

Updated Chronology Of The Scientific, Political And Family Life Of Albert Einstein

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Abstract— This year commemorates one hundred years of the General Relativity Theory, described at the time by Max Born as the greatest feat of human thinking. Recently the press has focused a great deal of coverage on the experimental discovery of gravitational waves, for the greater good of Dr. Einstein. In order to remember this transcendental scientist, we made some simple distinctions when recalling the most significant milestones of his existence. This chronology synthesizes his accomplishments and proves useful for introducing his work. We focus on his personal and family life as well as the most important moments of his contributions to the advancement of physics in the 20th century

Keywords— general relativity; gravitational waves; milestones

I. INTRODUCTION

Published literature contains much material about the life of Albert Einstein, such as the biography by Isaacson [1], which by far is the most complete and essential source of the study of Einstein's life. Here in Mexico, excellent biographies have been published, such as the one from the National Polytechnic Institute (IPN) [2], and the one from the Science and Technology Council (CONACYT) [3] containing an abundance of historical data, both scientific and political. Other important works are those of De La Peña [4] and Garcia Colin [5]. Additionally, featured in some literature are chronologies such as [6, 7]; these are very similar to the one proposed herein; however, we are making some adjustments and have extended the data up to our day, that is to say, we updated the chronology so as to include the final events and have added an important aspect after Einstein's death in 1955. Therefore, we believe that the chronology of the most influential person of the 20th century is of value for study and dissemination.

II. CHRONOLOGY

Albert Einstein was born in 1879 to a Jewish family in Ulm, Germany, in the State of Bavaria. His father, Herman Einstein, was an electro-chemical technology merchant. His mother, Paulina Koch, whose fondness for German music was well known, imbued in her children a taste for melody.

In 1880, his family moved to Munich due to the business of his father and Uncle Jacob; the latter was an engineer and was a huge influence on young Einstein's early mathematical education as was his

friend, Max Talmud. In 1881, his sister Maja Einstein was born, and she stuck with him until the day she died.

In 1884 he received an exciting gift that he later declared was a catalyst to his curiosity in science. That gift was a compass! One year later, in 1885 he attended Petersshule, a Catholic elementary school in Munich. There he started to learn how to play the violin.

Einstein entered the Luitpold junior high school in Munich in 1888. He didn't care for the school system; he accused it of being too strict and rigid, somewhat militaristic. One teacher he had problems with predicted he would have little chance of success in life.

When difficulties arose with the businesses of his father and uncle, his family relocated to Milan, Italy in 1893 however he stayed in Munich with some relatives.

In 1895 he was expelled from Luitpold as he was considered a disruptive influence, so he moved to the Swiss town Aarau, close to Zurich, to finish junior high and start "matura" (high school). It was here that he found enjoyment in the more liberal Swiss school system. In Aarau he stayed with the family of one of his teachers, Jost Winteler.

1896 saw Einstein resign his German nationality in order to avoid military service. This same year he started his physics and mathematics studies at the Federal Institute of Technology in Zurich (ETH). Among his classmates were Marcel Grossman and Mileva Maric.

He received an ETH diploma in 1900, but he did not qualify for an academic position. In 1901, he became a citizen of Switzerland having paid for the process with his savings. He was denied for military service due to his flat feet and varicose veins. 1901 was also the year that he started working as a junior high school teacher close to Zurich, in Winterthur.

1902 was the year he began his work on gas kinetic theory and published these in the German physics magazine, Annalen der Physik. It was also the same year his father Herman died in Milan, Italy.

With the help of his classmate Marcel Grossman, he started to work as a technician in the Federal Patent Office in Bern in 1902. This was the only work option for Einstein as he could not hold an academic position; despite this, the job allowed him to continue with his research.

In 1903 he married Mileva Maric who proved to be of great assistance in the development of the

mathematical calculations of his research. Their son, Hans Albert Einstein, was born in Bern in 1904. As an adult he became an engineer and professor at Berkeley University.

He published articles in 1905, including the acclaimed *Annus Mirabilis*, where he proposed the quantum nature of light, the atomic structure of matter, and the special relativity. The Physics revolution had begun.

Einstein obtained a PhD in 1906 with the thesis "New Determination of Molecular Dimensions". He dedicated his thesis to his ex-classmate Marcel Grossman.

The University of Zurich was where he landed his first job as a full professor, thus, he left the Federal Patent Office in Bern.

In 1910 his second child, Eduardo, aka "Tede", was born. As an adult he was a musician. Due to his being hypersensitive, he exhibited emotional issues, which led to his being diagnosed as having mental illness.

The first Solvay congress was held in Brussels in 1911, named so after its sponsor Ernest Solvay. Rutherford and Poincaré attended this event, among other great scientists from physics and chemistry.

In 1912, Einstein began his TGR work along with his ex-classmate Marcel Grossman, who helped him with the estimation of tensors. The following year, Max Planck and Walther Nernst went to Zurich to visit Einstein and offer him the position of researcher and professor. Over the years, he became the director of the Kaiser Wilhelm Institute of Physics in Berlin. Before the end of 1913, he, along with Marcel Grossman, published "A Project of the Theory of General Relativity and Generalized Gravitation".

In 1914 Mileva and her children left Berlin, and so began the marital separation and the subsequent issue of child abandonment. Einstein argued that war prevented him from living with them.

In 1916 he published the General Theory of Relativity, thought by many to be the greatest feat of human thought. Also, he published his first press release about gravitational waves and gravitons. There is still controversy in this regard, since the mathematician David Hilbert also developed the calculations.

He established the first relativism model of the cosmos through the introduction of a cosmologic constant.

The divorce agreement with his wife Mileva stipulated that in the event of receiving the Nobel Prize, the money would be used by Mileva and her children. He married Elsa Loewenthal, who was his divorced cousin and the mother of two children named Margot and Ilse. Elsa looked after him during his period of illness up to his recovery in 1917.

In 1919, the English astronomer Arthur Eddington verified the validity of Einstein's theory of relativity from observations made during a solar eclipse. This fact gained Eddington worldwide recognition.

The house of Einstein's ex-wife Mileva, located in Zurich, was the location where in 1920, his mother, Paulina Koch passed away in the presence of her two grandsons, Hans and Eduardo.

In Germany, racist hostility was apparent. There were rallies attacking "Jewish" science. During one of Einstein's lectures at the University of Berlin there occurred social disruptions of anti-Semitic origin. All of this occurred in 1920, the same year he met Niels Bohr, with whom he discussed much about quantum mechanics and philosophy. Bohr dedicated an article to these debates called "Discussions with Einstein about the epistemological problems in atomic physics".

In 1921 he received the Nobel Prize for Physics due to his contribution to the quantum nature of light or the photoelectric effect. He did not attend the ceremony due to prior commitments. The prize money was given to Mileva.

He made his first trip to the United States in 1921 in order to collect funds for the Hebrew University of Jerusalem. While there he gave lectures in several universities and President Warren G. Harding received him in the White House.

In 1922, he was named member of the International Cooperation Committee of the League of Nations (predecessor to the United Nations) although years later he resigned from this position. Einstein's friend and Minister of Foreign Affairs, Walter Rathenau, who warned him about the risk involved in being a Jew with a high public profile, was killed in Germany. That same year he traveled to Singapore, Hong Kong, Shanghai, and Japan. On the scientific scene, Arthur Compton definitively demonstrated the existence of photons. This fact established the sound justification of the quantum nature of light, after Planck's studies on black bodies and Einstein's photoelectric effect.

Einstein visited Palestine where he received a tribute and became the first honorary citizen of Tel Aviv. After this trip he traveled to Spain and developed a relationship with the writer Ortega y Gasset. These events took place in 1923.

In 1924, the theoretical formulation about condensation, Bose-Einstein, is discovered, which consisted of a state of matter that occurs at temperatures close to absolute zero. Due to its origin, this constitutes quantum properties. The idea's principle is from the Indian physicist Satyendra Nath Bose. A quantum classification of particles was produced, dividing them in bosons and fermions. Bose and Einstein signed the original article.

Along with Mahatma Gandhi he signed a manifest against compulsory military service. He received the Copley Medal of the Royal Society of London in 1925. That same year he traveled to Latin America, making stops in Montevideo, Buenos Aires and Rio de Janeiro.

During the 1927 Solvay Conference, where the great minds of contemporaneous quantum theory attended, such as Planck, Bohr, Born, Heisenberg, Schrödinger, De Broglie, Dirac, Pali, Debye, Bragg, Compton, Lorentz, and Ehrenfest, to name a few,

discussions about the Copenhagen interpretation of quantum mechanics took place.

In 1928, Einstein became ill from a heart condition that fatigued him for several months. Helen Dukas started to work with him; she was his secretary and assistant until the end of her life.

In a debate with pro-Nazi academics that took place in 1929, he made his famous declaration: "Only two things are infinite, the universe and human stupidity, and I'm not sure about the former."

In 1931 he visited the US, where he had his second internship at Caltech; one year prior he had his first internship at the same university.

The following year, 1932, he supported the International Conscientious Objectors who were protesting against mandatory military service. By 1933, Hitler rose to power in Germany and the war nightmare began. The Nazis searched Einstein's home while he was away and accused him of collaboration with the enemy. He promptly left Germany and lived in exile in France, Belgium, the United Kingdom and finally the US where he was named professor at the Institute for Advanced Studies at Princeton.

A year later in 1934, he, along with Boris Podolsky and Nathan Rose, published the work called "The EPR Paradox". This consisted of a mental experiment to question the basis of quantum theory.

By 1935, he bought a house in Princeton where he, his wife, his sister Maja, and her secretary and assistant Helen Dukas lived.

Einstein's second wife, Elsa, died of a heart attack in 1936, the same year that his friend, classmate and co-author of some of his published works as well as a great mathematician, Marcel Grossman, died as a result of a beating he received from Nazi groups.

Einstein sent a letter to Roosevelt in 1939 requesting to start a program to investigate the development of the atomic bomb. This situation brought him grief since it contradicted his pacifist ideals, but he said he had to do so considering the possible development of the nuclear bomb by the Nazis.

He became an American citizen and eventually his participation with the armed forces made him subject to permanent surveillance by the FBI.

Philosophical discussions took place on a regular basis in 1943 between Einstein, Kurt Godel, Bertrand Russell and Linus Pauling.

By 1945 he acquired a pension, retired from teaching and focused on forging the unified theory and to work exclusively on his theoretical investigations. During the same year, several scientists issued a letter to President Roosevelt requesting that the production of the atomic bomb cease. It is said that due to Roosevelt's death, this letter was never read. The tragic events in Hiroshima and Nagasaki caused Einstein to adopt a critical view and he started to promote peace actively. He gave a lecture in New York called "The War is Won, But the Peace is Not."

In 1946, the Emergence Committee of Atomic Scientists was created to produce a "chain reaction on conscience and communication." Einstein published an article in *Annalen der Mathematik* about the Unified Field Theory. His idea was to have a valid model where the infinitely small and the infinitely big (such as atoms and galaxies) are subject to the same rules.

Mileva Maric, his first wife, mother of his children, died in Switzerland in 1948. She had an abdominal aortic aneurysm [8].

For the first time, the Albert Einstein Award in Theoretical Physics was awarded in 1951. This award was established to recognize significant achievements in natural sciences. It was endowed by the Lewis and Rosa Strauss Memorial Fund in honor of Albert Einstein's 70th birthday. 1951 also saw his sister Maja die in Princeton, while her husband John Winteler was trapped in Fascist Italy and he was never heard from again.

He also wrote the article in the magazine *Monthly Review*, an organ of the Communist Party of the US entitled "Why Socialism?"

Chaim Weizmann, President of Israel, died in 1952. Distinguished members of the State offered Einstein the position, but he diplomatically refused. Later on he said: "I cannot be responsible for a country whose actions can be in conflict with my conscience." He also talked about the coexistence between Arabs and Jews [9].

In 1954 he publicly supported Robert Oppenheimer, the physicist who headed the Manhattan Project for the construction of the atomic bomb, and who later was accused by the US government of collaborating with communists. This was already during the McCarthy era.

In 1955, he and Bertrand Russell signed a statement demanding nuclear disarmament. Einstein died in a Princeton hospital on April 18, at 1:15 am, in the presence of the attending nurse. His body was cremated and his ashes were scattered at an undisclosed location.

In 1964, John Bell proposed the mathematical models for the EPR paradox. The Luitpold junior high school in Munich adopted the name "Albert Einstein".

His son Eduardo died in a psychiatric hospital in Zurich in 1965. He was never able to enter to the US due to his schizophrenia.

In 1970, peace activist and friend of Einstein, Bertrand Russell died in London.

Hans Albert Einstein died in 1973 in California, where he was a recognized professor of hydraulic engineering at Berkeley.

On the occasion of his one hundredth birthday, in 1979, the Albert Einstein Medal was constituted as an award given by the Albert Einstein Society in Bern.

Helen Dukas, who after Einstein's death became the protector of his legacy and papers, died in 1982.

In 1988, the American Association of Civil Engineers instituted the Hans Albert Einstein award in recognition of his achievements in erosion, sedimentation, and the development of aqueducts.

In 1995, Eric Cornell and Carl E. Wiemann in the US experimentally discovered the Bose-Einstein condensate.

Research conducted in 1977 discovered the priority of Einstein over mathematician Hilbert regarding the fatherhood of the Theory of General Relativity with reference to an article from Corry Stachel and Renn in Science magazine.

A US Times magazine of 1999 proposed Einstein as the most influential person of the twentieth century. The article said that "His genius outlined the steps of science and technology of the twentieth century."

In 2001, Eric Cornell and Carl Wiemann won the Nobel Prize for Physics for the experimental test of the Bose-Einstein condensate.

World press published the discovery of gravitational waves. These waves are the ripples in the fabric of space-time predicted by Einstein in the Theory of General Relativity. The experiment took place in the Laser Interferometer Gravitational-Wave Observatory.

III. CONCLUSIONS

An easy way to study the biography of a character of science is using any relationship of historical landmarks in the form of timelines or chronology. Our contribution is to update the dates of the timeline on the life and work of Albert Einstein. We believe that the highlight is the confirmation of Bose Einstein condensation and the recent experimental discovery of

the graviton. Similarly, consider the academic life in civil engineering of his son Hans Albert Einstein, is also complementary. Our next job is to achieve a simple mathematical language to do the same, but including equations, so that could help as a teaching of the ideas of this giant of modern science.

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