Albert Einstein*  

Einstein, Albert, this century's most renowned scientist, was born in Ulm, in the kingdom of Württemberg, now part of Germany, the son of Hermann Einstein, a small businessman, never very successful, and Pauline née Koch. In 1881 Maria, his only sibling, was born. In 1880 the family moved to Munich, where Einstein attended public school and high school, always doing well. (The story that he was a poor pupil is a myth, probably caused by his dislike of formal education.) In those years he also received violin lessons privately and, in order to comply with legal requirements, instruction in the elements of Judaism. As a result of this inculcation, Einstein went through an intense religious phase at age about eleven, following religious precepts in detail and (he later told a friend) composing songs in honor of God. A year later, this phase ended abruptly and forever as a result of his exposure to popular books on science, to 'the holy geometry book' (as he called it) on Euclidean geometry, to writings of Kant, and more.

In 1895 Einstein took the entrance examination at the Federal Institute of Technology (ETH) in Zurich but failed because of poor grades in literary and political history. In 1896, after a year of study at a high school in Aarau (Switzerland), he did gain admission, however. In that year he gave up his German citizenship and became stateless, in 1901, Swiss.

During his next four years as an ETH student, Einstein did not excel in regular course attendance, relying far more on self-study. In 1900 he passed his final examinations with good grades, which qualified him as high school teacher in mathematics and physics. For the next two years he had to be satisfied with temporary teaching positions until, in June 1902, he was appointed technical expert third class at the Patent Office in Berne.

In January 1903 Einstein married Mileva Marić, of Greek-Catholic Serbian descent, a fellow student at the ETH. In 1902 the couple had a daughter out of wedlock, Liesel, whose fate remains unknown, and after marriage two sons, Hans Albert, who became a distinguished professor of hydraulic engineering in Berkeley, California, and Eduard, a gifted child, who became a student of

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medicine in Zurich, but then turned severely schizophrenic and died in a psychiatric hospital.

In 1914 the Einsteins separated, in 1919 they divorced. Thereafter Einstein remarried with his cousin Elsa Einstein, who brought him two stepdaughters. He had several extramarital affairs during this second marriage.

None of Einstein's first four papers, published between 1901 and 1904, foreshadowed his explosive creativity of 1905, his *anum mirabilis*, in which he produced: in March, his proposal of the existence of light quanta and the photoelectric effect, work for which in 1922 he received the Nobel Prize; in April, a paper on the determination of molecular dimensions which earned him his PhD in Zurich; in May, his theory of special relativity; in September, a sequel to the preceding paper containing the relation \( E = mc^2 \). Any one of these papers would have made him greatly renowned; their totality made him immortal.

Only after all these publications did Einstein's academic career begin: privatdozent in Berne, 1908; associate professor, University of Zurich, 1909, the year of his first honorary degree (Geneva); full professor at the Karl Ferdinando University, Prague, 1911; professor at the ETH, 1912; professor and member of the Prussian Academy of Sciences, Berlin, 1914–32, where he arrived four months before the outbreak of the First World War.

In 1915 Einstein composed his first political document, a 'Manifesto to Europeans,' in which all those who cherish European culture were urged to join in a League of Europeans (never realized). Far more important, in that year Einstein completed his masterpiece, perhaps the most profound contribution to physics of the twentieth century: his general relativity theory, on which he had been brooding for the previous eight years. In the special theory all laws of physics have the same form for any two observers moving relatively to each other in a straight line and with constant, time-independent, velocity. In the general theory the same is true for all kinds of relative motion. This demands a revision of Newton's theory of gravitation. Space is curved, Einstein now asserted, the amount of curvature depending on how dense matter is at that place—matter determines its gravitational action 'what shape space is in.'

The superiority of Einstein's over Newton's theory became manifest in 1915, when Einstein could for the first time explain an anomaly in the motion of the planet Mercury (advance of the perihelion), known observationally since 1859. He also predicted that light grazing the sun bends by a factor two larger than predicted by Newton's theory.

In 1916 Einstein completed his most widely known book *On the Special and the General Theory of Relativity, Popularly Explained*, wrote the first paper on gravitational waves and became president of the *Deutsche Physikalische Gesellschaft*. In 1917 he became ill, suffering successively from a liver ailment, a stomach ulcer, jaundice, and general weakness, but nevertheless managed to complete his first paper on relativistic cosmology. He did not fully recover until 1920.

In November 1919 Einstein became the mythical figure he is to this day. In May of that year two solar eclipse expeditions had (in the words of the astronomer Eddington) 'confirm[ed] Einstein's weird theory of non-Euclidean space.' On November 6, the President of the Royal Society declared in London that this was 'the most remarkable scientific event since the discovery [in 1846] of the predicted existence of the planet Neptune.'

The next day The Times in London carried an article headlined 'Revolution in Science/New theory of the Universe/Newtonian ideas overthrown.' Einstein had triumphed over Newton (who of course is and remains a stellar figure in science). The drama of that moment was enhanced by the contrast with the recently concluded World War, which had caused millions to die, empires to fall, the future to be uncertain. At that time Einstein emerges, bringing new law and order. From that time on the world press made him into an icon, the θέατος ανήρ, the divine man, of the twentieth century.

At about that time one begins to perceive changes in the activities of Einstein, now in mid-life. He began writing non-scientific articles. In 1920 he was exposed to anti-semitic demonstrations during a lecture he gave in Berlin. At the same time, Jews fleeing from the East came literally knocking at his door for help. All that awakened in Einstein a deepened awareness of the Jewish predicament, and caused him to speak up and write in favor of Jewish self-expression by means of settling in Palestine, creating there a peaceful center where Jews could live in dignity and without persecution. Thus, he became an advocate of what one may call moral Zionism, though he never was a member of any Zionist organization.

The 1920s was also the period of Einstein's most extensive travels. In 1921 he paid his first visit to the United States for the purpose of raising funds for the planned Hebrew University, being honored on the way, including being received by President Harding. In 1922 his visit to Paris contributed to the normalization of Franco-German relations. Also in that year he accepted membership in the League of Nation's Committee on Intellectual Cooperation. In June, Walter Rathenau, Foreign Minister of Germany, a Jew and an acquaintance of Einstein, was assassinated. After being warned that he, too, might be in danger, Einstein left with his wife for a five months' trip abroad. After short visits to Colombo, Singapore, Hong Kong, and Shanghai, they arrived in Japan for a five-week stay. The press reported that, at a reception, the center of attention was not the Empress, everything turned on Einstein.

On the way back they visited Palestine. In introducing Einstein at a lecture, the president of the Zionist Executive said: 'Mount the platform which has been awaiting you for two thousand years.' Thereafter Einstein spent three weeks in
Spain. In 1925 he journeyed to South America, lecturing in Buenos Aires, Montevideo, and Rio de Janeiro. Apart from three later trips to the United States, this was the last major voyage in Einstein's life.

All these multifarious activities took a lot of Einstein's energies but did not keep him from his physics research. In 1922 he published his first paper on unified field theory, an attempt at incorporating not only gravitation but also electromagnetism into a new world geometry, a subject that was his main concern until the end of his life. He tried many approaches; none of them have worked out. In 1924 he published three papers on quantum statistical mechanics which include his discovery of so-called Bose–Einstein condensation. This was his last contribution to physics which may be called seminal. He did continue to publish all through his later years, however.

In 1925 quantum mechanics arrived, a new theory with which Einstein never found peace. His celebrated dialogue with Bohr on this topic started at the 1927 Solvay conference. They were to argue almost until Einstein's death without ever coming to an agreement.

In 1928 Einstein suffered a temporary physical collapse due to an enlargement of the heart. He had to stay in bed for four months and keep to a salt-free diet. He fully recuperated but stayed weak for a year. 1929 witnessed his first visit with the Belgian royal family, leading to a life-long correspondence with Queen Elizabeth.

Einstein had been a pacifist since his young years but in the 1920s his position became more radical in this respect. For example, in 1925 he, Gandhi, and others signed a manifesto against obligatory military service, in 1930 another supporting world government. In that year and again in 1931 he visited the United States. In 1932 he accepted appointment as professor at the Institute for Advanced Study in Princeton, originally intending to divide his time between Princeton and Berlin. When, however, he and his wife left Germany on December 10 of that year, they would never set foot in Germany again—in January 1933 the Nazis came to power. Though remaining pacifist at heart, Einstein was deeply convinced that they could only be defeated by the force of arms.

Because of the new political situation, Einstein changed his plans, arriving on October 17, 1933 in the US to settle permanently in Princeton, whereafter he left that country only once, in 1935, to travel to Bermuda in order to make from there application for permanent residency. In 1940 he became a US citizen.

Einstein also remained a prominent figure in his new country. In 1934 he and his wife were invited by the Roosevelts and spent a night at the White House. He remained scientifically active, wrote in fact some good papers, but nothing as memorable as in his European days.

In 1939 Einstein wrote to Roosevelt to draw his attention to possible military uses of atomic energy. His influence on these later developments was marginal, however. In 1943 he became consultant to the US Navy Bureau of Ordnance but was never involved in atomic bomb work. In 1944 a copy of his 1905 paper on relativity, handwritten by him for this purpose, was auctioned for six million dollars as a contribution to the war effort. (It is now in the Library of Congress.)

After the war he continued to speak out on political issues, such as his open letter to the United Nations urging the formation of a world government, and his frequent condemnations in the press of McCarthy's activities. After the death of Chaim Weizmann, first president of Israel, Einstein was invited, but declined, to be his successor.

In 1948 Einstein was found to have a large intact aneurysm of the abdominal aorta. In 1950 he wrote his testament, willing his papers and manuscripts to the Hebrew University (where they are now). On April 11, 1955, Einstein wrote his last letter (to Bertrand Russell), in which he agreed to sign a manifesto urging all nations to renounce nuclear weapons. On April 13 Einstein wrote a draft (incomplete) for a radio address which ends: 'Political passions, aroused everywhere, demand their victims.' On the afternoon of that day his aneurysm ruptured. On the 15th he entered Princeton Hospital, where he died on April 18 at 1:15 a.m. His body was cremated that same day. The ashes were scattered at an undisclosed place. The following November his first great-grandson was born.