
SURVEY REVIEW

A NOT QUITE RANDOM WALK THROUGH SOME
SCIENTIFIC LIVES

Denis Brian, *The Curies: A Biography of the Most Controversial Family in Science*. Hoboken, New Jersey: John Wiley & Sons, Inc., 2005. 353 + xxii. US\$30.00 HB.

Abraham Pais, *J. Robert Oppenheimer: A Life*. With Supplemental Material by Robert P. Crease. New York: Oxford University Press, 2006. 353 + xxii. US\$30.00 HB.

Nina Byers and Gary Williams (eds), *Out of the Shadows: Contributions of Twentieth-century Women to Physics*. New York: Cambridge University Press, 2006. 471 + xxv. US\$35.00 HB.

By Naomi Pasachoff

The assemblage of books reviewed here might appear random, but a connection can be discerned between them: Pais has touched on Curie's life in his earlier books and wrote the relevant entry in Byers and Williams' collection, which also profiles several other women participants in the Curie story.

While I can recommend *The Curies* to readers unfamiliar with the family's dramatic story, I had expected to like Brian's book more than I did. I admire his *Einstein: A Life* (1997). I was flattered to find my name in his Acknowledgments among those 'previous Marie Curie biographers' whose efforts 'greatly enriched' his own work. But despite the promotional literature's claim that Brian's is 'the first biography to trace the entire Curie dynasty, from Pierre and Marie's fruitful union and achievements to the lives and accomplishments of their two daughters...and son-in-law,' there is little in this book that readers cannot find elsewhere. I particularly recommend Spencer Weart's *Scientists in Power* (1979),

a better written collective biography of the scientific circle that coalesced around Pierre and Marie Curie and then around Irène and Frédéric Joliot-Curie. Weart's book describes, as compellingly as any novel, how these scientists promoted research as a tool to create a just society and how, during the Cold War, power passed from scientists to the government and its industrial allies.

My main issue with *The Curies* is its extended title. Brian nowhere clearly develops a thesis positing the Curie family as 'the most controversial in science.' Are there other contenders for that title? If so, who are they, and what makes the Curie family more deserving than they of that dubious distinction? If not, what's the point of introducing the fictitious competition?

Readers are forced to come to their own conclusions as to just why the Curies merit the 'controversiality cup'. Feminist issues, to be sure, are relevant. Some Curie contemporaries could not believe a woman capable of independent work meriting not one but two Nobel Prizes; many convinced themselves that the credit given Mme. Curie belonged rightly to her husband, Pierre, to whose coat-tails, they assumed, she merely clung. Three decades after Pierre and Marie shared the Nobel Prize for physics, however, when the Curies' older daughter, Irène, shared the Nobel Prize for chemistry with her husband and colleague, Frédéric Joliot, France was happy to honour a husband and wife team of scientists. Among other controversies swirling around Marie Curie, *née* Sklodovska, was the press-driven scandal of the Polish-born vixen (falsely 'accused' of being Jewish to boot) who allegedly destroyed a good French Catholic family. Some detractors claimed that Curie's rumoured affair with Paul Langevin, a former student of Pierre's and a close colleague of both Curies, began during Pierre's lifetime. These rumour-mongers insisted Pierre's death under the wheels of a horse-drawn lorry on a wet Paris day had been no accident, but that knowledge of the affair had driven Pierre to suicide.

As Brian notes, the controversial nature of the Curie family extended into the second generation, because of the left-wing politics of both Joliot-Curies but especially of Frédéric, who in 1950 was fired as High Commissioner for Atomic Energy. Irène's politics led to her brief incarceration in 1948 as an undesirable alien on Ellis Island. Surely, however, there was nothing controversial about the third and fourth generations of Curies briefly covered in Brian's tale. Curie's grandson, Pierre, became a biophysicist specialising in

photosynthesis. In 1948 Marie Curie's granddaughter, H el ene Joliot-Curie, married Michel Langevin, the grandson of Curie's erstwhile lover. Both H el ene and Michel became respected nuclear physicists at the Institute of Nuclear Physics at Orsay, which her parents established. Their son, Yves, became an astrophysicist specialising in planetology and asteroids.

Even if two generations of controversy suffice to secure the titular prize to the Curie clan, Brian fails to explain how and why the stigma of controversy lifted, leading France to embrace these once marginalised figures. If, in the 1950s, Joliot "was no longer welcome at the scientific establishments he had largely created" (p. 379), why was he chosen in 1958 to preside "over the International Congress of Nuclear Physics" (p. 392)? Why did both Ir ene and Fred merit state funerals on days designated for national mourning? Why, in 1995, were the Curies' remains exhumed from the family plot at Sceaux for re-interment in the Panth eon? Curie became the first French woman to be buried in the French national mausoleum in her own right, but Brian does not explain what led Mitterrand to agree to the reburial.

Aside from disappointment with the book's title and its failure to break new ground, I was sorry to detect a few errors. Brian's assertion that Rutherford, like the Curies, "had chosen not to make money from any of his discoveries" (p. 77), is questionable with regard to both parties. Several biographers describe Rutherford's eagerness to develop commercially the system of wireless communication he had been working on before joining J. J. Thomson's X-ray research at the Cavendish. He hoped to make enough money by doing so to expedite his marriage to the girl he left behind in New Zealand. But after making inquiries in the finance community, Thomson advised his young collaborator that the scheme was unlikely ever to prove commercially viable. Furthermore, as Curie's recent biographer Barbara Goldsmith documents, Pierre made a considerable amount of money from patenting some of his instruments for detecting radioactivity. Brian's assertion that Rutherford's 1908 Nobel Prize was for physics is unquestionably incorrect. Rutherford's chemistry Nobel led to his famous quip that the quickest transmutation he ever encountered was his own from a physicist into a chemist.

Although some of Brian's coverage of Marie's younger daughter, Eve – who at this writing still survives (p. 102) – is interesting, it meanders too much, particularly during his description of her

World War II activities. The result is both a shift in focus from the family's scientific endeavours and a number of inelegant passages struggling under the weight of facts. For example: "Although in the summer, Jean Moulin, a leader of the Resistance working for de Gaulle, had died of a heart attack after being interrogated under torture by the notorious Klaus Barbie, the *maquis* (the military branch of the resistance), 11 days after Italy's surrender on September 8, 1943, freed Corsica" (p. 347).

Such criticisms notwithstanding, I learned something from Brian's book, including a tidbit about the Curie–Rutherford relationship: convinced that she would die in the early 1920s, Rutherford prepared an obituary for her at that time for the *Manchester Guardian*. She outlived his prediction, dying in 1934. With regard to the cause of her death, I had not known that scientific analysis at the time of the 1995 re-interment led to a new theory: since levels of radium in her coffin were too low to be responsible for her fatal aplastic anaemia, the hypothesis emerged that "her final illness and death was caused not by extended exposure to radium but as a direct result of her overexposure to X-rays in World War I" (p. 398). I was also interested to learn that Paul Appel, who as dean of the Sorbonne's faculty of sciences had been ready to fire Curie during the Langevin scandal and ship her back to Poland, later became President of the Curie Foundation. Thanks to Brian, I now also know that some French patriots deserve mention alongside the Danes who supported their country's Jews during Nazi occupation. According to Brian, after the Nazis required Jews in France to wear a yellow star with the word *Juif*, or Jew, sewn on it, "Forty cases of young non-Jews wearing the yellow star were reported to the SS. Other sympathisers wore yellow flowers or handkerchiefs, or yellow paper with *Goy* or their Christian names on them. Some non-Jewish Paris students sported *Juif* badges, claiming that the word was an acronym for 'Jeunesse Universitaire Intellectuelle Française'" (pp. 344–345).

While Brian does not make the connection, the story of Joliot's downfall makes a nice *segué* to the next book under consideration here. Brian details the role that Lieutenant Colonel Boris Pash played in the abrupt shift in Joliot's fortunes. Pash played a similar role in Oppenheimer's professional demise. Brian notes the broad implications for French national science policy of Joliot's personal undoing: "The French government, rather than scientists, now

determined...the future uses of nuclear fission” (p. 380). Similarly, a number of Oppenheimer’s biographers note that Oppie’s decline and fall left US scientists out of the policy-making loop.

One does not pick up a scientific biography by Abraham Pais with the same set of expectations one has for other books in this category. Pais is not a great stylist and readers searching for literary elegance should look elsewhere. What Pais *does* bring is an understanding of the science far exceeding that of most of his readers, together with a personal acquaintance with the subjects of his full-length biographies, including Einstein, Bohr, and Oppenheimer. Pais goes into less detail about nonscientific aspects of Oppenheimer’s life, especially his boyhood and Harvard years, than many of the other biographers that I covered in *Metascience* (15.2, 2006). But because he personally worked with Oppenheimer, the book is in some sense almost as much about Pais himself as about Oppenheimer. Pais occasionally indulges in lengthy digressions to describe his personal interactions. I share Pais’s shock at learning that John von Neumann – whom he describes as “a Jewish wunderkind from Hungary” – became a Catholic toward the end of his life and was buried “in a brief Catholic ceremony” (p. 109) that Pais attended. I was charmed to learn about a stilted, brief exchange he had with T. S. Eliot in an elevator one day in the Autumn of 1948 (p. 87). Neither these nor any of a myriad other similar detours, however, advances Pais’s main narrative. Similarly, aside from the self-satisfaction it clearly gave Pais, it is hard to justify his inclusion of a paragraph that Oppenheimer sent to the mathematicians at the Institute for Advanced Study: “The record of Dr. Pais’ work in the last decade is almost a history of the efforts to clarify our understanding of basic atomic theory and the nature of the elementary particles... He is one of the few young theoretical physicists who within the last decade have enriched our understanding of physics” (p. 93).

From the outset, Pais confesses his “ambivalent” (p. xx) feelings about Oppenheimer. Only after completing a number of other projects, and realising that to date no full-length biography of Oppenheimer had been published, did Pais proceed with such a project of his own. While working on the book, he developed “compassion for a man who could never find enough satisfaction with his signal achievements, who forever was compelled to reach for more” (p. xxii). Pais’s Introduction concludes with the stunning claim that Oppenheimer’s “tragedy” was “not the hearings” but

rather his inability to be satisfied with himself, which “caused him to have a wretched life” (p. xxii). Later in the book Pais also talks of Oppenheimer’s “forever troubled soul” (p. 101).

Pais, however, blames Oppenheimer for bringing on himself his decline and fall. He asserts that Oppenheimer could have avoided “that ugly treatment” by “powerful and vindictive men who would silence his voice” if “he had not been so extremely arrogant” (p. 83). Pais early on concluded that Oppenheimer, the Director of the Institute for Advanced Study, where Pais was first a visitor, then a member, and finally “third professor of physics, after Einstein and Oppenheimer” (p. 94), was arrogant and insensitive. The skills that had made Oppenheimer a successful director of “some 6,000 people” at the Los Alamos Laboratory were not ones that transferred well to Princeton, where “he was lording it over just about 100 persons” (p. 91).

In the early 1970s Pais began to interview people who interacted with Oppenheimer over the years. He charmingly reports that his extensive personal Oppenheimer collection includes “a copy of Oppenheimer’s FBI files, 7,400 pages in all,” a number he knows exactly “because I paid the FBI \$740 for xeroxing, at 10 cents a page” (p. xxi). Pais quotes from all of these sources at much greater length than any other biographer – often excessively. He justifies the lengthy extracts from Oppenheimer’s own speeches as proof of Oppie’s “mastery of language, on occasion perhaps exalted but never stooping to the use of sesquipedalian words” (p. xxi). It is amusing to note that Pais himself occasionally thus stoops. In musing, for example, on why Oppenheimer left Berkeley for Princeton, he writes: “[i]f he knew that politics is a saprogenic profession, he did not behave accordingly” (p. 83). I had to look up “saprogenic”, which means “causing putrefaction”.

It is hard not to conclude that Pais, while admiring Oppenheimer as a scientist, and particularly as a science educator, considered himself at least his intellectual equal and his moral superior. More than once, Pais mentions “the many errors he made in his [scientific] calculations” (p. 3). Noting that Oppenheimer “was a rhetor rather than a speaker”, Pais recalls his reaction after first hearing Oppenheimer lecture: “I had been intrigued, nay moved, by his words, but now found myself unable to reconstruct anything of substance. I would now say that this was not just a matter of stupidity from my side” (p. 2). He also reports with self-satisfaction

that when Oppenheimer first “made the cover” of *Time* on November 8, 1948, the formulae on the blackboard against which Oppenheimer was photographed were “incidentally,...not his but mine” (p. 90). Pais also sees himself as filling a leadership void at the Institute. Since Oppenheimer failed to help the young physicists he brought to the Institute adjust to its “peculiar” environment, Pais assumed the “self-appointed task” of keeping “a protective eye on the newcomers” (p. 94). He compares his own empathy for these young people with the “arrogance if not cruelty” that Oppenheimer often demonstrated at seminars, where he would undermine “with unnecessarily biting comments” the self-confidence of young speakers who had “failed to clarify or missed a point” (p. 139).

One of Pais’s more interesting personal insights into Oppenheimer results from an invitation to join what Pais dubs “a craps game in my apartment.” Having told Oppenheimer “it will be an all-male affair”, Oppenheimer responded, “But I am not all male”. This self-revelation confirmed a conviction Pais had already reached: “strong latent homosexuality was an important ingredient in Robert’s emotional makeup” (p. 142).

Perhaps the most valuable parts of Pais’s book are those where he participated in the story. Chapter 23, “In which the News of the Hearing is Made Public”, involves a phone call from the director of the Washington Bureau of the United Press to the Institute for Advanced Study, which was ultimately directed to Pais, since Oppenheimer was in Washington and Einstein was at home. With UP eager to have a statement from Einstein on the eve of the press’s breaking the story of the upcoming Oppenheimer hearings, Pais decided to visit Einstein’s home: “I realized that pandemonium on Mercer Street the next morning might be avoided by a brief statement that evening” (p. 215). Readers of other Oppenheimer biographies already know that Einstein’s first reaction to Pais’s explanation for his visit was laughter. “I was a bit taken aback and asked him what was so funny. He said the problem was simple. All Oppenheimer needed to do, he said, was to go to Washington, tell the officials that they were fools, and then go home” (p. 215). Further conversation led the two physicists to collaborate on a statement that Einstein read over the phone to the UP director. Pais abruptly ended the phone conversation before Einstein could say anything impromptu that might prove embarrassing if spread by the press.

Pais died before completing the book. The last 82 pages were written by Robert Crease, professor at SUNY Stony Brook, and author of a monthly column on science and society issues for *Physics World*. In his Preface, Crease writes, "When Abraham Pais passed away, his manuscript on Oppenheimer was about three-quarters complete....Pais's widow, Ida Nicolaisen, and Kirk Jensen, an editor at OUP, asked me to add just enough material to flesh out the story into a complete biography, keeping my own contributions to a minimum and leaving Pais's manuscript intact. I therefore composed short chapters on Oppenheimer's hearing, on reactions to the hearing, on Oppenheimer's life and work after trial, and on the year of his death. Wherever I could, I quoted from the notes Pais made after his conversations" (p. xvii).

While Crease's main contribution thus consists of four chapters, he also added, in brackets, an occasional useful insight during the course of Pais's narrative. We learn, for example, with regard to the weird story of Oppenheimer's having left a poisoned apple on the desk of his Cavendish Laboratory advisor: "Some historians think that this may simply refer to a dubious paper that Oppenheimer had left on [Patrick] Blackett's desk" (p. 13).

Crease sheds light on Oppenheimer's decision to endure the hearing rather than resign from his Atomic Energy Commission consultancy. Not only was Oppenheimer "by now...deeply attached to his power and influence", not only was he "confident of his ability to prevail over those who were less intellectually quick than he was; which is to say, over everyone else", but also he was "accustomed to regard himself as essentially a public custody" as were "other influential scientific leaders, who despite the controversies and occasional betrayals of previous years still vested him with leadership". Crease quotes a letter that physicist Victor Weisskopf sent Oppenheimer in April 1954, essentially saying there is no better martyr for the cause than you, so whatever suffering you bear is worth it: "if I had to choose whom to select for the man who has to take this on, I could not but choose you. Who else in this country could represent better than you the spirit and the philosophy of all that for which we are living?" (p. 229).

Crease also clarifies the point that Oppenheimer was not the first atomic scientist to be subjected to such hearings. "A tried and true, and generally successful, defense strategy was to bring in prominent friends to testify to your character and ability, and to be

impressive yourself. Oppenheimer was well positioned to do this". But the AEC Chairman Lewis Strauss was no ordinary adversary. Abetted by the Attorney General, Strauss had wiretaps installed in Oppenheimer's home and office and had his mail opened and read. Strauss also rigged things so that the AEC's chief counsel and staff had access to myriad documents, while Oppenheimer's legal team was denied access even to documents that Oppenheimer had helped draft. Breaking with precedent, Strauss also arranged for witnesses *against* the subject to testify at the hearing.

I found fascinating Crease's interpretation of why Oppenheimer refrained from talking about the hearing during the rest of his life. "It was as if he was aware of his forthcoming historical role as a martyr, that he was an actor on the world stage, that all he had to do was to step back and let...this story unfold, and that the confessional mode was unnecessary to this role and could only sully it" (p. 257).

Although Crease consistently mis-spells 'heroes' his conclusion that Oppenheimer finally failed to fill one of Aristotle's criteria for a tragic hero is interesting: "[w]hat's untragic is that he seems to lack curiosity about...[his] behaviour, as if it were not part of who he was. The Oppenheimer story evokes tragedy without fulfillment because it involves reversal without recognition" (p. 271).

Crease has fittingly chosen to end the book with a quotation from Pais's eulogy for Oppenheimer. After mentioning Oppenheimer's pre-eminence as a researcher, a teacher, a leader, and populariser, Pais said: "[w]hen all is interwoven with the dramatic events that centered around him we remember Oppenheimer as one of the most remarkable personalities of this century" (p. 309).

The failure of posterity to remember the contributions of women scientists is the rationale behind the publication of *Out of the Shadows: Contributions of Twentieth-century Women to Physics*. In her Introduction Nina Byers describes the book's hope "to bring a more gender-balanced perception of physicists" to the masses who "tend to think that physicists are men" (p. 1).

It is too bad that Byers and her co-editor Gary Williams did not consult Freeman Dyson (who, coincidentally, was brought by Oppenheimer to the Institute for Advanced Study, where he has remained throughout his career) before deciding to limit their selection of women physicists to those who made "important, original contributions...from 1876 to 1976" (p. 1). As Dyson notes

in his Foreword, this book “provides plenty of role models for the next generation of women physicists. It says to any young woman aspiring to a career in physics, ‘Welcome to the club’” (p. xxv). But laudable as Byers’s and Williams’s selection may be, by arbitrarily confining themselves to that 100-year period, they necessarily omit “many younger physicists whose careers are still on the rise...[who] would be more appropriate role models for an average modern teenager than the grand and remote figures of the past such as Marie Curie...and Emmy Noether...Curie and Noether are wonderful role models if you only dream of dedicating your heart and soul to science. [Claire] Max and [Ellen] Williams and [Penny] Sackett and [Sara] Seager are better if you are also worried about making a living and raising a family under modern conditions” (p. xxi).

Lacking room here for extended remarks about the book’s 40 scientific profiles (and noting the omission from that number of Melba Phillips, co-discoverer of the Oppenheimer-Phillips process), I shall limit my comments, first, to the five profiles related to Curie’s story, and then to brief observations about other entries.

In the Introduction Byers attributes Curie’s greater fame relative to that of the other 39 women profiled to “the widespread publicity she encouraged in the interest of obtaining funding for her laboratory”. She laments the emphasis “on the fact that she was a female physicist rather than on her brilliant insights and amazing experimental achievements” (p. 7). Proponent though I am of better conditions for women in science, I personally lament that many more people know about Curie’s contributions to the science of radioactivity than those of Rutherford, who actually figured out the process of radioactive decay. Rutherford’s insights were probably more brilliant than Curie’s, and his experimental results were at least as amazing as hers. While it is more general for women’s achievements to remain in the shadows than those of men, we do nobody any favours by allowing the reverse to happen. Pais, in his profile of Curie (pp. 43–55), himself notes that Rutherford was “arguably the greatest experimental physicist of the 20th century” (p. 50).

An embarrassing typo in Pais’s essay shows that this volume could have used additional scrutiny by a proof-reader: Eve Curie was born not in 1894 – which would, in the quaint terminology of yesteryear, have made her an illegitimate child – but in 1904.

Irène Joliot-Curie's entry is co-authored by her daughter, Hélène Langevin-Joliot. Sentences like "His influence on Irène's interests and general ideas has been especially important, together with that of Marie" (pp. 141–142) and "She ensured later the practical training needed for handling correctly X-ray apparatuses in complement to Marie Curie's lectures to groups of nurses" (p. 142) suggest that the authors' English might have benefited from the attention of a copy-editor; the lack of accents over "the College Sevigne" also testify to the need for further proofreading.

The book's first profile is of Hertha Ayrton, of whom hardly anyone except Curie enthusiasts is likely to have heard. Ayrton, who met Curie when Pierre lectured at the Royal Society in 1903, sheltered and nurtured Curie during her recuperation following the Langevin press scandal. The profile focuses on Ayrton's own scientific achievements, as inventor of a sphygmomanometer, a line divider, and a fan to clear poison gases out of trenches; as tamer of the electric arc; and as expert on the formation of sand ripples and of vortices in water and air. The Royal Society's lawyers' determination that marriage disqualified women for fellowship denied Ayrton that honour. She nonetheless was awarded the society's 1906 Hughes Medal, a distinction granted to few other women since.

In the Introduction, Byers incorrectly calls Lise Meitner "a Jewish woman, [who] had to flee Nazi persecution in 1938" (p. 5). In fact, Meitner was baptised as a Protestant in 1908, at the age of 30. For the Nazis, of course, anyone with Jewish ancestry was racially defective; it did not matter what religion one professed. Ruth Lewin Simes, author of an excellent full-scale biography of Meitner (1996), notes in her entry several similarities between Curie and Meitner. She omits, however, the interesting revelation in her longer work that in 1907 Curie turned down Meitner's application to work in her lab. Nor does she refer to the rivalry between Meitner and Irène Joliot-Curie that Brian describes in his book.

Most biographies of Curie include a description of the contribution of Marguerite Perey to the science of radioactivity: the discovery of the element francium, a name she chose "in honour of her native land...thus echoing Marie Curie's name [for one of the elements she discovered], polonium" (pp. 233–234). I was interested to learn that Perey achieved the distinction of adding to the periodic table despite the fact that her family's lack of means resulted

in her never earning a university degree. The profile also identifies Perey as the first woman to be elected a “corresponding member, of the Académie des Sciences, which had been closed to women (including Nobel laureates Marie Curie and her daughter Irène Joliot) for almost three centuries since it was founded in 1666” (pp. 237–238) and notes that she and Meitner met at the centenary celebration of Marie Curie’s birth in Warsaw in 1967.

As the author of short book-length biographies of Rutherford, Einstein, Bohr and Pauling, I was drawn to certain profiles in this book; as the wife of an astrophysicist, I paid careful attention to others. My research had introduced me in general terms to Harriet Brooks, whose contributions to the burgeoning science of radioactivity were made while working with Rutherford in Montreal. I was interested to learn how her scientific career ended. Despite the intervention of Margaret Maltby, subject of another profile in this book and head of physics at Barnard College, the Dean of Barnard would not permit Brooks to continue teaching there after a planned marriage. The stress of the dispute resulted both in a broken engagement and in Brooks’ resignation from Barnard. Her subsequent work at the Curie Institute resulted in no published papers. Her marriage to one of her McGill teachers led her to turn down a fellowship at Manchester, for which Rutherford, now chair of physics there, had recommended her. “A humble and self-effacing person, she eventually came to the conclusion that marriage without profession was to be preferred to profession without marriage” (p. 71). A brother-in-law of Harriet Brooks Pitcher, A. S. Eve, was both a professor of physics at McGill and Rutherford’s first biographer.

In addition to Curie, with whom he was friendly enough to hike in the mountains with children in tow, Einstein interacted with at least two other women profiled in this book. His memorial appreciation of Emmy Noether was more than respectful: “[i]n the realm of algebra, in which the most gifted mathematicians have been busy for centuries, she discovered methods which have proved of enormous importance” (p. 84). Einstein intervened on behalf of Marietta Blau after the *Anschluss*, finding her a position at the Polytechnic Institute in Mexico City, where she worked for several years.

Although I was surprised not to find a profile of Hilde Levi, whom Bohr assisted after the rise of the Nazis, there are some indirect links between Bohr and three women profiled here. The

seismologist Inge Lehmann (who first recognised the existence of the Earth's inner core) studied in the coed school run by Bohr's aunt Hanna Adler; there, Lehmann later recounted, "[n]o difference between the intellect of boys and girls was recognised, a fact that brought some disappointment later in life when I had to recognise that this was not the general attitude" (p. 104). Bertha Swirles Jeffreys, after retiring from Girton College, Cambridge, corresponded with playwright Michael Frayn about *Copenhagen*, his play about the 1941 meeting between Bohr and Heisenberg. Gertrude Scharff Goldhaber's work contributed to the collective theory of nuclear motion, for which Bohr's son, Aage, shared a Nobel Prize in 1975.

Although the book ignores crystallographer Rosalind Franklin, its profile of crystallographer Kathleen Yardley Lonsdale indicates that her collaboration at the Royal Institution with K. S. Krishnan "produced many new results that aroused the interest of a number of theoreticians, including Linus Pauling" (p. 194).

Like Dyson, I lament the lost opportunity to highlight here the work of the many outstanding women astrophysicists working today. I also wonder why Annie Jump Cannon, though mentioned several times in passing, does not merit her own profile. I feel privileged to have some degree of acquaintance with the three living astrophysicists profiled here, all of whom received honorary degrees at my institution, Williams College: Margaret Burbidge, Vera Rubin, and Jocelyn Bell Burnell. Rubin is not only subject of her own profile but also author of a moving entry on Cecilia Payne-Gaposchkin. In it we learn that Harvard President Lowell told Harlow Shapley that "Miss Payne should never have a position in the University while he was alive" (p. 166), and that Rubin herself, in 'a brazen act', valiantly but vainly urged the chair of the Harvard Astronomy Department to nominate Payne-Gaposchkin for membership in the National Academy of Sciences. Although Leo Goldberg, then Director of the Kitt Peak National Observatory, later nominated Payne-Gaposchkin, she died before the election.

Our not-quite-random walk having reached its end, I recommend all three books, but with qualification.

Department of English
Williams College
Williamstown, MA, USA