water, perhaps in swamps. Recent findings do not support this, and sauropods are thought to have been fully terrestrial animals.^[46]

Diplodocids like *Brontosaurus* are often portrayed with their necks held high up in the air, allowing them to browse on tall trees. Though some studies have suggested that diplodocid necks were less flexible than previously believed,^[47] other studies have found that all tetrapods appear to hold their necks at the

maximum possible vertical extension when in a normal, alert posture, and argue that the same would hold true for sauropods barring any unknown, unique characteristics that set the soft tissue anatomy of their necks apart from that of other animals.^[48]

Trackways of sauropods like *Brontosaurus* show that the average range for them was around 20–40 km (10–25 mi) per day, and they could potentially reach a top speed of 20–30 km/h (12–19 mph).^[7] The slow locomotion of sauropods may be due to the minimal muscling or recoil after strides.^[49]

Various uses have been proposed for the single claw on the forelimb of sauropods. They were suggested to have been for defence, but the shape and size of them makes this unlikely. Other predictions were that it could be for feeding, but the most probable is that the claw was for grasping objects like tree trunks when rearing.^[11]

Physiology

James Spotila *et al.* (1991) suggest that the large body size of *Brontosaurus* and other sauropods would have made them unable to maintain high metabolic rates, as they would not be able to release enough heat. However, temperatures in the Jurassic were 3 degrees Celsius higher than present.^[50] They assumed that the animals had a reptilian respiratory system. Wedel found that an avian system would have allowed them to dump more heat.^[51] Some scientists have argued that the heart would have had trouble sustaining sufficient blood pressure to oxygenate the brain.^[46]

Juveniles

Juvenile *Brontosaurus* material is known based on the type specimen of *B. parvus*. The material of this specimen, CM 566, includes vertebrae from various regions, one pelvic bone, and some bones of the hindlimb.^[25]



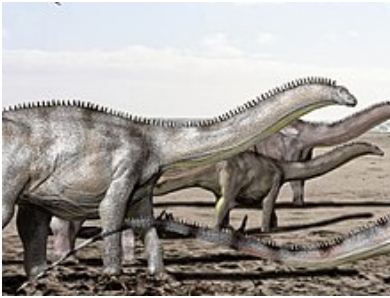
Reconstructed skeleton of a juvenile *B. parvus* (type specimen CM 566), [Carnegie Museum of Natural History](#)

Tail

An article that appeared in the November 1997 issue of *Discover Magazine* reported research into the mechanics of diplodocid tails by [Nathan Myhrvold](#), a computer scientist from Microsoft. Myhrvold carried out a computer simulation of the tail, which in diplodocids like *Brontosaurus* was a very long, tapering structure resembling a bullwhip. This computer modeling suggested that sauropods were capable of producing a whip-like cracking sound of over 200 decibels, comparable to the volume of a cannon.^[52] There is some circumstantial evidence supporting this as well: a number of diplodocids have been found with fused or damaged tail vertebrae, which may be a symptom of cracking their tails: these are particularly common between the 18th and the 25th caudal vertebra, a region the authors consider a transitional zone between the stiff muscular base and the flexible whiplike section.^[53] However, Rega (2012) notes that *Camarasaurus*, while lacking a tailwhip, displays a similar level of caudal co-ossification, and that *Mamenchisaurus*, while having the same pattern of vertebral metrics, lacks a tailwhip and doesn't display fusion in any "transitional region". Also, the crush fractures which would be expected if the tail was used as a whip have never been found in diplodocids.^[54] More recently, Baron (2020) considers the use of the tail as a bullwhip unlikely because of the potentially catastrophic muscle and skeletal damage such speeds could cause on the large and heavy tail. Instead, he proposes that the tails might have been used as a tactile organ to keep in touch with the individuals

behind and on the sides in a group while migrating, which could have augmented cohesion and allowed communication among individuals while limiting more energetically demanding activities like stopping to search for dispersed individuals, turning to visually check on individuals behind, or communicating vocally.^[55]

Paleoecology



Restoration of a *B. excelsus* group

The Morrison Formation is a sequence of shallow marine and alluvial sediments which, according to radiometric dating, ranges between 156.3 million years old (Mya) at its base,^[56] and 146.8 Mya at the top,^[57] which places it in the late Oxfordian, Kimmeridgian, and early Tithonian stages of the Late Jurassic period. This formation is interpreted as a semiarid environment with distinct wet and dry seasons. The Morrison Basin, where dinosaurs lived, stretched from New Mexico to Alberta and Saskatchewan, and was formed when the precursors to the Front Range of the Rocky Mountains started pushing up to the west. The deposits from their east-facing drainage basins were carried by streams and rivers and deposited in swampy lowlands, lakes, river channels, and floodplains.^[58] This formation is similar in age to the Lourinha Formation in Portugal and the Tendaguru Formation in Tanzania.^[59]

Brontosaurus may have been a more solitary animal than other Morrison Formation dinosaurs.^[60] As a genus, *Brontosaurus* existed for a long span of time, and have been found in most levels of the Morrison. *B. excelsus* fossils have been reported from the upper Salt Wash Member to the upper Brushy Basin Member, ranging from the middle to late Kimmeridgian age, about 154–151 Mya. Additional remains are known from even younger rocks, but they have not been identified as any particular species.^[42] Older *Brontosaurus* remains have also been identified from the middle Kimmeridgian, and are assigned to *B. parvus*.^[25] Fossils of these animals have been found in Nine Mile Quarry and Bone Cabin Quarry in Wyoming and at sites in Colorado, Oklahoma, and Utah, present in stratigraphic zones 2–6.^[61]

The Morrison Formation records an environment and time dominated by gigantic sauropod dinosaurs.^[61] Dinosaurs known from the Morrison include the theropods *Ceratosaurus*, *Ornitholestes*, and *Allosaurus*, the sauropods *Apatosaurus*, *Brachiosaurus*, *Camarasaurus*, and *Diplodocus*, and the ornithischians *Camptosaurus*, *Dryosaurus*, and *Stegosaurus*.^[62] Other vertebrates that shared this paleoenvironment included ray-finned fishes, frogs, salamanders, turtles, sphenodonts, lizards, terrestrial and aquatic crocodylomorphans, and several species of pterosaurs. Shells of bivalves and aquatic snails are also common. The flora of the period has been revealed by fossils of green algae, fungi, mosses, horsetails, cycads, ginkgoes, and several families of conifers. Vegetation varied from river-lining forests of tree ferns, and ferns (gallery forests), to fern savannas with occasional trees such as the *Araucaria*-like conifer *Brachyphyllum*.^[63]

In popular culture

The length of time taken for Riggs's 1903 reclassification of *Brontosaurus* as *Apatosaurus* to be brought to public notice, as well as Osborn's insistence that the *Brontosaurus* name be retained despite Riggs's paper, meant that the *Brontosaurus* became one of the most famous dinosaurs. *Brontosaurus* has often been depicted in cinema, beginning with Winsor McCay's 1914 classic *Gertie the Dinosaur*, one of the first animated films.^[64] McCay based his unidentified dinosaur on the apatosaurine skeleton in the American Museum of Natural History.^[65] The 1925 silent film *The Lost World* featured a battle between a *Brontosaurus* and an *Allosaurus*, using special effects by Willis O'Brien.^[66] The 1933 film *King Kong* featured a *Brontosaurus* chasing Carl Denham, Jack Driscoll and the terrified sailors on Skull Island. These, and other early uses of the animal as major representative of the group, helped cement *Brontosaurus* as a quintessential dinosaur in the public consciousness.^[67]



Outdated 1897 restoration by Charles R. Knight of *B. excelsus* submerged in water, and *Diplodocus* dragging its tail

Sinclair Oil Corporation has long been a fixture of American roads (and briefly in other countries) with its green dinosaur logo and mascot, a *Brontosaurus*. While Sinclair's early advertising included a number of different dinosaurs, eventually only *Brontosaurus* was used as the official logo, due to its popular appeal.^[68]



Gertie the Dinosaur (1914)

As late as 1989, the U.S. Postal Service caused controversy when it issued four "dinosaur" stamps: *Tyrannosaurus*, *Stegosaurus*, *Pteranodon*, and *Brontosaurus*. The use of the term *Brontosaurus* in place of *Apatosaurus* led to complaints of "fostering scientific illiteracy."^[69] The Postal Service defended itself (in Postal Bulletin 21744) by saying, "Although now recognized by the scientific community as *Apatosaurus*, the name *Brontosaurus* was used for the stamp because it is more familiar to the general population." Indeed, the Postal Service even implicitly rebuked the somewhat inconsistent complaints by adding that "[s]imilarly, the term 'dinosaur' has been used generically to describe all the animals [i.e., all four of the animals represented in the given stamp set], even though the *Pteranodon* was a flying reptile [rather than a true 'dinosaur']," a

distinction left unmentioned in the numerous correspondence regarding the *Brontosaurus/Apatosaurus* issue. Palaeontologist Stephen Jay Gould supported this position. In the essay from which the title of the collection *Bully for Brontosaurus* is taken, Gould wrote: "Touché and right on; no one bitched about *Pteranodon*, and that's a real error."^[67] His position, however, was not one suggesting the exclusive use of the popular name; he echoed Riggs' original argument that *Brontosaurus* is a synonym for *Apatosaurus*. Nevertheless, he noted that the former has developed and continues to maintain an independent existence in the popular imagination.^[67]

The more vociferous denunciations of the usage have elicited sharply defensive statements from those who would not wish to see the name be struck from official usage.^[67] Tschopp's study^[4] has generated a very high number of responses from many, often opposed, groups – of editorial,^[70] news staff,^{[40][71]} and personal blog nature (both related^{[72][73]} and not^[74]), from both^[75] sides of the debate, from related^[26] and unrelated contexts, and from all over the world.^[76]

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External links

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- Is Brontosaurus Back? (Youtube video, 11 minutes, 2015) (<https://www.youtube.com/watch?v=QiliCc-wvj8>)
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