Albert Einstein

Albert Einstein (/ˈaɪnstaɪn/ *EYEN-styne*;[5] German: [ˈalbɛɐt ˈʔaɪnʃtaɪn] ; 14 March 1879 – 18 April 1955) was a German-born theoretical physicist who is widely held as one of the most influential scientists. Best known for developing the theory of relativity, Einstein also made important contributions to quantum mechanics.[1][6] His mass–energy equivalence formula $E = mc^2$, which arises from special relativity, has been called "the world's most famous equation".[7] He received the 1921 Nobel Prize in Physics "for his services to theoretical physics, and especially for his discovery of the law of the photoelectric effect",[8] a pivotal step in the development of quantum theory.

Born in the German Empire, Einstein moved to Switzerland in 1895, forsaking his German citizenship (as a subject of the Kingdom of Württemberg)[note 1] the following year. In 1897, at the age of seventeen, he enrolled in the mathematics and physics teaching diploma program at the Swiss federal polytechnic school in Zürich, graduating in 1900. In 1901, he acquired Swiss citizenship, which he kept for the rest of his life. In 1903, he secured a permanent position at the Swiss Patent Office in Bern. In 1905, he submitted a successful PhD dissertation to the University of Zurich. In 1914, he moved to Berlin in order to join the Prussian Academy of Sciences and the Humboldt University of Berlin. In 1917, he became director of the Kaiser Wilhelm Institute for Physics; he also became a German citizen again, this time as a subject of the

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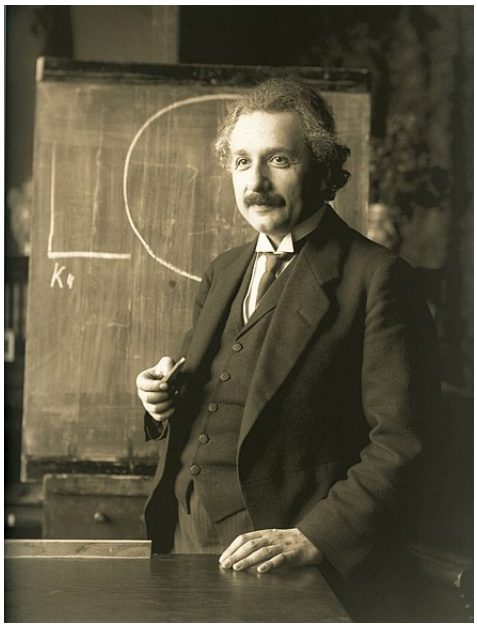


Einstein in 1921

Born	14 March 1879 Ulm, Kingdom of Württemberg, German Empire
Died	18 April 1955 (aged 76) Princeton, New Jersey, US
Citizenship	Kingdom of Württemberg, part of the German Empire (until 1896)[note 1] Stateless (1896–1901) Switzerland (1901–1955) Austria, part of the Austro-Hungarian Empire (1911–1912)

Kingdom of Prussia.[note 1] In 1933, while Einstein was visiting the United States, Adolf Hitler came to power in Germany. Horrified by the Nazi war of extermination against his fellow Jews,[9] Einstein decided to remain in the US, and was granted American citizenship in 1940.[10] On the eve of World War II, he endorsed a letter to President Franklin D. Roosevelt alerting him to the potential German nuclear weapons program and recommended that the US begin similar research. Einstein supported the Allies but generally viewed the idea of nuclear weapons with great dismay.[11]

Einstein's work is also known for its influence on the philosophy of science.[12][13] In 1905, he published four groundbreaking papers, sometimes described as his *annus mirabilis* (miracle year).[14] These papers outlined a theory of the photoelectric effect, explained Brownian motion, introduced his special theory of relativity—a theory which addressed the inability of classical mechanics to account satisfactorily for the behavior of the electromagnetic field—and demonstrated that if the special theory is correct, mass and energy are equivalent to each other. In 1915, he proposed a general theory of relativity that extended his system of mechanics to incorporate gravitation. A cosmological paper that he published the following year laid out the implications of general relativity for the modeling of the structure and evolution of the universe as a whole.[15][16]

In the middle part of his career, Einstein made important contributions to statistical mechanics and quantum theory. Especially notable was his work on the quantum physics of radiation, in which light consists of particles, subsequently called photons. With the Indian physicist Satyendra Nath Bose, he laid the groundwork for Bose-Einstein statistics. For much of the last phase of his academic life, Einstein worked on two endeavors that proved ultimately

	Kingdom of Prussia, part of the German Empire (1914–1918)[note 1]
	Free State of Prussia (Weimar Republic, 1918–1933)[note 1]
	United States (1940–1955)
Education	Swiss federal polytechnic school in Zurich (Dipl., 1900) University of Zurich (PhD, 1905)
Known for	*See list*
	General relativity
	Special relativity
	Photoelectric effect
	$E=mc^2$ (mass–energy equivalence)
	$E=hf$ (Planck–Einstein relation)
	Theory of Brownian motion
	Einstein field equations
	Bose–Einstein statistics
	Bose–Einstein condensate
	Gravitational wave
	Cosmological constant
	Unified field theory
	EPR paradox
	Ensemble interpretation
	List of other concepts
Spouses	Mileva Marić (m. 1903; div. 1919)
	Elsa Löwenthal (m. 1919; died 1936)
Children	Lieserl · Hans Albert · Eduard "Tete"

unsuccessful. First, he advocated against quantum theory's introduction of fundamental randomness into science's picture of the world, objecting that "God does not play dice".[17] Second, he attempted to devise a unified field theory by generalizing his geometric theory of gravitation to include electromagnetism too. As a result, he became increasingly isolated from the mainstream modern physics. His intellectual achievements and originality made *Einstein* broadly synonymous with *genius*.[18] In 1999, he was named *Time*'s Person of the Century.[19] In a 1999 poll of 130 leading physicists worldwide by the British journal *Physics World*, Einstein was ranked the greatest physicist of all time.[20]

Life and career

Childhood, youth and education

Einstein in 1882, age 3

Albert Einstein was born in Ulm,[21] in the Kingdom of Württemberg in the German Empire, on 14 March 1879.[22][23] His parents, secular Ashkenazi Jews, were Hermann Einstein, a salesman and engineer, and Pauline Koch. In 1880, the family moved to Munich's borough of Ludwigsvorstadt-Isarvorstadt, where Einstein's father and his uncle Jakob founded Elektrotechnische Fabrik J. Einstein & Cie, a company that manufactured electrical equipment

Awards

- Barnard Medal for Meritorious Service to Science (1920)
- Nobel Prize in Physics (1921)
- Matteucci Medal (1921)
- ForMemRS (1921)[1]
- Copley Medal (1925)[1]
- Gold Medal of RAS (1926)[2]
- Max Planck Medal (1929)
- Membership of NAS (1942)[3]
- *Time* Person of the Century (1999)

Scientific career

Fields Physics

Institutions *See list*

- University of Bern (1908–1909)
- University of Zurich (1909–1911)
- Charles University in Prague (1911–1912)
- ETH Zurich (1912–1914)
- Prussian Academy of Sciences (1914–1933)
- Humboldt University of Berlin (1914–1933)
- Kaiser Wilhelm Institute (director, 1917–1933)
- German Physical Society (president, 1916–1918)
- Leiden University (visits, 1920)
- Institute for Advanced Study (1933–1955)
- California Institute of Technology (visits, 1931–

based on direct current.[21] He often related a formative event from his youth, when he was sick in bed and his father brought him a compass. This sparked his lifelong fascination with electromagnetism. He realized that "Something deeply hidden had to be behind things."[24]

Albert attended St. Peter's Catholic elementary school in Munich from the age of five. When he was eight, he was transferred to the Luitpold Gymnasium, where he received advanced primary and then secondary school education.[25]

In 1894, Hermann and Jakob's company tendered for a contract to install electric lighting in Munich, but without success—they lacked the capital that would have been required to update their technology from direct current to the more efficient, alternating current alternative.[26] The failure of their bid forced them to sell their Munich factory and search for new opportunities elsewhere. The Einstein family moved to Italy, first to Milan and a few months later to Pavia, where they settled in Palazzo Cornazzani.[27] Einstein, then fifteen, stayed behind in Munich in order to finish his schooling. His father wanted him to study electrical engineering, but he was a fractious pupil who found the Gymnasium's regimen and teaching methods far from congenial. He later wrote that the school's policy of strict rote learning was harmful to creativity. At the end of December 1894, a letter from a doctor persuaded the Luitpold's authorities to release him from its care, and he joined his family in Pavia.[28] While in Italy as a teenager, he wrote an essay entitled "On the Investigation of the State of the Ether in a Magnetic Field".[29][30]

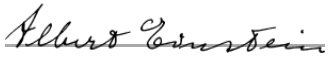
	1933) University of Oxford (visits, 1931–1933)[4] Brandeis University (director, 1946–1947)
Thesis	*Eine neue Bestimmung der Moleküldimensionen (A New Determination of Molecular Dimensions) (http://e-collection.library.ethz.ch/eserv/eth:30378/eth-30378-01.pdf)* (1905)
Doctoral advisor	Alfred Kleiner
Other academic advisors	Heinrich Friedrich Weber

Albert Einstein's voice

1:31

Opening of Einstein's speech (11 April 1943) for the United Jewish Appeal (recording by Radio Universidad Nacional de La Plata, Argentina

Signature



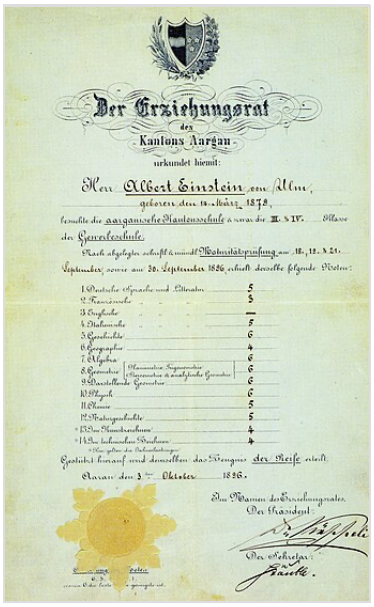
Einstein excelled at physics and mathematics from an early age, and soon acquired the mathematical expertise normally only found in a child several years his senior. He began teaching himself algebra, calculus and Euclidean geometry when he was twelve; he made such rapid progress that he discovered an original proof of the Pythagorean theorem before his thirteenth birthday.[31][32][33] A family tutor, Max Talmud, said that only a short time after he had given the twelve year old Einstein a geometry textbook, the boy "had worked through the whole book. He thereupon devoted himself to higher mathematics ... Soon the flight of his mathematical genius

was so high I could not follow."[34] Einstein recorded that he had "mastered integral and differential calculus" while still just fourteen.[32] His love of algebra and geometry was so great that at twelve, he was already confident that nature could be understood as a "mathematical structure".[34]


Einstein in 1893, age 14

At thirteen, when his range of enthusiasms had broadened to include music and philosophy,[35] Talmud introduced Einstein to Kant's *Critique of Pure Reason*. Kant became his favorite philosopher; according to Talmud, "At the time he was still a child, only thirteen years old, yet Kant's works, incomprehensible to ordinary mortals, seemed to be clear to him."[34]

In 1895, at the age of sixteen, Einstein sat the entrance examination for the federal polytechnic school (later the Eidgenössische Technische Hochschule, ETH) in Zürich, Switzerland. He failed to reach the required standard in the general part of the test,[36] but performed with distinction in physics and mathematics.[37] On the advice of the polytechnic's principal, he completed his secondary education at the Argovian cantonal school (a *gymnasium*) in Aarau, Switzerland, graduating in 1896.[38] While lodging in Aarau with the family of Jost Winteler, he fell in love with Winteler's daughter, Marie. (His sister, Maja, later married Winteler's son Paul.[39])


Einstein's *Matura* certificate, 1896[note 2]

In January 1896, with his father's approval, Einstein renounced his citizenship of the German Kingdom of Württemberg in order to avoid conscription into military service.[40] The *Matura* (graduation for the successful completion of higher secondary schooling), awarded to him in September 1896, acknowledged him to have performed well across most of the curriculum, allotting him a top grade of 6 for history, physics, algebra, geometry, and descriptive geometry.[41] At seventeen, he enrolled in the four-year mathematics and physics teaching diploma program at the federal polytechnic school. Marie Winteler, a year older than him, took up a teaching post in Olsberg, Switzerland.[39]

The five other polytechnic school freshmen following the same course as Einstein included just one woman, a twenty year old Serbian, Mileva Marić. Over the next few years, the pair spent many hours discussing their shared interests and learning about topics in physics that the polytechnic

school's lectures did not cover. In his letters to Marić, Einstein confessed that exploring science with her by his side was much more enjoyable than reading a textbook in solitude. Eventually the two students became not only friends but also lovers.[42]

Historians of physics are divided on the question of the extent to which Marić contributed to the insights of Einstein's *annus mirabilis* publications. There is at least some evidence that he was influenced by her scientific ideas,[42][43][44] but there are scholars who doubt whether her impact on his thought was of any great significance at all.[45][46][47][48]

Marriages, relationships and children

Correspondence between Einstein and Marić, discovered and published in 1987, revealed that in early 1902, while Marić was visiting her parents in Novi Sad, she gave birth to a daughter, Lieserl. When Marić returned to Switzerland it was without the child, whose fate is uncertain. A letter of Einstein's that he wrote in September 1903 suggests that the girl was either given up for adoption or died of scarlet fever in infancy.[49][50]

Albert Einstein and Mileva Marić Einstein, 1912

Einstein and Marić married in January 1903. In May 1904, their son Hans Albert was born in Bern, Switzerland. Their son Eduard was born in Zürich in July 1910. In letters that Einstein wrote to Marie Winteler in the months before Eduard's arrival, he described his love for his wife as "misguided" and mourned the "missed life" that he imagined he would have enjoyed if he had married Winteler instead: "I think of you in heartfelt love every spare minute and am so unhappy as only a man can be."[51]

Albert Einstein and Elsa Einstein, 1930

In 1912, Einstein entered into a relationship with Elsa Löwenthal, who was both his first cousin on his mother's side and his second cousin on his father's.[52][53][54] When Marić learned of his infidelity soon after moving to Berlin with him in April 1914, she returned to Zürich, taking Hans Albert and Eduard with her.[42] Einstein and Marić were granted a divorce on 14 February 1919 on the grounds of having lived apart for five years.[55][56] As part of the divorce settlement, Einstein agreed that if he were to win a Nobel Prize, he would give the money that he received to Marić; he won the prize two years later.[57]

Einstein married Löwenthal in 1919.[58][59] In 1923, he began a relationship with a secretary named Betty Neumann, the niece of his close friend Hans Mühsam.[60][61][62][63] Löwenthal nevertheless remained loyal to him, accompanying him when he emigrated to the United States in 1933. In 1935, she was diagnosed with heart and kidney problems. She died in December 1936.[64]

A volume of Einstein's letters released by Hebrew University of Jerusalem in 2006[65] added further names to the catalog of women with whom he was romantically involved. They included Margarete Lebach (a married Austrian),[66] Estella Katzenellenbogen (the rich owner of a florist business), Toni Mendel (a wealthy Jewish widow) and Ethel Michanowski (a Berlin socialite), with whom he spent time and from whom he accepted gifts while married to Löwenthal.[67][68] After being widowed, Einstein was briefly in a relationship with Margarita Konenkova, thought by some to be a Russian spy; her husband, the Russian sculptor Sergei Konenkov, created the bronze bust of Einstein at the Institute for Advanced Study at Princeton.[69][70]

Following an episode of acute mental illness at about the age of twenty, Einstein's son Eduard was diagnosed with schizophrenia.[71] He spent the remainder of his life either in the care of his mother or in temporary confinement in an asylum. After her death, he was committed permanently to Burghölzli, the Psychiatric University Hospital in Zürich.[72]

1902–1909: Assistant at the Swiss Patent Office

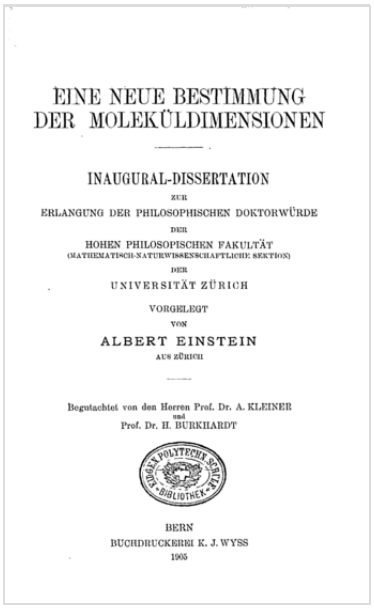
Einstein graduated from the federal polytechnic school in 1900, duly certified as competent to teach mathematics and physics.[73] His successful acquisition of Swiss citizenship in February 1901[74] was not followed by the usual sequel of conscription; the Swiss authorities deemed him medically unfit for military service. He found that Swiss schools too appeared to have no use for him, failing to offer him a teaching position despite the almost two years that he spent applying for one. Eventually it was with the help of Marcel Grossmann's father that he secured a post in Bern at the Swiss Patent Office,[75][76] as an assistant examiner – level III.[77][78]

Patent applications that landed on Einstein's desk for his evaluation included ideas for a gravel sorter and an electric typewriter.[78] His employers were pleased enough with his work to make his position permanent in 1903, although they did not think that he should be promoted until he had "fully mastered machine technology".[79] It is conceivable that his labors at the patent office had a bearing on his development of his special theory of relativity. He arrived at his revolutionary ideas about space, time and light through thought experiments about the transmission of signals and the synchronization of clocks, matters which also figured in some of the inventions submitted to him for assessment.[14]

In 1902, Einstein and some friends whom he had met in Bern formed a group that held regular meetings to discuss science and philosophy. Their choice of a name for their club, the Olympia Academy, was an ironic comment upon its far from Olympian status. Sometimes they were joined by Marić, who limited her participation in their proceedings to careful listening.[80] The thinkers whose works they reflected upon included Henri Poincaré, Ernst Mach and David Hume, all of whom significantly influenced Einstein's own subsequent ideas and beliefs.[81]

1900–1905: First scientific papers

Einstein's first paper, "Folgerungen aus den Capillaritätserscheinungen" ("Conclusions drawn from the phenomena of capillarity"), in which he proposed a model of intermolecular attraction that he afterwards disavowed as worthless, was published in the journal *Annalen der Physik* in 1901.[82][83] His 24-page doctoral dissertation also addressed a topic in molecular physics. Titled "Eine neue Bestimmung der Moleküldimensionen" ("A New Determination of Molecular Dimensions") and dedicated to his friend Marcel Grossman, it was completed on 30 April 1905[84] and approved by Professor Alfred Kleiner of the University of Zurich three months later. (Einstein was formally awarded his PhD on 15 January 1906.)[84][85][86] Four other pieces of work that Einstein completed in 1905—his famous papers on the photoelectric effect, Brownian motion, his special theory of relativity and the equivalence of mass and energy—have led to the year being celebrated as an *annus mirabilis* for physics akin to 1666 (the year in which Isaac Newton experienced his greatest epiphanies). The publications deeply impressed Einstein's contemporaries.[87]


EINE NEUE BESTIMMUNG
DER MOLEKÜLDIMENSIONEN

INAUGURAL-DISSERTATION
ZUR
ERLANGUNG DER PHILOSOPHISCHEN DOKTORWÜRDE
DER
HOHEN PHILOSOPISCHEN FAKULTÄT
(MATHEMATISCH-NATURWISSENSCHAFTLICHE SEKTION)
DER
UNIVERSITÄT ZÜRICH
VORGELEGT
VON
ALBERT EINSTEIN
AUS ZÜRICH

Begutachtet von den Herren Prof. Dr. A. KLEINER
und
Prof. Dr. H. BURKHARDT

BERN
BUCHDRUCKEREI K. J. WYSS
1905

Einstein's 1905 dissertation, *Eine neue Bestimmung der Moleküldimensione* ("A new determination of molecular dimensions")

1908–1933: Early academic career

Einstein's sabbatical as a civil servant approached its end in 1908, when he secured a junior teaching position at the University of Bern. In 1909, a lecture on relativistic electrodynamics that he gave at the University of Zurich, much admired by Alfred Kleiner, led to Zürich's luring him away from Bern with a newly created associate professorship.[88] Promotion to a full professorship followed in April 1911, when he accepted a chair at the German Charles-Ferdinand University in Prague, a move which required him to become an Austrian citizen of the Austro-Hungarian Empire.[89][90] His time in Prague saw him producing eleven research papers.[91]

In July 1912, he returned to his *alma mater*, the ETH Zurich, to take up a chair in theoretical physics. His teaching activities there centred on thermodynamics and analytical mechanics, and his research interests included the molecular theory of heat, continuum mechanics and the development of a relativistic theory of gravitation. In his work on the latter topic, he was assisted by his friend, Marcel Grossmann, whose knowledge of the kind of mathematics required was greater than his own.[92]

Einstein in 1904, age 25

In the spring of 1913, two German visitors, Max Planck and Walther Nernst, called upon Einstein in Zürich in the hope of persuading him to relocate to Berlin.[93] They offered him membership of the Prussian Academy of Sciences, the directorship of the planned Kaiser Wilhelm Institute for Physics and a chair at the Humboldt University of Berlin that would allow him to pursue his research supported by a professorial salary but with no teaching duties to burden him.[53] Their invitation was all the more appealing to him because Berlin happened to be the home of his latest girlfriend, Elsa Löwenthal.[93] He duly joined the Academy on 24 July 1913,[94] and moved into an apartment in the Berlin district of Dahlem on 1 April 1914.[53] He was installed in his Humboldt University position shortly thereafter.[94]

The outbreak of the First World War in July 1914 marked the beginning of Einstein's gradual estrangement from the nation of his birth. When the "Manifesto of the Ninety-Three" was published in October 1914—a document signed by a host of prominent German thinkers that justified Germany's belligerence—Einstein was one of the few German intellectuals to distance himself from it and sign the alternative, eirenic "Manifesto to the Europeans" instead.[95][96] However, this expression of his doubts about German policy did not prevent him from being elected to a two-year term as president of the German Physical Society in 1916.[97] When the Kaiser Wilhelm Institute for Physics opened its doors the following year—its foundation delayed because of the war—Einstein was appointed its first director, just as Planck and Nernst had

Olympia Academy founders: Conrad Habicht, Maurice Solovine, and Einstein

promised.[98]

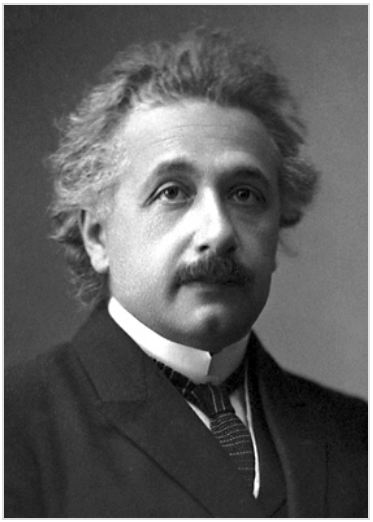
Einstein was elected a Foreign Member of the Royal Netherlands Academy of Arts and Sciences in 1920,[99] and a Foreign Member of the Royal Society in 1921. In 1922, he was awarded the 1921 Nobel Prize in Physics "for his services to Theoretical Physics, and especially for his discovery of the law of the photoelectric effect".[8] At this point some physicists still regarded the general theory of relativity skeptically, and the Nobel citation displayed a degree of doubt even about the work on photoelectricity that it acknowledged: it did not assent to Einstein's notion of the particulate nature of light, which only won over the entire scientific community when S. N. Bose derived the Planck spectrum in 1924. That same year, Einstein was elected an International Honorary Member of the American Academy of Arts and Sciences.[100] Britain's closest equivalent of the Nobel award, the Royal Society's Copley Medal, was not hung around Einstein's neck until 1925.[1] He was elected an International Member of the American Philosophical Society in 1930.[101]

Einstein resigned from the Prussian Academy in March 1933. His accomplishments in Berlin had included the completion of the general theory of relativity, proving the Einstein–de Haas effect, contributing to the quantum theory of radiation, and the development of Bose–Einstein statistics.[53]

1919: Putting general relativity to the test

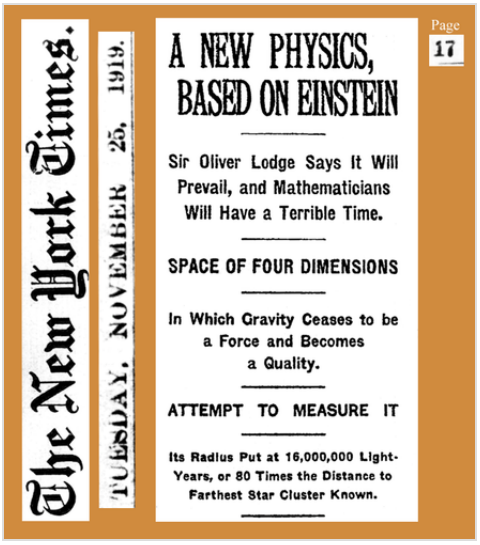
In 1907, Einstein reached a milestone on his long journey from his special theory of relativity to a new idea of gravitation with the formulation of his equivalence principle, which asserts that an observer in an infinitesimally small box falling freely in a gravitational field would be unable to find any evidence that the field exists. In 1911, he used the principle to estimate the amount by which a ray of light from a distant star would be bent by the gravitational pull of the Sun as it passed close to the Sun's photosphere (that is, the Sun's apparent surface). He reworked his calculation in 1913, having now found a way to model gravitation with the Riemann curvature tensor of a non-Euclidean four-dimensional spacetime. By the fall of 1915, his reimagining of the mathematics of gravitation in terms of Riemannian geometry was complete, and he applied his new theory not just to the behavior of the Sun as a gravitational lens but also to another astronomical phenomenon, the precession of the perihelion of Mercury (a slow drift in the point in Mercury's elliptical orbit at which it approaches the Sun most closely).[53][103] A total eclipse of the Sun that took place on 29 May 1919 provided an opportunity to put his theory of gravitational lensing to the test, and observations performed by Sir Arthur Eddington yielded results that were consistent with his calculations. Eddington's work was reported at length in newspapers around the world. On 7 November 1919, for example, the leading British newspaper, *The Times*, printed a banner headline that read: "Revolution in Science – New Theory of the Universe – Newtonian Ideas Overthrown".[104]

1921–1923: Coming to terms with fame



Einstein's official portrait after receiving the 1921 Nobel Prize for Physics

With Eddington's eclipse observations widely reported not just in academic journals but by the popular press as well, Einstein became "perhaps the world's first celebrity scientist", a genius who had shattered a paradigm that had been basic to physicists' understanding of the universe since the seventeenth century.[105]



The New York Times. TUESDAY, NOVEMBER 25, 1919. Page 17

A NEW PHYSICS, BASED ON EINSTEIN

Sir Oliver Lodge Says It Will Prevail, and Mathematicians Will Have a Terrible Time.

SPACE OF FOUR DIMENSIONS

In Which Gravity Ceases to be a Force and Becomes a Quality.

ATTEMPT TO MEASURE IT

Its Radius Put at 16,000,000 Light-Years, or 80 Times the Distance to Farthest Star Cluster Known.

The New York Times reported confirmation of the bending of light by gravitation after observations (made in Príncipe and Sobral) of the 29 May 1919 eclipse were presented to a joint meeting in London of the Royal Society and the Royal Astronomical Society on 6 November 1919.[102]

Einstein began his new life as an intellectual icon in America, where he arrived on 2 April 1921. He was welcomed to New York City by Mayor John Francis Hylan, and then spent three weeks giving lectures and attending receptions.[106] He spoke several times at Columbia University and Princeton, and in Washington, he visited the White House with representatives of the National Academy of Sciences. He returned to Europe via London, where he was the guest of the philosopher and statesman Viscount Haldane. He used his time in the British capital to meet several people prominent in British scientific, political or intellectual life, and to deliver a lecture at King's College.[107][108] In July 1921, he published an essay, "My First Impression of the U.S.A.", in which he sought to sketch the American character, much as had Alexis de Tocqueville in *Democracy in America* (1835).[109] He wrote of his transatlantic hosts in highly approving terms: "What strikes a visitor is the joyous, positive attitude to life ... The American is friendly, self-confident, optimistic, and without envy."[110]

In 1922, Einstein's travels were to the old world rather than the new. He devoted six months to a tour of Asia that saw him speaking in Japan, Singapore and Sri Lanka (then known as Ceylon). After his first public lecture in Tokyo, he met Emperor Yoshihito and his wife at the Imperial Palace, with thousands of spectators thronging the streets in the hope of catching a glimpse of him. (In a letter to his sons, he wrote that Japanese people seemed to him to be generally modest, intelligent and considerate, and to have a true appreciation of art.[111] But his picture of them in his diary was less flattering: "[the] intellectual needs of this nation seem to be weaker than their artistic ones – natural disposition?" His journal also contains views of China and India which were uncomplimentary. Of Chinese people, he wrote that "even the children are spiritless and look obtuse... It would be a pity if these Chinese supplant all other races. For the likes of us the mere

thought is unspeakably dreary".[112][113]) He was greeted with even greater enthusiasm on the last leg of his tour, in which he spent twelve days in Mandatory Palestine, newly entrusted to British rule by the League of Nations in the aftermath of the First World War. Sir Herbert Samuel, the British High Commissioner, welcomed him with a degree of ceremony normally only accorded to a visiting head of state, including a cannon salute. One reception held in his honor was stormed by people determined to hear him speak: he told them that he was happy that Jews were beginning to be recognized as a force in the world.[114]

Einstein's decision to tour the eastern hemisphere in 1922 meant that he was unable to go to Stockholm in the December of that year to participate in the Nobel prize ceremony. His place at the traditional Nobel banquet was taken by a German diplomat, who gave a speech praising him not only as a physicist but also as a campaigner for peace.[115] A two-week visit to Spain that he undertook in 1923 saw him collecting another award, a membership of the Spanish Academy of Sciences signified by a diploma handed to him by King Alfonso XIII. (His Spanish trip also gave him a chance to meet a fellow Nobel laureate, the neuroanatomist Santiago Ramón y Cajal.)[116]

1922–1932: Serving the League of Nations

Einstein at a session of the International Committee on Intellectual Cooperation (League of Nations) of which he was a member from 1922 to 1932

From 1922 until 1932, with the exception of a few months in 1923 and 1924, Einstein was a member of the Geneva-based International Committee on Intellectual Cooperation of the League of Nations, a group set up by the League to encourage scientists, artists, scholars, teachers and other people engaged in the life of the mind to work more closely with their counterparts in other countries.[117][118] He was appointed as a German delegate rather than as a representative of Switzerland because of the machinations of two Catholic activists, Oskar Halecki and Giuseppe Motta. By persuading Secretary General Eric Drummond to deny Einstein the place on the committee reserved for a Swiss thinker, they created an opening for Gonzague de Reynold, who used his League of Nations position as a platform from which to promote traditional Catholic doctrine.[119] Einstein's former physics professor Hendrik Lorentz and the Polish chemist Marie Curie were also members of the committee.[120]

1925: Touring South America

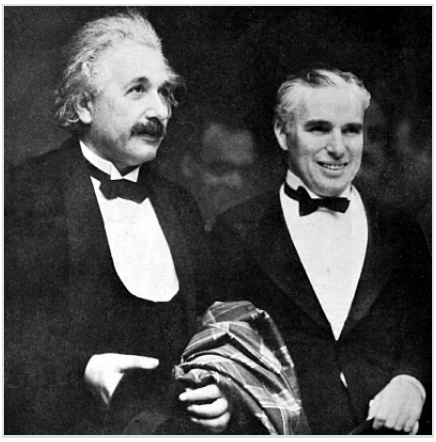
In March and April 1925, Einstein and his wife visited South America, where they spent about a week in Brazil, a week in Uruguay and a month in Argentina.[121] Their tour was suggested by Jorge Duclout (1856–1927) and Mauricio Nirenstein (1877–1935)[122] with the support of several

Argentine scholars, including Julio Rey Pastor, Jakob Laub, and Leopoldo Lugones. and was financed primarily by the Council of the University of Buenos Aires and the *Asociación Hebraica Argentina* (Argentine Hebraic Association) with a smaller contribution from the Argentine-Germanic Cultural Institution.[123]

1930–1931: Touring the US

In December 1930, Einstein began another significant sojourn in the United States, drawn back to the US by the offer of a two month research fellowship at the California Institute of Technology. Caltech supported him in his wish that he should not be exposed to quite as much attention from the media as he had experienced when visiting the US in 1921, and he therefore declined all the invitations to receive prizes or make speeches that his admirers poured down upon him. But he remained willing to allow his fans at least some of the time with him that they requested.[124]

After arriving in New York City, Einstein was taken to various places and events, including Chinatown, a lunch with the editors of *The New York Times*, and a performance of *Carmen* at the Metropolitan Opera, where he was cheered by the audience on his arrival. During the days following, he was given the keys to the city by Mayor Jimmy Walker and met Nicholas Murray Butler, the president of Columbia University, who described Einstein as "the ruling monarch of the mind".[125] Harry Emerson Fosdick, pastor at New York's Riverside Church, gave Einstein a tour of the church and showed him a full-size statue that the church made of Einstein, standing at the entrance.[125] Also during his stay in New York, he joined a crowd of 15,000 people at Madison Square Garden during a Hanukkah celebration.[125]



Einstein with Charlie Chaplin at the Hollywood premiere of Chaplin's *City Lights*, January 1931

Einstein next traveled to California, where he met Caltech president and Nobel laureate Robert A. Millikan. His friendship with Millikan was "awkward", as Millikan "had a penchant for patriotic militarism", where Einstein was a pronounced pacifist.[126] During an address to Caltech's students, Einstein noted that science was often inclined to do more harm than good.[127]

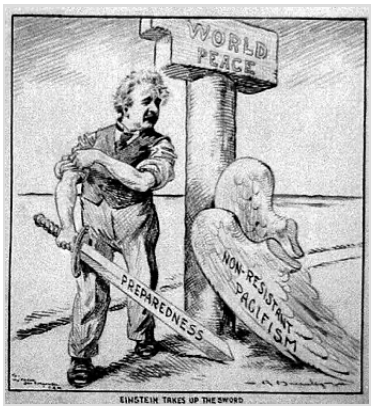
This aversion to war also led Einstein to befriend author Upton Sinclair and film star Charlie Chaplin, both noted for their pacifism. Carl Laemmle, head of Universal Studios, gave Einstein a tour of his studio and introduced him to Chaplin. They had an instant rapport, with Chaplin inviting Einstein and his wife, Elsa, to his home for dinner. Chaplin said Einstein's outward persona,

calm and gentle, seemed to conceal a "highly emotional temperament", from which came his "extraordinary intellectual energy".[128]

Chaplin's film *City Lights* was to premiere a few days later in Hollywood, and Chaplin invited Einstein and Elsa to join him as his special guests. Walter Isaacson, Einstein's biographer, described this as "one of the most memorable scenes in the new era of celebrity".[127] Chaplin visited Einstein at his home on a later trip to Berlin and recalled his "modest little flat" and the piano at which he had begun writing his theory. Chaplin speculated that it was "possibly used as kindling wood by the Nazis".[129]

1933: Emigration to the US

In February 1933, while on a visit to the United States, Einstein knew he could not return to Germany with the rise to power of the Nazis under Germany's new chancellor, Adolf Hitler.[130][131]



Cartoon of Einstein after shedding his "pacifism" wings (Charles R. Macauley, c. 1933)

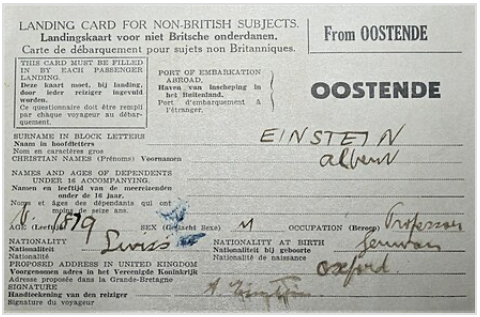
While at American universities in early 1933, he undertook his third two-month visiting professorship at the California Institute of Technology in Pasadena. In February and March 1933, the Gestapo repeatedly raided his family's apartment in Berlin.[132] He and his wife Elsa returned to Europe in March, and during the trip, they learned that the German Reichstag had passed the Enabling Act on 23 March, transforming Hitler's government into a *de facto* legal dictatorship, and that they would not be able to proceed to Berlin. Later on, they heard that their cottage had been raided by the Nazis and Einstein's personal sailboat confiscated. Upon landing in Antwerp, Belgium on 28 March, Einstein immediately went to the German consulate and surrendered his passport, formally renouncing his German citizenship.[133] The Nazis later sold his boat and converted his cottage into a Hitler Youth camp.[134]

Refugee status

In April 1933, Einstein discovered that the new German government had passed laws barring Jews from holding any official positions, including teaching at universities.[133] Historian Gerald Holton describes how, with "virtually no audible protest being raised by their colleagues", thousands of Jewish scientists were suddenly forced to give up their university positions and their names were removed from the rolls of institutions where they were employed.[136]

A month later, Einstein's works were among those targeted by the German Student Union in the Nazi book burnings, with Nazi propaganda minister Joseph Goebbels proclaiming, "Jewish intellectualism is dead."[133] One German magazine included him in a list of enemies of the

German regime with the phrase, "not yet hanged", offering a $5,000 bounty on his head.[133][137] In a subsequent letter to physicist and friend Max Born, who had already emigrated from Germany to England, Einstein wrote, "... I must confess that the degree of their brutality and cowardice came as something of a surprise."[133] After moving to the US, he described the book burnings as a "spontaneous emotional outburst" by those who "shun popular enlightenment", and "more than anything else in the world, fear the influence of men of intellectual independence".[138]


LANDING CARD FOR NON-BRITISH SUBJECTS.
Landingskaart voor niet Britsche onderdanen.
Carte de débarquement pour sujets non Britanniques.
From OOSTENDE
OOSTENDE
EINSTEIN
albert
Swiss
Professor
Oxford

Landing card for Einstein's 26 May 1933 arrival in Dover, England from Ostend, Belgium,[135] enroute to Oxford[4]

Einstein was now without a permanent home, unsure where he would live and work, and equally worried about the fate of countless other scientists still in Germany. Aided by the Academic Assistance Council, founded in April 1933 by British Liberal politician William Beveridge to help academics escape Nazi persecution, Einstein was able to leave Germany.[139] He rented a house in De Haan, Belgium, where he lived for a few months. In late July 1933, he visited England for about six weeks at the invitation of the British Member of Parliament Commander Oliver Locker-Lampson, who had become friends with him in the preceding years.[135] Locker-Lampson invited him to stay near his Cromer home in a secluded wooden cabin on Roughton Heath in the Parish of Roughton, Norfolk. To protect Einstein, Locker-Lampson had two bodyguards watch over him; a photo of them carrying shotguns and guarding Einstein was published in the *Daily Herald* on 24 July 1933.[140][141]

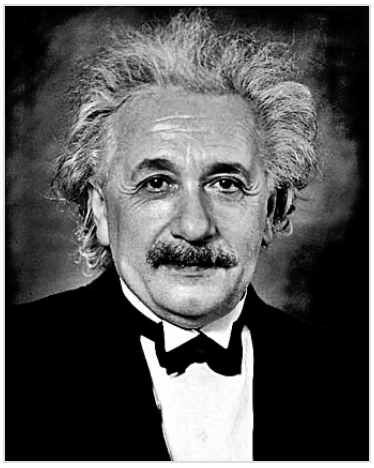
Locker-Lampson took Einstein to meet Winston Churchill at his home, and later, Austen Chamberlain and former Prime Minister Lloyd George.[142] Einstein asked them to help bring Jewish scientists out of Germany. British historian Martin Gilbert notes that Churchill responded immediately, and sent his friend, physicist Frederick Lindemann, to Germany to seek out Jewish scientists and place them in British universities.[143] Churchill later observed that as a result of Germany having driven the Jews out, they had lowered their "technical standards" and put the Allies' technology ahead of theirs.[143]

Winston Churchill and Einstein at Chartwell House, 31 May 1933

Einstein later contacted leaders of other nations, including Turkey's Prime Minister, İsmet İnönü, to whom he wrote in September 1933, requesting placement of unemployed German-Jewish scientists. As a result of Einstein's letter, Jewish invitees to Turkey eventually totaled over "1,000 saved individuals".[144]

Locker-Lampson also submitted a bill to parliament to extend British citizenship to Einstein, during which period Einstein made a number of public appearances describing the crisis brewing in Europe.[145] In one of his speeches he denounced Germany's treatment of Jews, while at the same time he introduced a bill promoting Jewish citizenship in Palestine, as they were being denied citizenship elsewhere.[146] In his speech he described Einstein as a "citizen of the world" who should be offered a temporary shelter in the UK.[note 3][147] Both bills failed, however, and Einstein then accepted an earlier offer from the Institute for Advanced Study, in Princeton, New Jersey, US, to become a resident scholar.[145]

Resident scholar at the Institute for Advanced Study


Portrait of Einstein taken in 1935 at Princeton

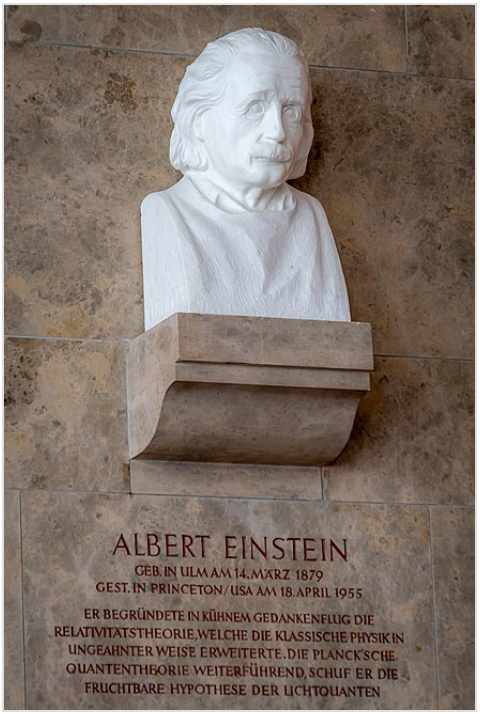
On 3 October 1933, Einstein delivered a speech on the importance of academic freedom before a packed audience at the Royal Albert Hall in London, with *The Times* reporting he was wildly cheered throughout.[139] Four days later he returned to the US and took up a position at the Institute for Advanced Study,[145][148] noted for having become a refuge for scientists fleeing Nazi Germany.[149] At the time, most American universities, including Harvard, Princeton and Yale, had minimal or no Jewish faculty or students, as a result of their Jewish quotas, which lasted until the late 1940s.[149]

Einstein was still undecided about his future. He had offers from several European universities, including Christ Church, Oxford, where he stayed for three short periods between May 1931 and June 1933[4] and was offered a five-year research fellowship (called a "studentship" at Christ Church),[150][151] but in 1935, he arrived at the decision to remain permanently in the United States and apply for citizenship.[145][152]

Einstein's affiliation with the Institute for Advanced Study would last until his death in 1955.[153] He was one of the four first selected (along with John von Neumann, Kurt Gödel, and Hermann Weyl[154]) at the new Institute. He soon developed a close friendship with Gödel; the two would take long walks together discussing their work. Bruria Kaufman, his assistant, later became a physicist. During this period, Einstein tried to develop a unified field theory and to refute the accepted interpretation of quantum physics, both unsuccessfully. He lived in Princeton at his home from 1935 onwards. The Albert Einstein House was made a National Historic Landmark in 1976.

World War II and the Manhattan Project

In 1939, a group of Hungarian scientists that included émigré physicist Leó Szilárd attempted to alert Washington to ongoing Nazi atomic bomb research. The group's warnings were discounted. Einstein and Szilárd, along with other refugees such as Edward Teller and Eugene Wigner, "regarded it as their responsibility to alert Americans to the possibility that German scientists might win the race to build an atomic bomb, and to warn that Hitler would be more than willing to resort to such a weapon."[155][156] To make certain the US was aware of the danger, in July 1939, a few months before the beginning of World War II in Europe, Szilárd and Wigner visited Einstein to explain the possibility of atomic bombs, which Einstein, a pacifist, said he had never considered.[157] He was asked to lend his support by writing a letter, with Szilárd, to President Roosevelt, recommending the US pay attention and engage in its own nuclear weapons research.

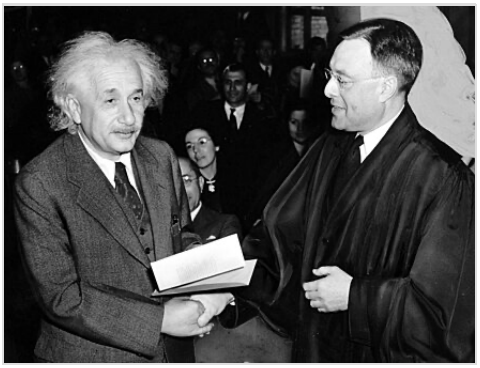


Marble bust of Einstein at the Deutsches Museum in Munich

The letter is believed to be "arguably the key stimulus for the U.S. adoption of serious investigations into nuclear weapons on the eve of the U.S. entry into World War II".[158] In addition to the letter, Einstein used his connections with the Belgian royal family[159] and the Belgian queen mother to get access with a personal envoy to the White House's Oval Office. Some say that as a result of Einstein's letter and his meetings with Roosevelt, the US entered the "race" to develop the bomb, drawing on its "immense material, financial, and scientific resources" to initiate the Manhattan Project.

For Einstein, "war was a disease ... [and] he called for resistance to war." By signing the letter to Roosevelt, some argue he went against his pacifist principles.[160] In 1954, a year before his death, Einstein said to his old friend, Linus Pauling, "I made one great mistake in my life—when I signed the letter to President Roosevelt recommending that atom bombs be made; but there was some justification—the danger that the Germans would make them ..."[161] In 1955, Einstein and ten other intellectuals and scientists, including British philosopher Bertrand Russell, signed a manifesto highlighting the danger of nuclear weapons.[162] In 1960 Einstein was included posthumously as a charter member of the World Academy of Art and Science (WAAS),[163] an organization founded by distinguished scientists and intellectuals who committed themselves to the responsible and ethical advances of science, particularly in light of the development of nuclear weapons.

US citizenship



Einstein accepting a US citizenship certificate from judge Phillip Forman

Einstein became an American citizen in 1940. Not long after settling into his career at the Institute for Advanced Study in Princeton, New Jersey, he expressed his appreciation of the meritocracy in American culture compared to Europe. He recognized the "right of individuals to say and think what they pleased" without social barriers. As a result, individuals were encouraged, he said, to be more creative, a trait he valued from his early education.[164]

Einstein joined the National Association for the Advancement of Colored People (NAACP) in Princeton, where he campaigned for the civil rights of African Americans. He considered racism America's "worst disease",[137][165] seeing it as "handed down from one generation to the next".[166] As part of his involvement, he corresponded with civil rights activist W. E. B. Du Bois and was prepared to testify on his behalf during his trial as an alleged foreign agent in 1951.[167] When Einstein offered to be a character witness for Du Bois, the judge decided to drop the case.[168]

In 1946, Einstein visited Lincoln University in Pennsylvania, a historically black college, where he was awarded an honorary degree. Lincoln was the first university in the United States to grant college degrees to African Americans; alumni include Langston Hughes and Thurgood Marshall. Einstein gave a speech about racism in America, adding, "I do not intend to be quiet about it."[169] A resident of Princeton recalls that Einstein had once paid the college tuition for a black student.[168] Einstein has said, "Being a Jew myself, perhaps I can understand and empathize with how black people feel as victims of discrimination".[165]

Personal views

Political views

In 1918, Einstein was one of the signatories of the founding proclamation of the German Democratic Party, a liberal party.[170][171] Later in his life, Einstein's political view was in favor of socialism and critical of capitalism, which he detailed in his essays such as "Why Socialism?".[172][173] His opinions on the Bolsheviks also changed with time. In 1925, he criticized them for not having a "well-regulated system of government" and called their rule a "regime of terror and a tragedy in human history". He later adopted a more moderated view, criticizing their

methods but praising them, which is shown by his 1929 remark on Vladimir Lenin:

> In Lenin I honor a man, who in total sacrifice of his own person has committed his entire energy to realizing social justice. I do not find his methods advisable. One thing is certain, however: men like him are the guardians and renewers of mankind's conscience.[174]

Albert Einstein and Elsa Einstein arriving in New York in 1921. Accompanying them are Zionist leaders Chaim Weizmann (future president of Israel), Weizmann's wife Vera Weizmann, Menahem Ussishkin, and Ben-Zion Mossinson.

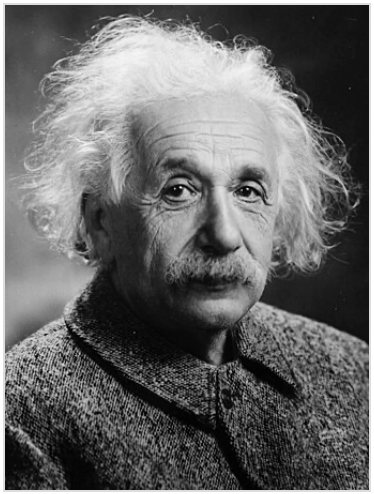
Einstein offered and was called on to give judgments and opinions on matters often unrelated to theoretical physics or mathematics.[145] He strongly advocated the idea of a democratic global government that would check the power of nation-states in the framework of a world federation.[175] He wrote "I advocate world government because I am convinced that there is no other possible way of eliminating the most terrible danger in which man has ever found himself."[176] The FBI created a secret dossier on Einstein in 1932; by the time of his death, it was 1,427 pages long.[177]

Einstein was deeply impressed by Mahatma Gandhi, with whom he corresponded. He described Gandhi as "a role model for the generations to come".[178] The initial connection was established on 27 September 1931, when Wilfrid Israel took his Indian guest V. A. Sundaram to meet his friend Einstein at his summer home in the town of Caputh. Sundaram was Gandhi's disciple and special envoy, whom Wilfrid Israel met while visiting India and visiting the Indian leader's home in 1925. During the visit, Einstein wrote a short letter to Gandhi that was delivered to him through his envoy, and Gandhi responded quickly with his own letter. Although in the end Einstein and Gandhi were unable to meet as they had hoped, the direct connection between them was established through Wilfrid Israel.[179]

Relationship with Zionism

Einstein was a figurehead leader in the establishment of the Hebrew University of Jerusalem,[180] which opened in 1925.[181] Earlier, in 1921, he was asked by the biochemist and president of the World Zionist Organization, Chaim Weizmann, to help raise funds for the planned university.[182] He made suggestions for the creation of an Institute of Agriculture, a Chemical Institute and an Institute of Microbiology in order to fight the various ongoing epidemics such as malaria, which he called an "evil" that was undermining a third of the country's development.[183] He also promoted

the establishment of an Oriental Studies Institute, to include language courses given in both Hebrew and Arabic.[184]



Einstein in 1947

Einstein was not a nationalist and opposed the creation of an independent Jewish state.[185] He felt that the waves of arriving Jews of the Aliyah could live alongside existing Arabs in Palestine. The state of Israel was established without his help in 1948; Einstein was limited to a marginal role in the Zionist movement.[186] Upon the death of Israeli president Weizmann in November 1952, Prime Minister David Ben-Gurion offered Einstein the largely ceremonial position of President of Israel at the urging of Ezriel Carlebach.[187][188] The offer was presented by Israel's ambassador in Washington, Abba Eban, who explained that the offer "embodies the deepest respect which the Jewish people can repose in any of its sons".[189] Einstein wrote that he was "deeply moved", but "at once saddened and ashamed" that he could not accept it.[189]

Religious and philosophical views

Per Lee Smolin, "I believe what allowed Einstein to achieve so much was primarily a moral quality. He simply cared far more than most of his colleagues that the laws of physics have to explain everything in nature coherently and consistently."[190] Einstein expounded his spiritual outlook in a wide array of writings and interviews.[191] He said he had sympathy for the impersonal pantheistic God of Baruch Spinoza's philosophy.[192] He did not believe in a personal god who concerns himself with fates and actions of human beings, a view which he described as naïve.[193] He clarified, however, that "I am not an atheist",[194] preferring to call himself an agnostic,[195][196] or a "deeply religious nonbeliever".[193] He wrote that "A spirit is manifest in the laws of the universe—a spirit vastly superior to that of man, and one in the face of which we with our modest powers must feel humble. In this way the pursuit of science leads to a religious feeling of a special sort."[197]

1:31

Opening of Einstein's speech (11 April 1943) for the United Jewish Appeal (recording by Radio Universidad Nacional de La Plata, Argentina)

"Ladies (coughs) and gentlemen, our age is proud of the progress it has made in man's intellectual development. The search and striving for truth and knowledge is one of the highest of man's qualities ..."

Einstein was primarily affiliated with non-religious humanist and Ethical Culture groups in both the UK and US. He served on the advisory board of the First Humanist Society of New York,[198] and was an honorary associate of the Rationalist Association, which publishes *New Humanist* in