Einstein in His Youth

The Collected Papers of Albert Einstein. Vol. 1, The Early Years, 1879–1902. JOHN STACHEL, editor. David C. Cassidy and Robert Schulmann, associate editors. Jürgen Renn, assistant editor. Princeton University Press, Princeton, NJ, 1987. lxvi, 422 pp., illus., + plates. $52.50. English translation, Anna Beck; Peter Havas, consultant. xxii, 196 pp. Available only to purchasers of the main volume: paper, $22.50; microfiche, $10.

This publication of the papers of the greatest physicist of the modern age is a momentous and welcome event. Over half of the 142 documents of the first 23 years of Einstein's life that are contained in the initial volume are here made available for the first time, including over 50 letters between Einstein and Mileva Marić, the fellow student whom he was to marry.

Publication of the Einstein papers was contemplated from the time of his death in 1955. In 1971 the Einstein estate signed an agreement with the Princeton University Press for publication of the complete writings, scientific and nonscientific. Now, after 16 years of search for funding and over a decade of litigation, arbitration, and dedicated labor, we have the first of a planned 35 volumes of a complete edition encompassing 43,000 documents. The project will certainly run well into the 21st century.

The editorial selection of materials, preparation of the texts, and annotations are scrupulous and expert. Where I have been able to check the text against archival originals, it is faithfully rendered. An introductory excerpted biography of Einstein by his sister is valuable for bringing us family lore as well as her own recollections. The volume's appendixes, especially the biographical sketches of persons significant in Einstein's life, are useful, as are the photographic plates and other illustrations. The editors have rendered a magnificent service by giving us all the known early letters, writings, school records, and personal documents of or pertaining to Einstein.

A companion paperback volume of English translations, available only to the purchasers of the documentary edition, contains neither notes nor editorial apparatus. The translations appear to have been made in a hurry, are often awkward in the rendering of Einstein's clear and pungent style, and are sometimes misleading. The Princeton University Press does not presume to offer this translation as a standard against which other translations are to be measured and promises to commission a more "elegant" translation in the future. I have done my own translations for this essay, and I advise readers who wish to appreciate Einstein to do likewise.

Another deficiency is in the geographic apparatus. The map showing the significant locales of Einstein's first two decades is grossly inaccurate, for example placing Lugano on Lago Maggiore and Heidelberg in the location of Heilbronn.

What do we know with the publication of these *Collected Papers* that we did not know before? We know a great deal more about Einstein's relationship with his future wife, Mileva. We know for the first time of their premarital child. The volume offers a fleshed-out picture of Einstein's human relationships. We are given the data from which to draw a richer, more nuanced and fine-grained portrait of his adolescent development. An attempt at assessment of the man, his personality, and his mind is now more possible than ever before.

Einstein was a child of the central European "heartland." If one draws a circle with a radius of 300 miles centering on Zürich one touches the significant loci of his early life. He was born in the south German city of Ulm, he attended Gymnasium in Munich, his parents lived in Pavia and Milan in the Po Valley. He holidayed with his family and school class in Alpine resorts of Switzerland and hiked with Mileva over Swiss and Italian passes such as the Klausen and Splungen.

Albert benefited from a combination, ideal for him, of nurturance and being forced to early independence. As a child he was so slow in learning to speak that his concerned parents consulted a doctor about the problem. He was pushed to autonomy by the arrival of a sibling when he was two-and-a-half years old. Of his baby sister, according to the biographical sketch she later wrote, he said, "But where are her wheels?" To little Albert the baby was a disappointing and unsatisfactory toy. At age three to four, his sister records, he was allowed to venture alone on Munich's busiest streets. The first time he was accompanied, the second time he was watched without knowing it, thereafter he crossed the boulevards on his own. While watching a parade as a boy Albert was frightened because the marching soldiers seemed to have no wills of their own. He made his parents promise that he would never have to be a soldier.

The issue of anti-Semitism was ever present in Einstein's life and early taught him the position of solitary opposition. The fact that he became a Zionist in the 1920s is entirely consistent with his life experience. Of his school encounters in Munich, he recalled in 1920:

> Among the children, especially in the elementary school, anti-Semitism was vigorous. It was based on the children's peculiar consciousness of racial characteristics and on impressions from religious training. Violent attacks and abuse were frequent on the way to school, but usually not too vicious. They sufficed, nevertheless, in establishing a strong feeling of estrangement already in the child [p. lx, note 44].

A number of Einstein's relatives had an inclination for mathematics, including his father, Hermann. Albert was not particularly good at arithmetic. In his 11th year he went through an intense Jewish religious phase in which he refused to eat pork. This religious orthodoxy passed within a year. He was not bar mitzvah.

There is a part of the Einstein legend that warms the hearts of schoolboys and of scholars who cannot find suitable academic employment. The historian Felix Gilbert describes Einstein's early career as a "catastrophe." Einstein himself called it a "comedy." His Gymnasium teacher told him he would never amount to anything and expressed the wish that he leave the school, saying, "Your very presence destroys my respect in class." Einstein in fact left the Gymnasium without a *matura* and so was ineligible for admission to any German university.

The Einstein family moved a great deal owing to economic reversals. When Albert was 15 months old the Einsteins moved from Ulm to Munich, when he was six they changed homes in Munich, and when he was 15 they moved to Italy.

The axial period of Einstein's emotional development was ages 15 to 16. At 15, when his family moved to Italy, he was left alone to finish his schooling in Munich. Becoming depressed and nervous, he withdrew from the Gymnasium without graduating and went to his parents in Milan, who were aghast at his self-willed behavior. Albert was adamant in refusing to return to Munich, but he promised to prepare himself for the fall entrance examinations to the highly respected ETH, the Swiss Federal Institute of Technology, in Zürich, which he did. He was permitted to take the entrance examination although he was two years under the regular age of admission

because he was recommended to the director by a family friend as a "Wunderkind." He failed the general literary and historical part of the examination and was referred to the Aargau Kantonsschule in Aarau, about 40 kilometers west of Zürich. He completed the *matura* there with the highest average in his class and entered the ETH in October 1896.

Einstein decided at 16 to renounce his German nationality. The ideological reason was his dislike of the German worship of authority. The editors believe that his motive was to avoid service in the German army. Even at the turn of the century, before the world knew that the status of "stateless" meant jeopardy to life itself, to surrender the protection of nationality was no small matter. For the five years from 1896 to 1901 Einstein was legally without a country (*heimatlos*). As a "tolerated" (*tolerirt*) resident in Switzerland he could have been expelled at any time. Two family friends had to post bond for him. The complex procedure by which he acquired Swiss citizenship is documented. Included are reports on his character obtained by the police from friends and landladies. The scrupulous Swiss also required a detective report on the business record and financial assets of the Einstein family in Milan. After recounting the economic vicissitudes of the family, the report closes on the melancholy note, "A fortune [not "real property" as in the translation] is, as far as we know, not present" (30 January 1901). The sober burghers of the Zürich Municipal Naturalization Commission summoned Einstein to an interview in which they inquired about his drinking habits and whether his family had a history of syphilis. Satisfied, they approved his application while laughing at him and teasing him about his ignorance of the world. Despite his lack of wealth or prospects thereof Einstein was admitted to the privileges of being a burgher of Zürich, which conferred Swiss citizenship.

The image of Einstein as a cold, detached person that is put forth by some biographers—for example Ronald Clark, who wrote that Einstein was "a man who excluded emotion from his life whenever possible"—does not square with the evidence of these early letters and relationships. He was capable of intense, lasting friendships and benefited from them. Gustav Maier of Zürich ran interference for him in his early attempt to enter the ETH. The father and uncle of his friend Michele Angelo Besso of Trieste tried to get him an academic position in Italy when all doors in the north were closed. The job Einstein eventually got as a provisional Technical Expert, Third Class, at the Swiss Patent Office was obtained through the connections of the father of another friend and classmate, Marcel Grossmann.

Einstein had a lifelong intimate relationship with the family Winteler of Aarau, with whom he boarded for a year while attending school there. Indeed, there was a web of intermarriages and interrelationships between the Einsteins and the Wintelers that Albert initiated. Jost Winteler was a teacher of Greek and history, a political and religious liberal. Einstein became a member of the Winteler family, referred to the parents as "Papa" and "Mama," and had his first, platonic, love affair with their daughter Marie. Albert's sister Maria married a Winteler son, Paul. Albert's lifelong friend Michele Angelo Besso married Anna Winteler, another daughter.

But the compelling evidence of Einstein's passionate nature is in his hitherto unpublished letters to Mileva. The letters express longing and love as well as thoughts on physics and the problems both of them had with their parents and in getting teaching positions:

> As long as I have joy and strength in me, I will be happy in your embrace, and you will be holy to me. And my happiness is your happiness. If you knew what you meant to me you would not envy any of your girl friends; because if I may say so, you have more than all of them. In any case, come to me in Como and bring along my blue robe in which we may both wrap ourselves, and also do not forget your opera glasses. Additionally bring a joyful heart and a clear head. I promise you, you never had such a splendid excursion, even if it rains cats and dogs [30 April 1901].

The 21-year-old Albert held his own with his mother on the issue of his relationship with Mileva. Pauline Einstein campaigned with what he termed "the treatment." She staged "scenes," threw herself on her pillow, and cried like a child. She told Albert he was ruining his future and destroying his life because "Mileva is not presentable in any decent family." "She is a book like you—but you should have a wife." Albert countered energetically, affirming that he planned to marry Mileva, so that when his mother saw she was accomplishing nothing but enraging him she gradually desisted in her offensive (29 July 1900).

In January 1902, a year before their marriage, Mileva bore a daughter named Lieserl while at her home in Novi Sad, Hungary, now a part of Yugoslavia. Before the child was born Einstein wondered how to bring her to Switzerland: "I would not like to have to give her up" (12 December 1901). After her birth he enthusiastically inquired about the infant's behavior and appearance. He asked for a photograph and wrote; "I would also like to make a Lieserl once, it must be just too fascinating" (4 February 1902).

Though Einstein made close friends among his peers and their parents, he did not relate well to his mentors or to authorities. He offended them and thus made himself rejectable. The young Einstein was obstinate, sure of himself, unimpressed by authority, and often scrappy when he felt unjustly treated. While he was a student at the ETH Einstein discovered two errors in the electron theory of the distinguished physicist Paul Drude and wrote Drude to make him aware of his mistakes. Einstein was convinced that when Drude saw his proofs he would be impressed because they were so simple. He also hoped that Drude would give him a job. Drude's response filled Einstein with rage. As he described it to "Papa" Jost Winteler:

> What you said about the German professors is not at all exaggerated. I have once again encountered a miserable example of this type—one of the leading physicists of Germany. To two factual objections against one of his theories which I sent him, and which prove a direct defect in his conclusions, he answers with a reference to another (infallible) colleague who shares his view. I am shortly going to heat it up for that man with a vigorous publication. The stupor of authority is the greatest enemy of the truth [8 July 1901].

Einstein was undaunted by the prospect of having his doctoral dissertation on the kinetic theory of gases rejected by Professor Alfred Kleiner. He wrote Mileva that he would simply publish the letter of rejection with the dissertation. He was, however, bitter at the smug and powerful authorities:

> The obstacles that these old philistines place in the way of all those who are not their sort are really frightful. It seems to me this type instinctively views every young intelligent mind as a threat to his wormeaten dignity. If he dares to reject my doctoral thesis, then I will publish his letter of refusal, black on white, together with the dissertation, and he will have shamed himself. But if he accepts it, then we will see what position the nice Mr. Drude takes. . . . A pompous group, all of them. If Diogenes were alive today, he would search with his lantern for a *decent* person in vain [17 December 1901].

Einstein's darkest hour came when, upon graduation from the ETH, he was unable to find an academic position. He felt that he lacked support from his teachers. He applied to each of the leading physicists in Europe for an assistantship. The rejections and unanswered letters were persistent and frustrating. As he put it, "Soon I will have honored all physicists from the North Sea to the southern tip of Italy with my offer!" (4 April 1901). Einstein was convinced that Professor Heinrich Weber was giving him a bad reference and that he would never get a job. He tried to secure an assistantship in Italy because "one of the chief difficulties, namely anti-Semitism, which in German lands is as obnoxious to me as it is harmful, is absent

here" (27 March 1901). Mileva wrote to a friend of hers, "You know my darling has a very sharp tongue and moreover is a Jew" (23 November–mid-December 1901).

Hermann Einstein was a loving father without academic connections who saw his boy desperate and depressed and who was eager to improve his son's prospects. He humbly appealed to the eminent Wilhelm Ostwald at Leipzig for a few words of encouragement to Albert. A note from Ostwald, pled the father, would restore Albert's joy in life. Father Einstein also asked for an assistantship for his son and cautioned that Albert knew nothing of his initiative.

In the summer of 1901 Einstein worked as a substitute teacher in a technical school in Winterthur. Then he applied to several secondary schools for teaching positions, unsuccessfully. He was finally reduced to being a private tutor for an English boy who was preparing for the ETH. During this depressing period he wrote Mileva, "I swear a solemn vow that I will always help gifted young men whenever it is in my power" (12 December 1901). It was a promise he kept.

The appointment to the Swiss Patent Office came as a deliverance. Einstein was elated with the job and the security it offered, with the coziness and charm of medieval Bern, and with the large room he rented for himself and Mileva. He drew a sketch of it for her describing the placement of every picture and piece of furniture (4 February 1902). This was to be their home in Bern, where he wrote the three great papers of 1905 that transformed modern science.

What made Albert Einstein the creative person he was? Unquestionably he had genetic endowment, but what were the psychological specifics of this genius and what was their etiology? If we knew how to create an Einstein every ambitious middle-class family would be following the formula.

On the basis of these newly published documents we can say that Albert had an early, strong sense of autonomy as expressed by his leaving home, applying for admission to the ETH before he had reached the usual age of admission, giving up his citizenship to be a stateless person at age 16, and refusing to let his mother dictate his personal relationships.

Certainly such a sense of self-worth has much to do with a supportive home environment. His mother was immensely proud of Albert's early intellectual achievements. She wrote her sister of his excellent grades in primary school and her pleasure in his being first in the class. However, support alone is not enough—it can also stultify development and foster dependency. What Einstein had was the special balance of intense early nurture and autonomy that gave him a self-esteem that would carry him through the years when he was homeless, degreeless, and jobless. He was consequently never hopeless or loveless.

There are, of course, a number of puzzles and unanswered questions left by the publication of this correspondence. Why did Einstein begin his doctoral work with Heinrich Weber and continue it with Alfred Kleiner? Why did he withdraw his dissertation in 1902? Was it truly, as the editorial note suggests, out of consideration for Kleiner's friend Ludwig Boltzmann, whom Einstein had sharply criticized? Did Weber really stand in the way of his getting a job, as Einstein believed? There is no evidence produced, although it should be available. Lastly, what happened to his daughter Lieserl? If she died, when and where? If not, there could be an 85-year-old lady in Novi Sad today bearing Albert Einstein's genes.

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The Vertebrates Updated

Vertebrate Paleontology and Evolution. ROBERT L. CARROLL. Freeman, New York, 1987. xiv, 698 pp., illus. $52.95.

For decades A. S. Romer's *Vertebrate Paleontology* in its three editions was the standard textbook in the field in the English language, consulted by several generations of students of its increasingly fact-filled subject. Common wisdom had it that Romer would surely be the last mortal to survey the whole field between two covers. To do this, Romer had found it necessary to approach the subject from a nearly completely biological point of view, giving only the briefest of comments on other facets of the discipline. Indeed, Romer was a strong advocate of the notion that vertebrate paleontology is scarcely a discipline at all; rather, it is a subdivision of biology, not just a "service subject" to be taught in geology departments that recognize the value of biostratigraphy. Romer cut Gordian knots without remorse; to the unsuspecting reader, few problems clouded the didactic scenery. Yet as any who wrestle with the complex issues in the field know, scientific problems abound—a major factor that makes the subject interesting and fun for researchers and general readers alike. For those requiring a deeper view, Romer wrote a supplemental book, *Notes and Comments on Vertebrate Paleontology*, in which various murky problems were discussed less dogmatically. With the last edition of *Vertebrate Paleontology*, in 1966, the "Romer view" became frozen, and inevitably it became outdated rapidly as the field experienced relentless and seemingly exponential expansion. No single-authored textbook attempting the same broad sweep and offering so much detail in a single volume could be named successor.

Carroll's encyclopedic tome succeeds in replacing Romer's masterpiece, although contentious specialists will surely quibble about the depth and accuracy of Carroll's treatment of "their" animals or about his eclectic systematic principles. But Carroll has single-handedly done Romer one better by bringing the ever more complex story either up-to-date or close to it. He writes extremely well, as did Romer. As before, coverage proceeds from "fishes" to mammals, with well-illustrated and well-organized chapters covering various real as well as paraphyletic groups. Scattered through these are discussions of such topics as the methodology of phylogenetic systematics, dinosaur extinction, flight in its various forms, and the evolutionary process.

Philosophically, *Vertebrate Paleontology and Evolution* is a book in transition. While for the most part true to the Romer tradition of dogma, phenetics, and paraphyly, Carroll has stuck an exploratory toe into cladistic waters. Interspersed with familiar but nearly useless "balloon," "stick," and "spaghetti" phylogenies are a few cladograms supported by characters at the nodes. In contrast to the older-style phylogenies, in which constituent taxa are often left unconnected and convey little more information than what is known about geologic ranges, the cladograms express explicit and testable hypotheses of genealogical relationship. These breathe scientific method into the subject and set the stage for further progress rather than scholastic stasis. Carroll attempts to acquaint us with the basics of phylogenetic reconstruction in chapter 1, but I found his understanding flawed. In place of words like "established," "known," "recognized," "revealed," "found," and "refutes," I wish he were thinking in modest terms like "hypothesized" or "contradicted." Carroll gets into hot water when he deals with the biological species concept, lineage branching, and stratofanatic assumptions of lineage continuity in the known fossil record that remind me of "connect-the-dots" art. *Mirabile dictu*, he also treats paraphyletic groups as an inevitable result of the process of evolution, whereas I would hold that paraphyletic groups are the result of what researchers do when they create a "non-group" remainder by the subtraction of one hypothesized monophyletic group from another one.

The text ends with an interesting chapter