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Albert Einstein in Switzerland:

The Education of the Most Famous Swiss American

by Kurt Winkler

The most famous Swiss American, by far, was Albert Einstein. It is well known that Einstein worked in Germany starting in 1914, but he was forced to leave in 1933 as someone the Nazis had “not yet hanged,” and he came to the United States where he taught at Princeton University for many years. However, Einstein had earlier lived in Switzerland for many years. Even though he became an American citizen in 1940, the great physicist retained ties to Switzerland, and he kept his Swiss passport all his life. Einstein spent his most productive years in Switzerland where he matured, received his advanced education, fell in love and married, made life-long friendships, formulated his most important ideas, and received his first academic position. The purpose of this paper is to examine Einstein’s life in Switzerland to understand better how his experiences there influenced his intellectual and emotional development.¹

Albert Einstein was born in Ulm, Germany, on March 14, 1879, but his family moved to Munich a year later where his father, Hermann, pursued a career in the electrical business. In Munich, Albert started his formal education and his intellectual expansion. Even though his mother, Pauline, was concerned that her oldest child started to talk relatively late, he showed much ability, and the stories of Albert’s slow mental development have been exaggerated.²

¹ For specific studies on Einstein in Switzerland, see Alexis Schwarzenbach, *Das verschmähte Genie: Albert Einstein und die Schweiz* (München: Deutsche Verlag, 2005) and Carl Seelig, *Albert Einstein und die Schweiz* (Zürich: Europa, 1952).

² Important recent biographies include: Banesh Hoffmann and Helen Dukas, *Albert Einstein Creator and Rebel* (New York: Viking, 1972); Roger Highfield and Paul Carter, *The Private Lives of Albert Einstein* (New York: St. Martin, 1993); Dennis Brian, *Einstein: A Life* (New York: Willey, 1996); Dennis Overbye, *Einstein in Love: a Scientific Romance* (New York: Viking, 2000); and Walter Isaacson, *Einstein: His Life and Universe* (New York: Simon & Schuster, 2008).

Pauline taught her son to play the violin beginning at age five. A year later, Albert started formal violin lessons. He later said the instruction was tiresome, and he criticized it much as he would later complain about the German school system. "I took violin lessons from age six to fourteen, but had no luck with my teachers for whom music did not transcend mechanical practicing." He claimed that he only made real progress at age thirteen, "after I had fallen in love with Mozart's sonatas."³

Einstein first attended school at age seven. He went to the *Peterschule*, a Catholic elementary school near his home, where he was the only boy in his class from the Jewish tradition. Einstein claimed that the school administration and the instructors did not persecute him, but the students were another matter. "Among the children, anti-Semitism was alive particularly at elementary school. It was based on the children's remarkable awareness of racial characteristics and on impressions left from religious instruction. Active attacks and verbal abuse on the way to and from school were frequent but usually not all that serious. They sufficed, however, to establish an acute feeling of alienation already in childhood."⁴

Einstein attended secondary school at the *Luitpold Gymnasium* starting at age nine, and he later complained bitterly about the nature of the instruction. He found it dull and oppressive. "I preferred to endure all sorts of punishments rather than to learn gabble by rote." He became morose, and he challenged his teachers. One of them even tried to convince him to withdraw from the institution. "I was summoned by my homeroom teacher who expressed the wish that I leave the school. To my remark that I had done nothing amiss he replied only 'your mere presence spoils the respect of the class for me.'"⁵

While Hermann Einstein's firm enjoyed some success in Munich initially, the business later failed, and its assets were liquidated in 1894. The family then moved to Pavia, Italy, where Hermann again tried to set up an electrical firm, but this venture also failed after two years. Albert remained in Munich when his family went to Italy, but he later dropped out of school to rejoin them. The story that Albert failed mathematics as a student is folklore, and he did not leave the *Luitpold Gymnasium* for

³ Einstein as cited in Hoffmann and Dukas, p. 20.

⁴ Einstein to [Paul Nathan] Apr. 3, 1920, in *The Collected Papers of Albert Einstein* (Princeton, New Jersey: Princeton University Press, 1987-) vol. 9: p. 304. Hereafter cited as *Einstein Papers*.

⁵ Einstein in Highfield and Carter, p. 15, and Einstein in Hoffmann and Dukas, p. 25.



Albert Einstein in 1896.

Credit: *Eidgenössische Technische Hochschule Zurich.*

academic reasons. He had very good grades in math, and he later laughed at the story of failure. “I never failed in mathematics,” he asserted, “before I was fifteen I had mastered differential and integral calculus.”⁶

Einstein left the Gymnasium and Germany for other reasons. He was likely fleeing the rigid school structure, and he was also clearly trying to avoid mandatory military service, which would start at age seventeen. Not only had he left the country, claiming that he would not return, but he renounced his German citizenship as well. Albert’s parents were concerned about their son’s academ-

ic future because he had just dropped out of school, but he reassured them by applying for admittance into the Swiss Federal Polytechnical School (*Eidgenössische Polytechnische Schule*) in Zurich, one of the most prestigious technical institutions in Europe. Albert was allowed to take the entrance examination when he was two years younger than the normal acceptance age of eighteen, and when he had not achieved the certificate (*Matura*) for completing his secondary education.

Albert took the test in Zurich in October 1895. He did well in mathematics and science, but he failed the examination overall. Perhaps recognizing that the young student had promise, the instructors at the Polytechnical school advised him to get his *Matura* and reapply in another year. One of them, Dr. Heinrich Weber, suggested that Einstein could attend his lectures without being formally enrolled, but this was impractical because Einstein still had to prepare himself to be admitted into the institution. He enrolled at the technical division of the nearby canton school in Aarau on October 26, 1895.⁷

⁶ Einstein in Brian, p. 281.

⁷ Highfield and Carter, pp. 20-21.

Einstein's experience in Aarau was very positive on his social and educational development. He described Aarau as "an unforgettable oasis in that European oasis, Switzerland." Albert's younger sister, Maria, also praised the school, stating that the "pupils were treated individually." "More emphasis was placed on independent thought than on punditry, and young people saw the teacher not as a figure of authority, but, alongside the student, a man of distinct personality." Albert also loved the school and its approach to learning, which was very different from the system in Germany which he so disliked. "When compared to six years' schooling at a German authoritarian gymnasium," Einstein later confessed, "it made me clearly realize how much superior an education based on free action and personal responsibility is to one relying on outward authority."⁸

At Aarau, the young genius used this approach of free thinking to ponder the most fertile question of his entire career. This was an idea "upon which I had already hit at the age of sixteen." He asked himself the question of what the world would look like, "If I pursue a beam of light." Historians of science have often changed this question to what everything would look like if he "rode" on a beam of light. He kept working on this idea for ten years until he published his special theory of relativity in 1905.⁹

Einstein attended school in Aarau for three semesters. During that time, he lived with Jost Winteler, a professor of history and Greek at the school, and his family. Jost's wife, Pauline, was kind and charitable, and the Winteler family accepted Einstein almost as a member of the family. Einstein soon called Pauline, "*Mamerl*" (Mom or Mommy). For years, the young scholar wrote affectionate letters addressed to "Mommy." He recalled the many "lovely hours" he spent with her. He thanked her for "all the love you have given me," and he often ended his letters with, "Thousand greetings and kisses."¹⁰

Einstein also became enamored with Marie, one of the three daughters among the seven Winteler children. Marie was reportedly

⁸ Maria and Albert Einstein in Isaacson, p. 26.

⁹ "Ein solches Prinzip ergab sich nach zehn Jahren Nachdenkens aus einem Paradoxon, auf das ich schon mit 16 Jahren gestossen bin: Wenn ich einem Lichtstrahl nach-eile...." Albert Einstein "Autobiographical Notes," in *Albert Einstein: Philosopher-Scientist* (New York: Harper, 1959), pp. 52-3.

¹⁰ Einstein to Pauline Winteler [May 1897, June 7, 1897, and Sept. 11, 1899], *Einstein Papers* vol. 1: pp. 32-34, 134-35.

the most attractive of the girls, and Albert soon established a special relationship with her.¹¹ She was two years older than he, but she was lively and knew how to brighten the day of her dear friend. They also shared an interest in music. They played duets in which Einstein played the violin, and Marie played the piano. With the cheerfulness of young love, they enjoyed each other's company. When Einstein went on a field trip to the Toggenburg Valley of Switzerland in the summer of 1896, he wrote to her about his feelings. He called her "sweet little angel," assured her that "love brings much happiness," and testified his affections, "You mean more to my soul than the whole world did before." He added playfully that she was the "insignificant silly little sweetheart that knows nothing and understands nothing."¹² This tease seemed innocent enough, but Marie's lack of intellectual promise was probably one of the reasons why Einstein lost interest in her.

Einstein went to Zurich in October 1896, and his friendship with Marie soon soured. He even became irritated by her letters and gifts. Even though she tried to maintain the relationship, Einstein ended it. He explained to Pauline Winteler in May 1897 that he regretted hurting Marie, "the dear child." He wrote that "intellectual work" would get him through "life's troubles," and he wished he "were able to give some of this to the good child."¹³

Marie led an unhappy life, and she seemed to suffer from mental illness. In the following years, she was often sick from work, and she married Albert Müller in 1911. They divorced in 1927, and she died in a mental asylum in 1957. The Winteler family suffered many other tragedies. One of the boys, Julius, went to America as a sea cook, but he returned to Switzerland in 1906, became deranged, and shot Pauline dead. Julius then killed Ernst Bandi, his sister's husband, before committing suicide.¹⁴

Einstein gained admittance into the Polytechnical School in Zurich and started his studies there in October 1896. He praised his opportunities to expand his skill in math, but he was more interested in physics. As he admitted later, "There I had excellent teachers (for example,

¹¹ Einstein's relationships with women are discussed in Dennis Overbye, *Einstein in Love: a Scientific Romance* (New York: Viking, 2000).

¹² Einstein to Marie Winteler [Apr. 21 1896] in *Einstein Papers* vol. 1: pp. 12-13.

¹³ Einstein to Pauline Winteler [May? 1897] in *Einstein Papers* vol. 1: pp. 32-33.

¹⁴ Highfield and Carter, pp. 23-24, 32.

Hurwitz, Minkowski), so that I really could have gotten a sound mathematical education. However, I worked most of the time in the physical laboratory, fascinated by the direct contact with experience.”¹⁵ However, Einstein enjoyed Heinrich Weber’s lectures on physics and eventually took fifteen courses from him. “Weber lectured on heat (temperature, heat quantities, thermal motion, dynamic theory of gasses) with great mastery. I am looking forward from one of his lectures to the next.”¹⁶

Einstein’s life in Zurich was also very important in areas outside of education, because he established two of the most important associations of his life. He met and became very good friends with Marcel Grossmann, who had relations in high places, and it was Grossmann’s connections that got Einstein his job at the Swiss Patent Office in Bern. Einstein also met his dear friend, Michele Angelo Besso, at this time. Six years older than Einstein, Besso had already graduated from the Polytechnical School and was working as an engineer. He also had a Jewish background, and Besso had a close relationship with the Winteler family, marrying Anna, one of the Winteler daughters. The depth of Einstein’s friendship with Besso was demonstrated by the fact that 229 letters between the two men have been found. Coincidentally, both men died only one month apart in 1955.¹⁷

Mileva Marić, who later became Einstein’s first wife, also enrolled at the Polytechnical School in Zurich in October of 1896. Mileva was born on Dec. 19, 1875, and she was more than three years older than Einstein. Her family were Serbs who lived in the Austro-Hungarian Empire, but they spoke German in the home. As a young woman in a school system that was prejudiced against her gender, Mileva was among the first females to get admitted to schools where only boys had been allowed to enroll, and she attended the Royal Classical High School (*Gymnasium*) which had formerly been for boys only. The male students at the school probably harassed Mileva, but she graduated in 1894. She took advantage of the Swiss schools that were famous for their excellence, and they also presented fewer obstacles to women. When

¹⁵ “Dort hatte ich vortreffliche Lehrer (z.B. Hurwitz, Mikowski), so dass ich eigentlich eine tiefe mathematische Ausbildung hätte erlangen können. Ich aber arbeitete die meiste Zeit im physikalischen Laboratorium, fasciniert durch die direkte Berührung mit der Erfahrung.” Einstein “Autobiographical Notes,” pp. 14-15.

¹⁶ Einstein to Mileva Marić [Feb. 16, 1898] in *Einstein Papers* vol. 1: p. 123.

¹⁷ Isaacson, pp. 27, 61.

she was admitted to the University of Zurich as a medical student in the spring of 1896, that institution of higher learning had first enrolled women only thirty-one years earlier in 1865.¹⁸ Also in 1867, it was the first university in all of Europe to grant a woman a Ph.D.

Mileva probably became acquainted with Einstein soon after she switched her studies from medicine at the university to mathematics and physics at the Polytechnical School in the fall of 1896. They took classes together in the first semester, and within a year they had established a special relationship. When Mileva went to Heidelberg in 1897 to continue her studies, they exchanged letters. Einstein clearly missed her, and he urged her to return to Zurich.¹⁹

Their correspondence gave insights into their relationship. At the time, Einstein was a handsome, healthy, and energetic young man at the height of his vigor. In contrast, Mileva was not considered attractive, and one friend even called her ugly. She was short, walked with a limp, and had suffered some kind of lung ailment, perhaps tuberculosis, that made her sickly. One of the reasons she came to Zurich might have been to improve her health by breathing the clean mountain air in the Alps nearby. Einstein's interest in Mileva surprised at least one of his friends who admitted, "I should never have the courage to marry a woman unless she was absolutely sound." To which Einstein responded, "But she has such a lovely voice."²⁰



Mileva Marić in 1896.

Credit: *Schweizerische Landesbibliothek, Bern, Switzerland.*

¹⁸ Highfield and Carter, pp. 34-39.

¹⁹ See Mileva Marić to Einstein [Oct. 20, 1897] and Einstein to Mileva Marić [Feb. 16, 1898] in *Einstein Papers* vol. 1: pp. 34-35 and pp. 123-24.

²⁰ Highfield and Carter, p. 45.

Mileva was very different than Marie Winteler in personality and education. While Einstein thought Marie had little knowledge and understanding, Mileva was intellectually exciting. Einstein and Mileva wrote to each other about their courses of study, about the lectures they attended, and they also exchanged ideas. He urged her to return to Zurich, which she did in 1898. She took an apartment near his, and they spent much time together studying, reading aloud, and engaging in intellectual discussions.²¹

In the next few years, the salutations in Einstein's letters to Mileva hinted at a deepening relationship. In 1898, he addressed her as "Esteemed Miss_" In 1899, the greetings had gone to "Dear Dolly" and "Dear Sweet Dolly_" In 1900, he wrote to her as "My dearest Dolly_"²² The couple shared an interest in music and in simple pleasures like drinking coffee. Mileva also overlooked Einstein's tendency to be absent minded. He often buttoned his shirts improperly, and he was constantly forgetting his umbrella or keys. Einstein often woke up his landlady at all hours when he called to her, "It's Einstein, I've forgotten my keys again." Mileva started to look after him much like she had cared for her younger siblings when growing up.

Even though Mileva was Einstein's main romantic interest, he was still flirtatious, and he enjoyed interacting with other young women. These included Anna Schmid to whom he wrote a poem with the lines, "Including a kiss on your tiny little mouth." He played duets with Susanne Markwalder, and he corresponded with Julia Niggli who was a friend he had known in Aarau. He even invited Julia for an apparent rendezvous in a hotel, a suggestion which shocked her.²³

Mileva and Einstein took their final examinations at the Polytechnical School in July 1900. They had studied together, and each of them wrote a similar thesis on heat conduction. Five students took the test at that time, and both Einstein and Mileva did poorer than the others. Out of a possible 24 on the theses, Einstein and Mileva got only 18 and 16 respectively while the others got 20 or better. The average grade of the

²¹ Mileva Marić to Einstein [Oct. 20, 1897] and Einstein to Mileva Marić [Feb. 16, 1898] in *Einstein Papers* vol. 1: pp. 34-35 and pp. 123-24. See also Isaacson, pp. 42-44.

²² Einstein to Mileva Marić *Einstein Papers* vol. 1: pp. 124-25, 129, 130, 132, 135-36, 141.

²³ Highfield and Carter, pp. 51-53. See also Einstein to Julia Niggli [July 28, Aug. 6?, and Sept. 11, 1899] in *Einstein Papers* vol. 1: pp. 127-30 and pp. 133-34.

other students on their other tests were 5.14, 5.23, and 5.45 out of a possible 6 points. Einstein's average was 4.91 and Mileva's was 4.00. Passing was believed to be 5 or close to it. As the examiner reported, "Based on these results, the Conference of Examiners move that diplomas be granted to candidates Ehrat, Grossman, Kollros, and Einstein, but not to Miss Maric'."²⁴ Einstein had barely squeaked by, but Mileva had failed. Mileva could have been treated unfairly because of her gender, but she also could have reached the limit of her stamina. However, Einstein continued to enjoy Mileva's intellect, and her academic setback did little to quell his interest in her.

At first, Einstein's mother, Pauline, considered her son's relationship with Mileva as one of his inconsequential romantic interests, yet as the friendship continued, Pauline became more alarmed, and she feared her son might marry the girl. Einstein's mother never fully explained what she did not like about Mileva, but Pauline clearly tried to get her son to end the relationship. The matter came to a head when Einstein met his mother at a spa in Sarnen, Switzerland, shortly after he took his examinations. Pauline asked him about his relationship with Mileva whom she called "Dolly," but Einstein corrected his mother and called Mileva "my wife."

His response set off an impressive "scene." "Mama threw herself on the bed, buried her head in the pillow, and cried like a child." His mother ranted, "You are ruining your future and blocking your path through life." "That woman cannot gain entrance to a decent family." Pauline continued the next day arguing, "She's a book like you—but you ought to have a wife." Referring to Mileva's age, his mother continued, "When you'll be 30, she'll be an old hag."²⁵ Einstein was unmoved by Pauline's performance, and he continued his relationship with Mileva.

Having passed his final examination, Einstein hoped to get employment at the Polytechnical School, but the coveted positions went to others. He then applied to numerous universities around Europe only to be disappointed. Einstein finally believed that the references sent by Dr. Heinrich Weber were negative and kept him from finding work. Weber had become irritated with the young scholar who attended lectures

²⁴ Adolf Hurwitz to Hermann Bleuler, July 27, 1900, in *Einstein Papers* 1: p. 141.

²⁵ Einstein to Mileva Maric' [July 29? 1900] in *Einstein Papers* vol. 1: pp. 141-42.

sporadically and whose attitude was far too self-serving. Einstein's admiration for his one-time mentor had soured considerably since the early days at the school. The young scholar began to think that Weber was more interested in lecturing on old, out-of-date theories rather than addressing the latest scientific developments. This resulted in Einstein's diminished respect for the man, and the young scholar's irritation became obvious. At one point, the professor scolded him, "You'll never let yourself be told anything." Einstein further annoyed the man by calling him casually "*Herr Weber*" (Mr. Weber) rather than the more formal and polite "*Herr Professor*" (Mr. Professor).²⁶

While Einstein was looking for work, he finally received his Swiss citizenship in February 1901. He had been without a country for four years, and his citizenship meant that he could then remain in Switzerland even if he could not find work. Even though he had given up German citizenship to avoid military service, he reported for military training as a Swiss citizen in March 1901. According to his medical examination, he suffered from varicose veins, sweaty feet, and flat feet. The "decision of the examining commission" was that Einstein was "Unfit A" which rejected him from military service.²⁷ He then had all the advantages of Swiss citizenship without the burden of military service.

After a vacation with Einstein in the Alps in May 1901, Mileva became pregnant. At that time, Einstein was seeking permanent employment, and his economic prospects had not yet materialized. Apparently, he never seriously considered marriage to Mileva at that time. He hoped to find work as a patent clerk in Bern, and the stigma of fathering an illegitimate child would have hampered his employability, so the couple decided that their baby was a liability. During the later stages of Mileva's pregnancy, Einstein kept his distance because it would have been scandalous if they had been seen together in public. Mileva went home to her family and gave birth to a baby girl sometime in late January 1902, whom Mileva called "Lieserl," which was a diminutive form of Liese (Elizabeth).²⁸

Einstein took a keen interest in the baby, and he wrote to Mileva asking many questions. "Is she healthy and does she already cry prop-

²⁶ Highfield and Carter, pp. 65, 69.

²⁷ Military Service Book, March 13, 1901, in *Einstein Papers* vol. 1: pp. 158-59.

²⁸ Isaacson, pp. 72-77.

erly? What kind of little eyes does she have? Whom does she resemble more? Who is giving her milk? Is she hungry?" He added, "I love her so much and I don't even know her yet_"²⁹ These sentiments were those of a happy father anxious to see his child, but they were odd coming from a man who soon gave his baby away.

Einstein probably never saw his daughter, and what happened to the child remains a mystery. Maleva's family kept any mention of the child from civic or church records, and her very existence has only been recently established. Michele Zackheim did a careful study on the girl and concluded, "It is my belief that Lieserl Einstein-Marić, born with a mental handicap, died at the age of twenty-one months of scarlet fever . . . on September 15, 1903." Other scholars disagree, and they argue that the question of the child's fate remains unresolved.³⁰

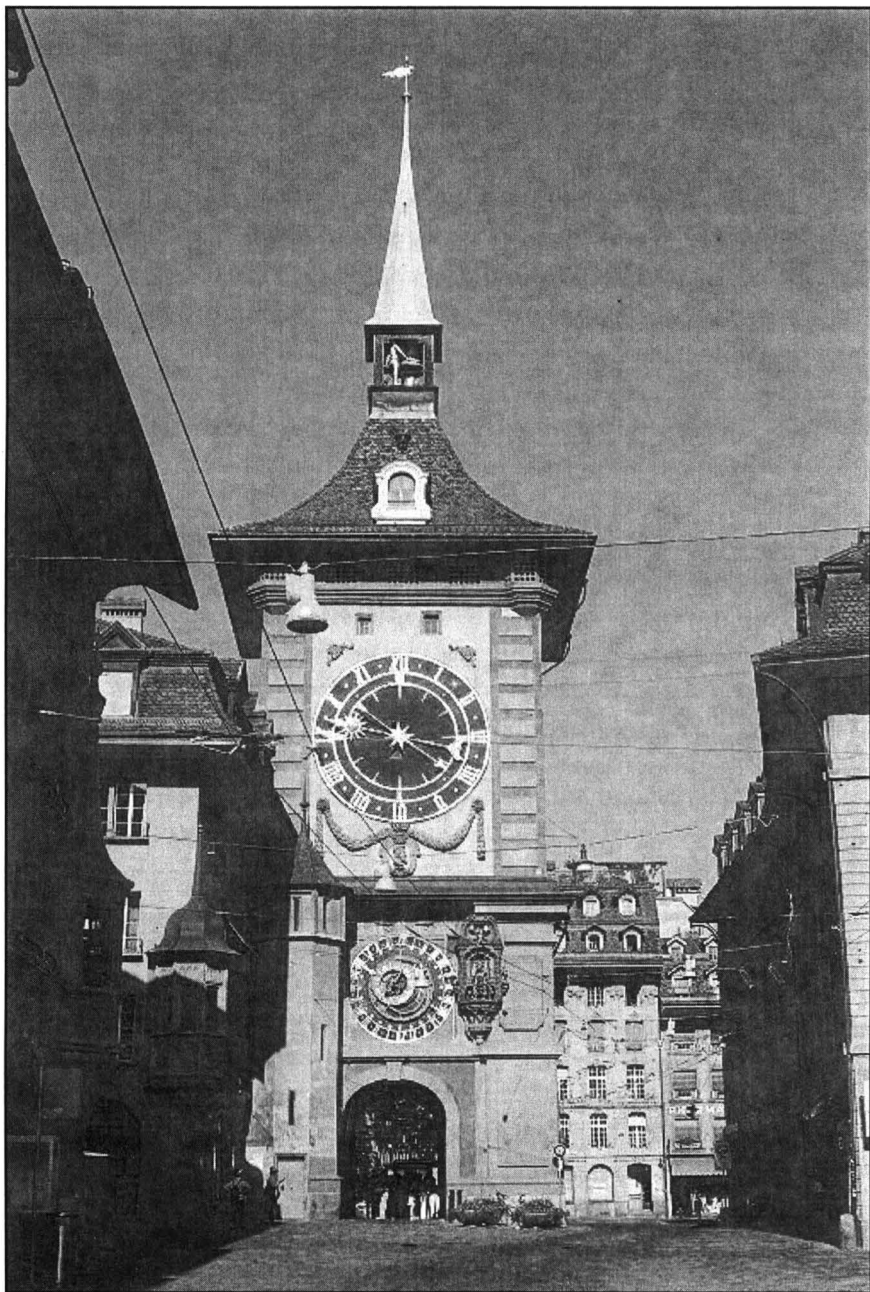
Einstein went to Bern to wait for his position at the Swiss Patent Office, and he tried to support himself by giving lessons on physics. His efforts provided little remuneration, but his teaching helped him meet Maurice Solovine, a Romanian studying at the University of Bern, and Conrad Habicht, a former student at the Zurich Polytechnical School. These young intellectuals soon called themselves the "Olympia Academy," and they enjoyed reading classic works of philosophy, literature, and science which they often discussed at length. Einstein began his employment at the Swiss Patent Office in Bern in June 1902, and Mileva soon joined him, but Lieserl was not with her. Einstein's father finally gave his consent to the marriage, and the couple were wed in a simply ceremony in the Bern city offices on January 6, 1903. Solovine and Habicht were the official witnesses, and the only celebration was an evening meal at a restaurant. There was no honeymoon. A quaint story relates that when Mileva and Einstein went to their apartment, they discovered that Einstein had accidentally locked them out.³¹

The couple soon lived at Kramgasse 49 in the picturesque Medieval section of Bern where a small Einstein museum is now located. He only lived a few hundred yards from the famous

²⁹ Einstein to Mileva Marić [Feb. 4, 1902] in *Einstein Papers* vol. 1: p. 191.

³⁰ Michele Zackheim, *Einstein's Daughter: the Search for Lieserl* (New York: Riverhead, 1999), p. 252. See Issacson, pp. 86-88, Overbye, p. 107, and Highfield and Carter, pp. 90-95.

³¹ Highfield and Carter, pp. 99-100.



Famous medieval clock tower in Bern, Switzerland.

Credit: Mike Lehmann in Wikipedia.

Medieval clock tower in Bern, the *Zytglogge*, and he went past it going to and from work every day. When he was contemplating time as part of his theories of relativity, he probably visualized that clock in his mind. Following the Swiss custom, Einstein placed his name on the door of his apartment, but his friend, Habicht, made a joke of it. He placed a sign on the door which read, “*Albert Ritter von Steissbein*.” Roughly translated it meant, “Albert Knight of the buttocks.” The *Steissbein* is the human tail bone. Einstein and Mileva reportedly laughed at the joke until they were breathless. Their first son, Hans Albert, was born on May 14, 1904, and Mileva’s family finally accepted the marriage at that point.³²

Einstein worked six days a week at the patent office, and he arrived daily at 8 AM. He did not find the work dull as he expected, and he said he “enjoyed it very much.” Also, the pay was more than that of a new professor. The time spent in the patent office was the most creative seven years of his life. As he recalled, “1902 through 1909 were my most productive years due to the fact that I did not have to worry about a livelihood. Also, the work with technical patents was a real savior for me. It forced me to think along many lines and gave me many new ideas to think of in the line of physics.” He added that he had more intellectual freedom at his job than at an academic institution, where he would be “forced to produce scientific writings in great amounts.” This “creates a danger of intellectual superficiality.”³³

The young scholar developed a routine which allowed him to get his work done and study physics as well. “I became accustomed to my work quite fast, and in a short time I was able to do a full day’s work in only two or three hours. The remaining part of the day, I would work out my own ideas, which later, of course, became the Relativity Theory.” His work day was eight hours, so he was essentially being paid to do physics for five or six hours. He was clever enough to avoid detection as he explained, “Whenever anybody would come by, I would cram my notes into my desk drawer and pretend to work on my office work.”³⁴ No matter how Einstein viewed the situation, it remains doubtful that he had everyone fooled for the seven years he worked at

³² Overbye, p. 111, and Highfield and Carter, p. 102.

³³ Einstein “Conversation” in Peter A. Bucky, *The Private Albert Einstein* (Kansas City: Andrews, 1992), p. 26.

³⁴ Einstein “Conversation,” p. 28.

the Patent Office. More likely, his supervisors and coworkers looked the other way and allowed Einstein to continue his studies on the job.

Einstein's intellectual advances were aided by the arrival of his dear friend, Michele Besso, who also worked at the Patent Office starting probably in 1904. Einstein and Besso were almost inseparable, and they spent many hours together discussing Einstein's ideas. While Besso contributed little if anything to Einstein's theories, the great physicist referred to his friend as "the best sounding board in Europe."³⁵

In Bern, Einstein worked on his Ph.D. dissertation for the University of Zurich, which he submitted on April 30, 1905. This impressive work on "Molecular Dimensions" has been overshadowed because Einstein published some of the most important works in theoretical physics in the same year, which has often been called Einstein's "miracle year." In a literal explosion of creativity, he published twenty reviews and four highly significant articles that year.³⁶

He submitted his first handwritten paper to the journal *Annalen der Physik* (Annals of Physics) on March 17, 1905. It dealt with the nature of light. He sent the second article to the same journal on May 11, which discussed molecules. The third was submitted late in June and was entitled: "On the Electrodynamics of Moving Bodies." This paper presented the theory of special relativity, in which Einstein discussed the space-time interval relative to the speed of light. In a gracious gesture to Besso, Einstein concluded his article with, "Let me note that my friend and colleague M. Besso steadfastly stood by me in my work on the problem here discussed, and that I am indebted to him for many a valuable suggestion."³⁷

Almost as an afterthought, Einstein submitted yet another short paper to *Annalen der Physik* that year. "Does the Inertia of a Body Depend on its Energy Content?" in which he argued that there is a relationship between matter and energy. He stated, "If a body releases the energy L in the form of radiation, its mass decreases by L/V^2 ."³⁸ He

³⁵ Einstein in Alice Calaprice and Trevor Lipscombe, *Albert Einstein: a Biography* (Wesport, Conn.: Greenwood, 2005), p. 24.

³⁶ *Einstein Papers* vol 2: pp. 78-179.

³⁷ Einstein "On the Electrodynamics of Moving Bodies," in *Einstein Papers* vol. 2: p. 171.

³⁸ Einstein "Does the Inertia of a Body Depend on its Energy Content?" in *Einstein Papers* vol. 2: p. 174.

later simplified this to the most famous equation in physics $E=mc^2$.

Einstein's creativity continued after the miracle year of 1905 when he was still working in the Patent Office. In 1906, he published an additional five articles in the *Annalen der Physik*. In 1907 he published seven articles; in 1908, four articles; and in 1909, he published four. The year 1907 proved to be a particularly fruitful year, when he had "the happiest [luckiest] thought in my life."³⁹ He explained how he came upon an exciting idea. "I was sitting in a chair in the patent office at Bern when all of a sudden a thought occurred to me, 'If a person falls freely he will not feel his own weight.' I was startled. This simple thought made a deep impression on me. It impelled me toward a theory of gravitation." Einstein's sudden insight made him realize that gravity and acceleration were identical. He published his initial findings in an article in the *Jahrbuch der Radioaktivität und Elektronik* (Yearbook of Radioactivity and Electronics) in November of that year.⁴⁰



Einstein in 1912.

Credit: *Eidgenössische Technische Hochschule Zurich.*

He continued to work on the idea until 1915 when he fully explained the general theory of relativity, which stated in part that gravity was actually a warp in space-time. This meant that the warp around a massive object would bend light. He knew that the Sun was so large that it would bend the light of any star passing near it. The problem was that the brightness of the Sun precluded such an observation unless

³⁹ The term is often translated as "luckiest." He actually wrote, "*der glücklichste Gedanke*" and a better translation is "luckiest thought" or "most fortunate thought." See Isaacson, p. 145.

⁴⁰ Einstein "On the Relativity Principle and the Conclusions Drawn from it," *Einstein Papers* vol. 2: pp. 252-311.

a measurement could be taken during a solar eclipse when the Sun's light would be blocked for a few minutes. This aspect of his theory was dramatically proven in 1919 when a measurement of a solar eclipse in South America and Africa proved that the gravity of the Sun bent the light of stars. The eminent historian, Paul Johnson, has stated that "the modern world began" at that point because it "confirmed the truth of ... [Einstein's] new theory of the universe."⁴¹

The scientific community reacted slowly to Einstein's ideas, but some important scholars were paying attention a few months after he published the initial papers in 1905. Riding on this notoriety, Einstein sought work in academic institutions, starting with the University of Bern nearby. He attempted to get a position as a *Privatdozent* or unpaid lecturer, hoping that he would not have to meet every academic requirement because of his excellent publication record, but his initial application was turned down. In 1908, he was finally given the opportunity to teach, but he had to give instruction at odd hours, and one of his classes met at 7 AM. Only three friends agreed to attend, and there were days when only one was present.⁴²

When the University of Zurich created a new position for an associate professor in theoretical physics in 1909, Einstein was offered the job. He refused the opportunity initially because the pay was too meager, but when it was increased, Einstein accepted. When he wrote to a friend, he seemed to keep some of his sense of humor and his distrust of the academic community, "Now I too am an official member of the guild of whores."⁴³

Einstein took a position at the German University in Prague in 1911 for better pay, but he did not remain long. The city was controlled by the Habsburgs, the Imperial House of Austria. The German-speaking residents of the city were resented by the Czech majority, and Einstein did not like the ethnic tensions in Prague. He also thought the city was dirty, which contrasted sharply with the tidiness of Switzerland, and his apartment was also plagued with bugs. He returned to Zurich the following year. His life in Zurich should have been among the most enjoyable times of his life. The young professor had good pay, a very

⁴¹ Paul Johnson, *Modern Times: the World from the Twenties to the Nineties* (New York: Harper, 1992), p. 1.

⁴² Highfield and Carter, pp. 120-24.

⁴³ Einstein to Jakob Laub [May 19, 1909], *Einstein Papers* vol. 5: p. 120.

nice apartment, and the association with close friends, but there was tension in his household.⁴⁴

Einstein's second son, Eduard "Tete," was born in Zurich on July 28, 1910, but he arrived when his parent's marriage was in trouble. Mileva was becoming less relevant to Einstein's life, and she became very upset when she intercepted a letter between her husband and a married woman, Anna Myer-Schmidt, whom Einstein had met in Aarau years before. Einstein resented his wife clinging to him, and she was unhappy about his other interests.⁴⁵

Mileva's husband even developed a relationship with his cousin, Elsa Einstein Löwenthal. She was his cousin twice over, being his second cousin on his father's side and his first cousin on his mother's side. Elsa was three years older than Einstein, and she had two daughters, Margot and Ilse, by a brief marriage. Einstein had known his cousin when they were children, and the two relatives became reacquainted when he went to Berlin without Mileva during Easter break in 1912. Elsa was very different from Mileva. She was not intellectual, but she gave comfort and was nurturing, qualities that Einstein now craved. Einstein and Elsa started corresponding soon after he returned to Zurich, and their letters were flirtatious and demonstrated a deepening relationship. At age 35, he took the opportunity to work at the Humboldt University in Berlin in 1914 mainly to be close Elsa. He left Mileva in Zurich with their two sons. Einstein and Mileva lived apart for five years and divorced in 1919, and he married Elsa in the same year.⁴⁶ Einstein came to the United States in 1933 which started his career as a Swiss American.

The permanent move to Berlin closed the Switzerland period of Einstein's life. He had lived in the Alpine country for nineteen years, which was the most important time frame for his intellectual and emotional development. He had enjoyed the Swiss and their tolerant cultural climate. But above all, he had greatly profited from the Swiss education system and his job at the Swiss Patent Office, which allowed him the freedom and opportunity to contemplate and discover some of the most profound ideas in theoretical physics.

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⁴⁴ Highfield and Carter, pp. 125-35.

⁴⁵ Highfield and Carter, pp. 130-35.

⁴⁶ Isaacson, pp. 172-83.