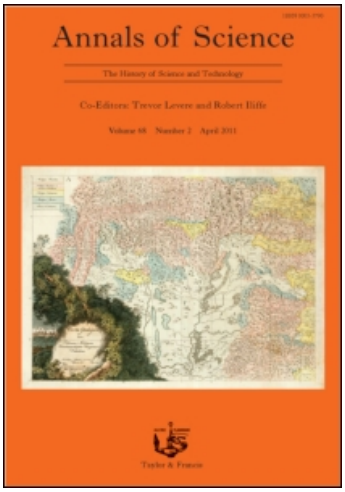

Annals of Science
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713692742

The Myriad Pieces of Einstein's Remains

Alberto A. Martínez[a]
[a] Department of History, University of Texas at Austin, Austin, TX, USA

First published on: 09 July 2010

To cite this Article Martínez, Alberto A.(2011) 'The Myriad Pieces of Einstein's Remains', Annals of Science, 68: 2, 267 — 280, First published on: 09 July 2010 (iFirst)
To link to this Article: DOI: 10.1080/00033791003683310
URL: http://dx.doi.org/10.1080/00033791003683310

Annals of Science,
Vol. 68, No. 2, April 2011, 267–280

Taylor & Francis
Taylor & Francis Group

Essay Review

The Myriad Pieces of Einstein's Remains

John Stachel, Robert Schulmann, Diana Kormos Buchwald, et al., editors, *The Collected Papers of Albert Einstein*, 12 Volumes. Princeton, NJ: Princeton University Press, 1987–2009.

Reviewed by

Alberto A. Martínez, *Department of History, University of Texas at Austin, 1 University Station B7000, Austin, TX 78712-0220, USA*

By 1919, Albert Einstein's thoughtful but absent-minded friend, Michele Besso, had lost all of his copies of Einstein's publications. He then suggested that Einstein publish an edition of his collected works, with an introduction that 'would convey which works were already familiar to you at the beginning of your work: Boltzmann, Lorentz (precisely *which* of their writings), then Planck (precisely *which* writings)'. Nothing came from this request. Also in 1919, Ludwig Darmstadter asked Einstein to bequeath his entire correspondence to the Prussian State Library. Einstein then agreed to contribute only 'the letters worthy of preservation', though ultimately his papers did not end up in Berlin. After his death in Princeton in 1955, his close friend economist Otto Nathan and his devoted secretary Helen Dukas, as Trustees of his Estate, laboured to collect and organise his documents to make them eventually accessible to the public.

Einstein had appointed Nathan as sole Executor of his Estate, and hence Nathan operated conscientiously to administer materials and to facilitate publication in many languages. Selected collections of Einstein's publications had been issued in Japanese and Russian, but nothing comprehensive. For years, Gerald Holton of Harvard University earnestly laboured to help Dukas to catalogue, describe, and microfilm many documents. By the late 1970s, the long project of publishing Einstein's collected papers finally began. I will review the entire series to date, 12 volumes, focusing on the latest volumes but first describing the early days of the Einstein Papers Project.

Einstein worked at the Institute for Advanced Study (originally housed at Fine Hall of Princeton University) for 21 years, until he died. Hence, the Director of its academic Press, Herbert S. Bailey Jr, enthusiastically led an effort to publish Einstein's scientific papers. But Nathan convinced him that they should publish not just the science but all of Einstein's writings, believing, in particular, that Einstein's writings on peace would eventually be regarded as more important than his physics. In 1971, the Einstein Estate finally reached an agreement with Princeton University Press to publish the complete 'Writings of Albert Einstein'. For years, they collaborated to plan the enormous project (they guesstimated roughly 10,000

Annals of Science ISSN 0003-3790 print/ISSN 1464-505X online
http://www.tandf.co.uk/journals
DOI: 10.1080/00033791003683310

documents in the Estate) and to secure funding. But they had difficulties finding an appropriate founding editor; some historians did not want the job, others were not offered the opportunity. From 1971 until 1976, three successive committees worked on the problem of finding a suitable editor. Meanwhile, Helen Dukas supervised the production of a microfilm copy of the Archive, carried out by the Princeton Microfilm Corporation at the Institute for Advanced Study. It yielded 61 reels of microfilm, in three copies: one for the Firestone Library of Princeton University, another for the Library of the Institute and a third for the Editor of the Papers Project.

Then, physicist Peter Bergmann, one of Einstein's closest collaborators in the late 1930s, recommended as prospective editor a fellow physicist who specialised in relativity: John Stachel, who for years had been agitating for an edition of Einstein's writings. In 1976, with the goal of obtaining funding from the National Science Foundation and the National Endowment for the Humanities, Princeton University Press appointed Stachel as editor. Previously, he had no experience editing historical documents. But thanks to a summer course sponsored by the National Historical Publications and Records Commission, taught by David Chestnutt and Mary Jo Kline, Stachel learned to apply the principles of 'historical editing' that had been developed in edited collections such as Julian Boyd's *The Papers of Thomas Jefferson*, Nathan Reingold's *The Papers of Joseph Henry* and especially Arthur Link's *The Papers of Woodrow Wilson*, all of whom Stachel visited.

Stachel started on January 1977; he laboured to familiarise himself with the immense collection of documents, to interrelate them. To protect the original documents, a full-sized printout of the microfilms was created. Stachel and his assistants began to compare each printed document with the corresponding original document, Xeroxing the originals of all unreadable or un-copied documents. Nathan objected to Stachel's assistants handling any original documents, so from August 1977, the editor alone worked on conforming copies to the originals, thousands of them. Stachel and his assistants (mainly Alice Calaprice) gradually organised and counted the items, developing a numerical Control Index, using punch-cards and the Princeton University mainframe computer. Consequently, they realised that the initial estimate of items had been wrong by more than a factor of four: there were actually some 42,000 items. This unexpected superabundance caused immense strains on the original plan to complete labours by projected time frames. And there were additional difficulties.

For years, Helen Dukas and Otto Nathan had acted as intermediaries, deciding which particular documents from the Einstein Archive could be seen, when, and by whom. Yet the Project's mandate was to produce a substantially complete edition of Einstein's papers, the only such edition of any scientist's papers. At times, Nathan and Dukas disagreed with Stachel's willingness to really publish *all* of Einstein's documents. There was a clause for 'privacy' in the Estate's initial contract, and Dukas had kept some personal letters out of the Archive files. Also, Nathan objected to Stachel's desire to revive an international search for documents. Although the Estate did not own all of Einstein's letters, it controlled their copyright, including those not in its possession. Hence Nathan and Dukas had previously managed to block publication of a book of early letters (in the possession of Einstein's son Hans Albert and his wife) between Einstein, his first wife Mileva Marić, and Hans Albert. And, Nathan and Dukas had required excisions from the correspondence between Einstein and Michele Besso, published in 1972. Moreover, several letters disappeared

from the Archive at Princeton before it was transferred to Jerusalem, but fortunately Stachel had made copies of most of them. (Such copies have now been published, as noted farther below.)

To prepare a funding application for the National Science Foundation (NSF) and the National Endowment for the Humanities (NEH) within a six-month deadline, Stachel prepared a plan of work that involved an exhaustive search for documents and full publication of the results. Consequently, Otto Nathan wanted to reverse his appointment as sole editor, proposing instead a trio of editors-in-chief, including Stachel; plus a general administrator. Nathan argued that no one editor could handle all of Einstein's physics, be equally knowledgeable about non-scientific matters; and, that a lone editor might perish, derailing the enterprise. Nathan hoped to work as co-editor, letting Stachel focus on Einstein's physics while Nathan would work on political materials. To that end, Nathan refused to sign Stachel's contract. By contrast, Bailey was pleased with Stachel, and the complications and costs of finding and hiring more editors seemed excessive. Consequently, the Editorial Advisory Board voted to keep Stachel as editor-in-chief, and to hire appropriate associate and assistant editors as originally planned. But the Estate remained unsatisfied. In 1979, they took their disagreement to arbitration. Stachel continued to labour, at first with just one assistant, and then had to cease direct work on the project. In 1980, in New York City, Judge Harold R. Tyler presided over arbitration hearings for ten days and finally favoured Princeton University Press and Stachel, in this noble 'tragedy'. Nathan rejected the decision, further delaying resumption of the project by appealing through two levels, to the highest court in New York State, even selling some of Einstein's most important manuscripts to finance litigation. Meanwhile, initial funding from the NSF and the NEH was running out, and the Project was unable to submit new applications for funding due to the legal problems. Fortunately, Harold W. McGraw made a major donation to endow the salary of an editor. In 1981, the Press finally won the case.

In early 1982, the Trustees of the Einstein Estate transferred responsibility for his papers to the Hebrew University in Jerusalem, Einstein's final heir as stipulated in his will. Thus the Estate of Albert Einstein was dissolved. Helen Dukas died soon thereafter, in February 1982, having dutifully finished her faithful labours. The Hebrew University became a dedicated and congenial partner to Princeton University Press.

After Herbert Bailey, Walter Lippincott became the new Director of Princeton University Press in 1986, inheriting the immense Einstein project. Stachel recalls that Lippincott told him 'at our first meeting no less, that if he had been Director of the Press he never would have started the project'. Nevertheless, in 1987, the Press published the elegant first volume of *The Collected Papers of Albert Einstein*. It did include the important early correspondence between Einstein and Mileva Marić, which had been rediscovered by Robert Schulmann in 1985. (Stachel knew that the descendants of Hans Albert Einstein held letters that the Estate did not, and he had been attempting to obtain them and had been misinformed that they included none from before 1914.) With help from Reuven Yaron, representative for the Hebrew University, the Einstein family finally allowed Yaron and Stachel to make copies of the letters, more than 400, and kindly refused any financial remuneration. The earliest letters included material of great human and scientific interest that thoroughly reshaped Volume 1. They also involved plenty of personal drama and unanswered questions: especially the disclosure of the birth of a daughter before Einstein and Marić's marriage, and the question of the nature of Marić's contribution

to Einstein's early researches, which captured the international attention of journalists and generated much speculation.

In the editorial work, Schulmann and David Cassidy labored alongside Stachel. Since Stachel held a tenured position at Boston University, after seven years on leave, Herbert Bailey agreed to Stachel's wish to move the Project to Boston University. There, Schulmann and Cassidy received appointments in the History Department, and Jürgen Renn and Don Howard joined the project. In 1988, after finishing work on the second volume, at a time of conflict among the editorial staff, Stachel resigned to continue his academic career, and his offer to work part-time on the Project was rejected by his successor, Martin Klein. By then, roughly 4,000 documents had been added to the archive as it existed in 1977; in great measure thanks to research trips (mainly by Schulmann and Stachel), to Bern, Zurich, Munich, New York (the Leo Baeck Library), Massachusetts (Brandeis University), Berkeley (for the Archive for the History of Quantum Physics), Caltech, Milan, Pavia, Isola della Scala, and elsewhere. Two-thirds of the documents published in Volume 1 came from such later findings and many of the annotations are based on them.

Over the years, several editors have contributed greatly to the subsequent volumes (the numbers in parentheses state how many volumes each individual co-worked on as main editors): Stachel (2), Cassidy (2), Schulmann (9 or 10), Renn (3), Martin Klein (4), Anne Kox (6), Michel Janssen (2), József Illy (5), Christoph Lehner (1), Diana Kormos Buchwald (5), Daniel Kennefick (1), Tilman Sauer (4), Ze'ev Rosenkranz (2) and Virginia Holmes (2). Moreover, the volumes have been enriched by several other associate editors, contributing editors, assistant editors, staff, and correspondents. Unfortunately, the volumes do not distinguish which contributions were authored by which editors (unlike the present review). I think that it would be preferable to give specific credit to each editor for any major editorial note authored. It is by no means evident that the order of credit in every volume fairly corresponds to the work actually contributed by each of the many editors. For example, for years Martin J. Klein kindly served as senior editor, lending his distinguished name and support to the enterprise to help it flourish, but most of the editorial annotations were actually written by the other editors, as Klein would graciously acknowledge in person. Also, Schulmann wrote many of the annotations in Volume 10, although his name does not appear as an editor, because by the publication date he no longer held that title.

Despite the initial false starts and delays, the publications have proceeded at a good pace. And notwithstanding any initial reservations, Lippincott continued to support the project until he retired in 2005. In March of that year, Peter J. Dougherty was appointed as Director of the Press. From 1987 to 2009, thirteen hardbound tomes have appeared, although the press numbers them as 'twelve' volumes, by labelling one 8A and the next 8B. (Editors Schulmann and Janssen wanted the correspondence during the war period to be included in a single oversized volume, but the Press wanted each volume to have the same size.) These twelve volumes sum up 8,843 pages total, including Introductions, front matter, and indices.

In addition, Princeton University Press has published separate paperback volumes of English translations. To grant funding, the NSF and the NEH had required that each volume should include English translations. But to enable the editors and staff to work expediently, they agreed to the compromise of separately issued English translations, with separate staffing. Those volumes have been prepared by Anna Beck, Peter Havas, Don Howard, Alfred Engel, Engelbert Schucking, and

most recently by Ann M. Hentschel, and Klaus Hentschel. The translations are intended to be used alongside the main volumes, as they do not include editorial annotations. Although supported by the main Project, the translations are quite separate. One peculiar consequence is that therefore the *Collected Papers* include two translations of various passages: for example, the editorial Introduction to Volume 9 includes various quotations translated into English, but such translations are distinct from the renderings found in the corresponding Translation Volume. Overall, the translations are very useful, literal and fair, even when they seem rushed or lack some of Einstein's clarity. Not all documents in the main volumes have been selected for translation (a change in the original policy), but the selection has been reasonable.

The Papers Project began at Princeton, but moved to Boston University in 1983. Later, Schulmann proposed to move the Project to Maryland (mainly because his spouse had moved to that area): either to Johns Hopkins University, to George Washington University, or to the University of Maryland. Meanwhile, Princeton University Press interviewed Hubert Goenner and Diana Kormos Buchwald as potential principal editor, and chose the latter. Since the fall of 2000, Diana Kormos Buchwald has laboured as the first General Editor. She soon moved the Project to the California Institute of Technology, where she has carried out the essential task of managing and coordinating the labours of many contributors and staff, and admirably meeting publication deadlines. The General Editor ensured that each translation volume include an index (which had been lacking in the first volumes), and she led the main editorial staff to become more involved in the translation project. She has also encouraged and supported the individual researches of contributors to the *Collected Papers*. The latest instalment, Volume 12, lists twelve editors and editorial assistants, plus eight Executive Committee members. It acknowledges funding support from eight foundations and institutions, and it expressly gives thanks for assistance from 115 additional individuals at 67 universities, libraries, and institutions in at least fourteen countries. To date, the volumes cover 42 years of Einstein's life, from his birth in 1879 until the end of 1921. In addition to the collections of original documents and copies at the Hebrew University and at Caltech, there are also Duplicate Copies of the original Archive at Boston University, at Princeton University, and at the Eidgenössische Technische Hochschule in Zurich. Furthermore, the team at Caltech has collaborated with the Hebrew University, especially Rosenkranz and Orly Simon, to produce the Einstein Archives Online: a public database of approximately 43,000 documents (mostly the original Dukas archive), plus records for most other items that have been published in the *Collected Papers*, plus more than 900 digitally photographed manuscripts in roughly 3,000 images, plus several English translations. The General Editor and Princeton University Press are also exploring the possibility of producing a comprehensive digital edition of the *Collected Papers*.

The *Collected Papers* provide important insights into how Einstein worked on science. Rather than settling for Einstein's published papers, in their inscrutable elegance, we follow him in the creative process. One major finding, for example, was that Pierre Speziali, editor of the Einstein/Besso correspondence, revealed to Schulmann a complicated manuscript co-written by Einstein and Besso, working out the calculations on the anomalous precession of Mercury based on the so-called *Entwurf* field equations and giving a disappointing result, before adopting the final form of the field equations. It was subsequently elucidated meticulously by Michel Janssen as scientific editor, in Volume 4.

Our understanding of Einstein has changed substantially thanks to the *Collected Papers*. Some decades ago, he was widely construed as the author of radically original and permanent theories, a saintly genius who wanted to read the mind of God, aloof to the world, a sensitive and dedicated pacifist who could be loved and admired as a role model by nearly everyone. In contradistinction, he now seems like a fallible but intensely driven and obstinate physicist, a self-absorbed individualist who increasingly tried to give as much as he received. He had genuine good intentions but occasionally hurt the persons closest to him. Contrary to the old myth that the young Einstein had been a lousy student, Schulmann discovered, by researching the archives of the Kanton of Aargau in Switzerland, that the school's grading scale had been reversed in 1896 at the beginning of the summer semester. Contrary to the old impression, advanced by Gerald Holton, that the adult Einstein was a theoretician aloof from facts, he was intensely interested in experiments, although confident in his theories. Still, he regarded his theories with more scepticism than many later physicists. In late 1919, he published a newspaper article denying scientific induction: '*the truth* of a theory can never be proven', and he then advocated the hypothetico-deductive approach to science, plus falsification.

Owing to his uncle's electrotechnical business, the young Einstein was also engaged in electrical technologies. From 1902 to 1909, Einstein appreciated the drudgery of his work at the patent office, and continued to cultivate an interest in practical things. He and Paul Habicht designed a machine to measure small electrical currents. Before World War I, he hardly participated in politics. Against the notion that he became actively involved in Berlin politics after 1914 (as argued by Otto Nathan and Heinz Norden in their 1960 book, *Einstein on Peace*), Schulmann and company pointed out that that was hardly the case. He profited from working on a gyrocompass that, incidentally, was used by the German navy; he designed an airfoil, advised an aircraft company. In 1914, he co-signed a pacifist manifesto drafted by physician Georg Nicolai. Einstein was certainly a pacifist, but he comfortably sat out the war in the capital of warmongering Germany and was reluctant to make public declarations.

Einstein held liberal and internationalist sympathies, and hence his name was included in a surveillance list of the Berlin police. Despite his early political inactivity, in 1919 he joined a commission to investigate war atrocities. He was optimistic about the nascent League of Nations. He supported the Weimar republic as his 'political wishes come true'.

Also in 1919, astronomers' observations of starlight during an eclipse provided support for Einstein's theory of gravity, his so-called general theory of relativity. These findings converted the successful physicist into an international celebrity. The *Collected Papers* are an extraordinary resource for tracking this transformation. The editorial team, led by Diana Kormos Buchwald, notes: 'Over a period of less than a year, Einstein acquired a celebrity status never before accorded a living scientist'. In 1919, one of Einstein's chief admirers, Alexander Moszkowski, writing in the *Berliner Tagblatt* (known by anti-Semites as 'the Jew paper') characterised the eclipse results as 'highest truth, beyond Galileo and Newton, beyond Kant' unveiled by 'an oracle from the depth of the skies'. Likewise, the *Berliner Illustrirte Zeitung* declared: 'A new eminence in the history of the world: Albert Einstein, whose theories signify a complete revolution of our understanding of nature and whose insights equal in importance those of Copernicus, Kepler and Newton'.

Scientific academies invited Einstein to join, and they awarded him various honours. And in 1921 alone, he received requests to translate his writings into at least 12 languages: English, French, Spanish, Italian, Russian, Polish, Hungarian, Ukranian, Japanese, Romanian, Yiddish and Hebrew. The deluge of paper invitations and requests was accompanied by telegrams, telephone calls, and visits. Einstein managed to respond kindly to nearly all inquiries, at the expense of working on science. He complained that he was becoming 'stupider by the day', and he frankly insisted that his abilities were 'overrated', that the attentions were 'undeserved'. Still, Einstein also exhibited streaks of opportunism. Having been an international celebrity for just one year, in the fall of 1920 Princeton and other universities invited him to deliver guest lectures, but Einstein requested ridiculously exorbitant fees: $15,000 as an honorarium from each institution (roughly $161,000 in 2009 dollars from just one institution), which they just could not pay. He requested such sums partly from lack of interest in travelling, to 'frighten' the universities, but also out of a desire to abruptly solve all of his financial obligations. Despite such flirtation with greed, when he finally visited the United States he did so in the fundraising interest of future young Jewish students.

Having suffered great obstacles as a young college graduate, in 1901 Einstein had written to his fiancée Mileva: 'I swear a solemn vow that I will always help gifted young men whenever it is in my power'. Hence, when he later taught at Berlin, he admitted non-registered auditors into his lectures, against university policies and despite student protests. He laboured to assist young scientists, such as Erwin Freundlich. In March 1919, in hopes of lessening the oppression of talented young Jews, he remarked that he felt 'most joy' from the realisation of a 'Jewish state in Palestine', where Jews would not be foreigners. (This usage of the term 'state' is unusual in Einstein's writings; e.g. by 1946 he dismissed the idea as 'hateful', yet he continuously yearned for a place of refuge for Jews who were unwanted elsewhere, and an intellectual and cultural centre, while also honouring the rights of Arabs in Palestine.) Thus, in 1921 he accompanied chemist Chaim Weizmann, the London-based president of the Zionist Organization, on a trip to the US to raise funds to establish the Hebrew University. Einstein argued that he was moved to act by having seen many instances in which young capable Jews had been academically oppressed. Einstein disliked nationalism, but he hoped that a Jewish settlement, by virtue of being small, would manage to resist the 'vanity of power'. (For more on his non-scientific and political trajectory, see *Einstein on Politics* [2007], by David E. Rowe and Robert Schulmann.) Einstein held no Jewish religious beliefs. He refused to pay congregational taxes to the Jewish community in Berlin. Yet he felt a sense of social duty to his ethnic group.

When Einstein and Weizmann arrived in the US, they were received by thousands of people, especially American-Jews who welcomed them as brilliant leaders. On this topic, annotations in the collected papers benefited especially from work by Ze'ev Rosenkranz and József Illy. (Illy also authored a book *Albert Meets America* [2006] which compiles and annotates newspaper clippings from the period and constitutes an excellent companion to the *Collected Papers*.) In an interview in Appendix D of Volume 7, Einstein commented on 'the dense crowd of people on the quay ... Jews, Jews, nothing but Jews. It was the first time in my life that I saw Jews en masse—I, who in the course of my life have met so many Jews, and that was certainly a great emotion'. American journalists eagerly consolidated the process of glorification that had begun in Germany. Einstein then received a striking letter from his old friend Besso, challenging him to come to terms with this new image: 'Might it be worthwhile

to return from the potent soulless universe into the desert again to seek one's soul? Whether your potent ability to concentrate can't, after all, make you into the wise man that people expect of you? ... can *you* become the wise man that the Americans welcomed and enthusiastically applauded?' This myth-making process was fuelled more by external circumstances and interests than by Einstein's intentions or works. He recognised its absurdity, but he embraced it. He dutifully provided witty soundbites for journalists, and he lent his support to various noble causes. Today his image stands as a means by which we can critically reflect on the power of individuals to affect intellectual history and society.

The Einstein Papers Project was initially guided by the following editorial principles, formulated by Stachel: comprehensiveness, chronological organisation, literality of transcription, and annotation as an aid to interpretation. The original goal of comprehensiveness, of publishing practically all the archived documents, has been abandoned, quite fairly. One reason is that the original rough estimate of the quantity of documents, approximately 10,000, was incorrect. Early planning was based on that estimate, until Stachel's team realised that there were more than 42,000 items. Moreover, the painstaking inquiries of the editors over the years, plus donations from various parties, have amassed more than 30,000 *additional* documents. An internal joint electronic database (created in 2002) of all items at Caltech and the Hebrew University currently holds 77,335 items (as of December 2009). However, this count includes items that exist in multiple versions (for example, manuscript drafts, typewritten copies, translations), so the count of unique items is lower. Accordingly, Diana Kormos Buchwald informs me that there are roughly 12,000 unique letters authored by Einstein, plus some 15,000 correspondence items received by him, plus, approximately 3,000 non-correspondence manuscripts and documents by Einstein. Summing up: roughly 30,000 items by or to Einstein (compared to 23,000 in 1987). Currently, the stated aim of the Einstein Papers Project is to publish roughly 14,000 (about half) of these documents in 30 volumes.

Another reason why inclusive publication became implausible is the extent to which Einstein increasingly generated and received paperwork. Volume 1 includes only 143 documents pertaining to *twenty-three years*: 1879 to 1901. But with fame, Einstein's paper trail grew immensely. From 1915 to 1917, he received roughly 15 letters per month, at least. The influx doubled in 1918. It doubled again in 1919, and increased again in late 1919 owing to the results of the eclipse expedition. For the year 1921 *alone*, the Archive includes more than 2,000 documents written by, to, and about Einstein, from which the editors selected 349 letters to publish in Volume 12 (plus more than 20 additional items).

To the editors' credit, they have rightly and boldly included a great number of highly private documents that reveal much about Einstein and his social milieu. Contrary to Einstein's penchant for privacy, the *Collected Papers* include numerous letters that would have embarrassed him immensely. Einstein's step-daughter, Margot, had stipulated that 124 letters from 1909 to 1920 should remain unpublished or closed for 20 years after her death. She died in 1986, and such letters were promptly published exactly 20 years later, in Volume 10. They include mostly letters to the divorcée Elsa Einstein, Einstein's first cousin on both paternal and maternal sides, to whom he declared his love in 1912—while he was still married to Mileva Marić. Moreover, Stachel's photocopies of several letters that disappeared (before the Archive was transferred to Jerusalem) were published in Volumes 5 and 8A. These are letters from Einstein to Elsa, which are designated by the marker

'ALSX' at the bottom of each letter, meaning Autograph Letter Signed, in photocopy. By contrast, few letters from Elsa to Albert remain, as he had promised to destroy them while still married to Marić. In Berlin, he desperately desired to separate from Marić, so in 1914 he gave her a ridiculous list of conditions of servitude that he required from her in order to keep his company. She acquiesced, but he soon drove her away regardless. He then moved into the home of Elsa and her two daughters in Berlin. In a letter from May 1918 (in the estate of Georg Nicolai), written by Elsa's 20-year-old daughter Ilse, Schulmann (and independently, Giuseppe Castagnetti) discovered another family scandal: apparently the 39-year-old Einstein became attracted to Ilse and was willing to marry her instead of Elsa. But Ilse was not interested. In 1919, after finally divorcing Marić, Einstein married Elsa, partly under pressure from relatives, and apparently from a selfish desire to have a personal caretaker. Einstein had made himself seriously ill by indulging in a frivolously unhealthy diet (he developed a life-threatening ulcer), alongside his chronic smoking. Future volumes might include any of the numerous documents that pertain to Einstein's subsequent extramarital affairs over the years.

When someone has been deified for decades, it becomes irresistible to highlight his human failings. Nevertheless, Einstein often showed great kindness to many people. For example, it is admirable to read (in Volumes 10 and 12) the extent to which he tried to explain the theory of relativity to a former co-worker from the Swiss Patent Office. Edouard Guillaume repeatedly mailed him various objections and criticisms, yet despite extraordinary busyness, Einstein painstakingly and kindly replied to them, in several letters. When he finally realised that Guillaume would not desist, he gracefully told him to persist, paraphrasing Schopenhauer: 'do what you just cannot keep yourself from doing'.

Aside from the focus on Einstein, the *Collected Papers* offer a rich source of insights into the lives of other physicists. For example, it is moving to see the stresses that Paul Ehrenfest endured. In 1919, when he attempted to write an explanation of Einstein's relativity theories for laypersons, he felt nervous, depressed, frustrated, and sick to his stomach because the two theories seemed inconsistent. Also, as a Jewish atheist, he felt exasperated for being chastised by Jewish leaders for insufficiently helping Zionism; he felt unfit for joining mass actions. Still, Einstein egged him on in both regards. Furthermore, the *Collected Papers* illuminates various ways in which physicists viewed Einstein. Aside from his best-known contributions, it is surprising to see that when Ehrenfest, Heike Kamerlingh Onnes, and others invited him to a professorship at Leiden in 1920, it was partly because they construed him to be a potential contributor to condensed matter physics in low temperatures. In turn, Einstein contributed to the analysis of superconductivity by proposing experiments that would test for the existence or properties of the Hall effect in superconductors. Einstein's initial analysis was based on Maxwell's equations but soon came to involve quantum notions in a pioneering way. This episode has been elucidated by Tilman Sauer, thanks to Issachar Unna's discovery of excerpts from a letter by Einstein in Ehrenfest's diaries, and to Unna's and Józef Illy's identification of a manuscript page (at the Burndy Library) as pertaining to this topic. Sauer's annotations in Volumes 10 and 12 are informed by a meticulous article in *Archive for History of Exact Sciences* (2007), which will be relevant also to the forthcoming Volume dealing with 1922, when Einstein published a paper on the superconductivity of metals.

Regarding the principle of chronological organisation, the editors have observed it dutifully, despite some difficulties. Naturally, as the Project progressed, many

documents have been located, or have become accessible, from years for which a volume had already been published. To make such documents available promptly, the editors have included them in the very next volume published. For example, although Volume 10 consists mostly of correspondence from 1920, its first 235 pages consist of 'Supplementary' documents from 1909 to 1919. Strangely, such documents have been numbered as being part of the volumes in which they would have been included if they had been available earlier. For example, Volume 10 begins with an item titled and listed as 'Vol. 5, 161a'. This unfortunate notation entails that scholars citing such a document might write seemingly nonsensical references such as: 'Einstein to Varićak, 19 May 1909, *CPAE* Vol. 5, doc. 161a, in *CPAE* Vol. 10, p. 5'. Given that eighteen more volumes are planned, it seems awkward that many volumes will deal both with a narrow chronological span, plus a supplement of documents from prior years. If so, somebody looking for a letter from one year might have to search in several volumes for it (unless there is a general index at hand). Already, there are letters from 1911 in volumes 5, 8, 10, 12. In my opinion, users would be better served by placing in each volume only items numbered with that volume number, while publishing belated texts in a separately bound and separately numbered supplementary volume. Also, more explicit and systematic use of dates would be helpful. Multiple references are cited by the year when they were published, generating ambiguity (when did Einstein actually write that?) and some vexing anachronisms, such as 'Einstein, 1979'. It would be preferable to list and refer to such references by the year when they were authored, whenever possible. Likewise, the endnotes to editorial introductions and documents would benefit from dates in more instances, rather than only stating, for example, 'Vol. 5, Doc. 493'.

Volume 11 consists not of primary documents but of a cumulative index for the first ten volumes, plus a bibliography, list of correspondence, chronology and errata. In an impressively kind gesture to general users, the editors and Princeton University Press agreed to not merely publish this volume on paper (which retails, like most others, for $125), but to provide copies of all of its contents as PDF documents available for free on the Press' website. As implied above, this cumulative index, authored mainly by Anne Kox, is *immensely* valuable. Moreover, a 46 page Chronology, from 1879 to 1920, is well-composed and very useful as a first-stop resource for dating events in Einstein's life. The brief errata (7 pages), by contrast, needed more work to clean up numerical mistakes: for example, in the Introduction to Volume 9, I noticed thirteen document numbering errors, for example, a parenthetical expression refers to the contents of (Doc. 336), but that document number is incorrect. In some cases the document in question is an adjacent document, but in others it is not.

Turn now to the principle of 'literality of the transcriptions'. The aim is to render the original materials in forms that are so accurate that, for the most part, historians can consult the publication rather than the originals. The *Collected Papers* succeed extremely well in providing scholars with literal and very useful transcriptions of documents, with necessary annotations. Einstein's original publications are reprinted in accurate facsimiles, while other documents are faithfully and elegantly transcribed. Libraries that purchase the *Collected Papers* provide a valuable research resource for their users.

Next, consider the principle of 'annotation as an aid to interpretation'. The editorial annotations are rightly kept apart from the texts, they economically interrelate documents and provide essential background, without imposing speculative interpretations onto the texts. Although various items are not issued in their entirety, owing

to limitations of space, the editors have very fairly selected to print the most significant parts and in most cases have duly noted the existence of additional portions and also of alternative versions. From the outset, the editors rightly realised that they should not try to impose seemingly conclusive commentaries, given that our historical understanding evolves in ways that might make suchlike commentaries obsolete. Looking at Volume 2, in particular, it is impressive that the editorial introductions to Einstein's major works have gracefully remained perspicacious, reliable and well balanced. By contrast, various books and articles on Einstein's works now seem dated, inaccurately conjectural, and stilted.

Without a doubt, among the most valuable aspects of the *Collected Papers* are the footnote annotations, in which editors painstakingly date and interconnect documents, and relate them to the concurrent state of physics and to many circumstances. For example, Volume 12 includes a cryptic scientific letter from Arnold Sommerfeld (October 1921), but it is followed by informative annotations pertaining to: Einstein's cancellation of a lecture in light of student protests, a relevant newspaper article, a discussion of the Treaty of Versailles on the division of German and Polish lands, a note about the publication of Einstein's lectures at Princeton and, most importantly, a concise clarification, by Jeroen van Dongen, of Sommerfeld's quantum numerical argument, by grounding it on now obscure papers by Sommerfeld and others. Likewise, Tilman Sauer has crafted informative annotations on the farther reaches of Einstein's theoretical works, such as in relation to Theodor Kaluza's attempt at a unified field theory (which Einstein praised but undermined). One might easily take for granted the considerable amounts of effort that are often necessary to manage to connect old texts to various other historical facts, yet I praise the various editors for their rich, enlightening, and helpful contributions.

Unfortunately, the quality and quantity of editorial notes have been inconsistent among the volumes. Volume 2 shines with approximately 149 full pages of editorial notes and footnotes (out of 693 total pages). By contrast, Volume 6 has merely 51 such pages (out of 656). Volume 6 deals with Einstein's works from 1914 to 1917, including what is often regarded as his most important contribution: the theory of gravity. Yet this volume includes less than four pages of editorial notes on this important topic, merely a superficial, summary introduction. Strangely, that discussion is briefer than what was allotted to a note on the flawed experiments by Einstein and Johannes de Haas on confirming the existence of molecular currents. One might surmise that the editors were occasionally under constraints, struggling to meet production deadlines, to keep the Project afloat, and even lacking assistance from appropriate specialists. Regarding Einstein's work on gravity, the poverty of Volume 6 is at least shored up by Michel Janssen's helpful annotations on the topic of gravitational waves, in Volume 7, and by abundant footnote annotations to letters in Volumes 8A and 8B.

In recent volumes, certain editorial notes are very well developed. One example is the overview, in Volume 9, on the eclipse expeditions of 1919. Einstein had presented three kinds of evidence that should test and support his theory of gravity: the advance of the perihelion of Mercury, the redshift of sunlight and the displacement of starlight. Explaining the motion of Mercury alone did not seem decisive because a separate kind of evidence seemed unsatisfactory. Some solar redshift was a well known phenomenon since the 1890s, but by 1919 most solar spectroscopists denied that it matched Einstein's theory. Hence the displacement of starlight became a seemingly crucial test. The editorial overview in Volume 9 is based partly on scholarly

articles such as the landmark writings of John Earman and Clark Glymour. Unfortunately, it does not point out the corrections to such works that have been advanced by Daniel Kennefick: in particular, that there were fair scientific grounds on which to discard plates from the Greenwich Observatory's Astrographic lens (at Sobral), that it was not arbitrarily discarded because of Eddington's bias in favour of Einstein's theory. Those plates were actually rejected by Frank Dyson (who was sceptical of Einstein's theory) apparently because information about a necessary scale value on that lens was lacking. In 1978, such plates were re-measured at the Royal Greenwich Observatory, yielding results much closer to Einstein's prediction.

In a few instances, brief editorial comments should have been sharpened. For example, in Volume 12, the editors remark on a comment by Einstein when speaking at the Parker School in Chicago: 'But when I was a student I saw that experiments of this kind [i.e. ether drift experiments] had already been done, in particular by your compatriot, Michelson'. The editors briefly allude to the old scholarly debate on the matter, and merely note that 'one remains mindful of the limited reliability of the stenographer's notes'. Non-specialists might infer that Einstein really did not know of Michelson's experiment, but actually it is clear that he did, and there is no reason to doubt the stenographer. Briefly, he knew about it: because he had read works by Wilhelm Wien (1898) and H. A. Lorentz (1895) that discussed it, and, because he said he did know it: to Max Wertheimer in 1916, in Chicago in 1921, to students at Kyoto in 1922, to Bernard Jaffe in 1942, to Robert Shankland in 1952, to N. Balazs in 1953, to Michael Polanyi in 1954. As Gerald Holton elucidated decades ago, Einstein knew of the experiment but it was not of any decisive importance to him, it just strengthened a conviction that he already had on the basis of other experiments and considerations. In a recent article in *Archive for History of Exact Sciences* (2009), one of the editors of the *Collected Papers*, Jeroen van Dongen acknowledges the significance of the remark at Chicago; but again, it is unfortunate that this kind of commentary, in brief, was not already included in Volume 12 itself.

Like no other source, the *Collected Papers* offer profound insights into how Einstein gradually changed over time. In the early 1900s, he worked mainly as an isolated amateur who discussed his ideas with friends and co-workers. By 1920, he was deeply engaged with an international network of academic peers and correspondents, including experimentalists, astronomers and mathematicians.

Despite his famous obstinacy, Einstein showed a recurring willingness to change his mind, in science. Although Einstein had a penchant for field theory, he was willing to acknowledge discontinuity. Volume 12 has relevant material in this connection. In 1921, Einstein proposed an experiment using canal rays to test whether emitted light, passing through a frequency-dependent dispersive medium, exhibited a classical Doppler variation of colours with directions, which he thought could test the notion of quantum emission. When the experiment was carried out it showed no such dependence. Einstein then wrote to Hermann Weyl: 'canal-ray experiment had a negative outcome, which ultimately means a refutation of the field theory of electricity'. And he also wrote to Max Born: 'Thus it is surely proven that the undulatory field has no real existence and that Bohrian emission is an instantaneous process in the real sense. It is my most powerful scientific experience in years'. Before most physicists, Einstein accepted the reality of light quanta. Hence the editorial introduction to Volume 12, aptly ends with Einstein's cliff-hanger question to Weyl: 'What next?' (However, as noted in the Introduction to Volume 7, in 1921 Einstein wrongly assumed that wave optics entailed that a dispersive medium

would deflect light emitted from fast ions, and hence his 'crucial' experiment actually lacked the decisive implication that he thought it had.) We much look forward to the volumes that will deal with Einstein's reactions to quantum mechanics.

Einstein sometimes also changed considerably in his personal relations. Whereas he first loved Mileva Marić as an intellectual equal, or as his 'student', he later came to despise her as if she were scheming, perverse and innately inferior. When she suffered a nervous breakdown in 1916, and was interned in a sanatorium, Einstein first believed that she was faking it. He also disbelieved that there was anything seriously wrong with their ill son Eduard. In 1917 Marić was hospitalised for chronic nerve pressure on her spine. Einstein struggled to be kind to her during their separation and divorce negotiations, but he repeatedly failed. Their other son, Hans Albert, complained that he knew Heinrich Zangger better than his father.

Einstein's changing relations with the young astronomer Erwin Freundlich also are noteworthy. From 1911 onwards, Einstein took a keen interest in him, and by 1913 embraced him as his apprentice. The two closely collaborated to devise plausible experimental tests of the emerging theory of gravity. Einstein laboured to secure for Freundlich a research appointment that would enable him to carry out observational work. He even petitioned Prussian officials to intervene on behalf of his protégé. When the Kaiser Wilhelm Institute of Physics was finally established in 1917, with Einstein as director, he promptly appointed Freundlich and arranged for access to instruments at Potsdam. Einstein later gave one of his manuscripts to Freundlich to use it for fundraising purposes. In 1920, the two continued to collaborate, as Freundlich helped Einstein in trying to calculate the volume density of globular star clusters (as clearly explicated by József Illy in Volume 7). But in 1921, Einstein wanted his fundraising manuscript back and repeatedly admonished Freundlich, who refused to return it. Freundlich was 'severely hurt', and Einstein decided to terminate all his interactions with him. Likewise, Einstein's friendship with his fan, Alexander Moszkowski, collapsed when the latter persisted in publishing their discussions without permission. As Einstein's fame increased, he repeatedly felt that he was pushed too far by some of the individuals who were closest to him, and it seems that they too deserved part of the blame for their dysfunctional relationships.

Although it was utterly far from the original intent of Otto Nathan and Helen Dukas, it seems that in time the *Collected Papers* are serving to thoroughly dismantle the old saintly image of Albert Einstein. There is a very positive consequence to this: that henceforth scientists and students who approach Einstein's theories might lose some of the respectful but crippling reverence that enables many to view his equations as sublime and virtually indelible descriptions of reality. Instead, it might encourage us to treat such theories as fallible works in progress, as Einstein himself preferred.

Over the years, Lewis Pyenson, author of important contributions to the history of Einstein's life and works, has repeatedly argued that the expenditure of millions of dollars in the production of the *Collected Papers* is unjustified. (Pyenson initially had sought to become an editor in the Project.) Whenever monies have been secured for any one project, we might, in hindsight, imagine other projects that would be more immediately valuable to taxpayers and the general public. But like any academic luxury, history of science is fortunate when any group of individuals manages to win support for an ambitious project, and it is not necessarily the case that otherwise such funding would instead go to another project in history of science. In a country that showers billions of dollars into military spending, it is not wrong that a

comparatively minute amount of funds help to support some historical consciousness. It is certainly strange and unwarranted that so many efforts, by Pyenson, by the editors, by myself, and by many other researchers, go toward the study of the life and works of mainly one man. But at best, we can well construe it not as a celebration of that person but as a focused window into the past, a way of cutting into history through the branching interactions of an increasingly well-connected agent. I commend the continued and extraordinary efforts of the various editors, Princeton University Press and the Hebrew University in Jerusalem for producing the *Collected Papers.*

Acknowledgements

I thank John Stachel, Robert Schulmann, Diana Kormos Buchwald, Daniel Kennefick and Jeroen van Dongen for kindly answering my inquiries, and for providing additional useful information.