

Einstein

His Life and Universe

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Sometime last year we were in Costco. I was bored. Costco is like that for me. Somewhere in the middle of the warehouse was a big stack of books, including a big stack of copies of this new Einstein biography - near 700 pages counting references. I picked one up and started reading in the middle.

Fifteen minutes later it was time to check out and for only \$10.99 plus tax I was able to take my copy home with me and add it to my barely controlled “to read” stack. But it was a good choice. Biographies are how we learn about what we consider greatness and who we, therefore, are.

Einstein is certainly considered “great,” especially in my professional culture. In many ways, some noble, others ignoble, he is exemplary of who we are.

Albert Einstein’s was born into the family of a competent engineer who was not very entrepreneurially successful. In his earliest years he was slow in some ways, particularly language and speech, but excelled at others. Despite urban legends, he never failed math in school, although he did decry mid-career that he hadn’t learned tensor calculus well enough in college to support his work on relativity without significant help. Indeed, he did pretty well academically, when he applied himself at all. He could be arrogant and insensitive, but this didn’t keep him from collaborating with peers who had done well in tensor calculus. His personality kept him from getting the type of job that he needed and wanted until well into his ultimate fame. He worked in the Swiss patent office for many years while working on unifying concepts in physics and didn’t get a doctoral dissertation accepted until he was already becoming famous for some of his early work.

Einstein had a passion for “thought experiments” and no talent at all for experimental science. As a young man, he saw much in the conventional wisdom of science at the time that was not internally consistent. Among his great passions was to reduce the laws of nature to their simplest form while making them consistent. His ultimate goal, a “unified theory” which would bring together what we think of as gravity (general relativity) and magnetism, has not been achieved. Indeed, it may not exist.

Although he is best known for solving the puzzles of special and general relativity, his first five papers in the “miracle year” of 1905 dealt with other issues that needed cleaning up at the time.

His doctoral dissertation was on the size of molecules and his Nobel Prize was for work on quanta of light - photons. He was first well known in physics for publishing a paper on Brownian motion, which had already been experimentally observed but not explained. Einstein derived it from first principles, given the particle nature of matter. The dual particle / wave nature of light was controversial throughout most of Einstein's career, but the particle nature of matter itself was not well understood or accepted at the beginning of his fame.

There is hardly a page in the book where I haven't underlined some clever anecdote, concept, or quip. It is all highly clever. Isaacson has done a very thorough job of going through everything known about Einstein's life and making it into a very presentable, readable, generous story of a very famous man's life. Nothing would be more fun than to go through and retell or expound on each of them, but I cannot in this format.

Einstein was married twice, first to Mileva, who bore him two sons, Hans Albert and Eduardo. There is also new evidence presented in this book that there may have been a pre-marital girl as well, but a serious and nearly successful attempt was made to eradicate all records of and correspondence about her life so the research is difficult. Hans Albert became a successful engineer in America and Eduardo ended up in mental institutions in Europe.

Mileva was a classmate of Albert's in college, one of the few girls in science in that era. She did not graduate. She tried twice to pass the exit exams but did not score well enough. Pregnancy interfered both times. Einstein difficulties in his early career, successes later, and non-warm personality were ultimately more than Mileva would repeatedly relocate for. Also, Einstein did not believe that humans were naturally monogamous and had many affairs, though few of them were very serious. Difficulties in both marriages were compounded by all of this. There was estrangement, separation, and finally a divorce. In negotiation Einstein made a remarkable offer to Mileva which she accepted. He believed he was certain to win the Nobel Prize one day and when he did, he would give her the prize money. He was good on his word for this, but controlled the money in a way that protected her. She used some of it to buy apartment buildings and lived on their income.

His second marriage was to his cousin Elsa Einstein. This is the woman who shared his fame and enjoyed doing so. There were no more children, but Elsa had daughters from a previous marriage, one of whom may have had an affair with Einstein herself at some point. Albert's philandering was hard on Elsa as well, but she stayed with him to her death in Princeton, which devastated him for a time.

Having tidied up several messy corners of science, Einstein developed the theory of special relativity. This is basically the outworking of the idea that there is no absolute inertial frame of reference in the universe. Spinoffs of this work include the famous equation $E = MC^2$, the shape of the universe, and an explanation of the null result of the Michaelson-Morely experiments to detect an aether. Over ten years later, he generalized this work (so to speak) with general relativity. This is the outworking of the hypothesis that all accelerations are equivalent, whether

made by changes in velocity or by gravity. Indeed, mass warps space-time such that a manifestation that we think of as gravity results. I do not know enough tensor calculus to follow the equations. Something to add to my todo list.

Einstein became really famous after general relativity was proven by measurements of light bending around the sun during a solar eclipse in 1919. Einstein did none of the experimental work, but he encouraged astronomers to pursue it.

These plus the particle / wave duality of everything led at once to a unification and comfortingly deepened understanding of the universe. They also led into an abyss of probabilistic indeterminism from which Einstein recoiled, though he could never fully extract himself.

Among the most humorous developments throughout the story is the ongoing interaction between Einstein and Neil's Bohr, the champion of quantum mechanics. For decades, from conference to seminar to private exchange, Einstein essentially held that "God does not play dice with the universe." Ultimately, Bohr told Einstein to quit telling God what to do! Einstein used his immense understanding of science to try to poke holes in quantum mechanics but the forces under Bohr who were defending and developing it reacted by shoring up their theories. Bohr's personal reaction to all this is the funny part. He was often reduced to muttering and would be heard saying, "Einstein, Einstein, Einstein!" From my perspective, Einstein did a great deal to firmly establish quantum mechanics through this very recalcitrance.

Einstein was culturally Jewish and was born in Germany, but he hated the military discipline of the Germans and renounced his citizenship. He had no country for a time, was Swiss for a while, resumed being German for a while, in order to take a job there, and ultimately ended up American. Though he was courted by various institutions in America, notably Caltech, he found California somewhat silly (despite Milliken) and ended up working at Princeton, essentially without real responsibilities for the second half of his career.

Einstein created the persona of the absent minded scientist. He was disheveled and frumpy, witty and unconcerned. Once his fame was established, he rode it to try to make the world a freer place for all, making many political enemies along the way. He loved his sailboat though he could not swim and, unconcerned for his own safety, was rescued by the Coast Guard a few times. It's not clear that it is true, but there is an anecdote about Einstein that he called Princeton one day to ask where his own house was.

The World Wars defined Einstein's path in many ways. World War One action interfered with an eclipse observation in Russia that might have proven general relativity before 1919, for example. As a Jew, he was unwelcome in his own homeland, increasingly so with Hitler's rise. He hated what Hitler stood for intensely and threatened to leave Europe permanently should the Fuhrer's power increase. It did and as the war was developing in Europe, Einstein's happenstance to be in America at the time turned into permanent residency and ultimately citizenship. Other family members such as Mileva, Eduardo, and several cousins and inlaws fared poorly in the war and

the devastated Europe that followed. Some disappeared and seem to be lost from the narrative. Einstein had been a pacifist, doing such things as encouraging two percent of citizens to refuse military service as a step towards world peace. When Hitler rose to power, he stopped promoting this idea, at least for the enemies of Hitler.

Einstein died of an aortal aneurism. There were procedures that might have been attempted to extend his life beyond age 76 but, to his credit, he declined, saying that nature should take its course. He worked on equations, fruitlessly, in the hospital up to the end. In a bizarre twist, truth being stranger than fiction, the doctor performing the autopsy kept his brain. The rest was cremated. The brain was diced and dissected and toured the country with this doctor for decades. Ultimately it ended up back with the family. At one point it was nearly used to prove paternity. A woman who had been raised as a grand-daughter of Einstein thought she might have been a direct child. (Einstein himself, when someone claimed to be his child, did not dismiss the possibility out of hand, having been far from monogamous.) Unfortunately, the brain had not been preserved in such a way that DNA verification was possible.

Although he could not be cleared by the U.S. Government establishment to work on anything substantial in the Manhattan project, it is well understood that his work in relativity led to the understanding of how to make nuclear bombs. Making the bombs was an engineering project, something Einstein would not have excelled at, but he did write a letter to President Roosevelt (a long story in itself) discussing his concerns about the possibility of Germany developing the bomb first and having a huge advantage late in the conflict. The fears turned out to be ill founded. Hitler prioritized other things, to our benefit, but the bomb was made nonetheless, by us.

Given Einstein's pacifist, anti-military nature, this is truly ironic.

Long and detailed though it was, I found this biography enjoyable and hard to put down. There is cleverness and enlightenment on every page, a hundred or a thousand times as much as I have been able to even allude to here. To understand what humans in our age think of as great and to therefore understand a little about who we are and who we have been made to be, I recommend Isaacson's Einstein as an excellent study.