Heady days in Princeton

Pursuit of Genius: Flexner, Einstein, and the Early Faculty at the Institute for Advanced Study
by Steve Batterson
A. K. Peters: 2006. 314 pp. $39

John Stachel

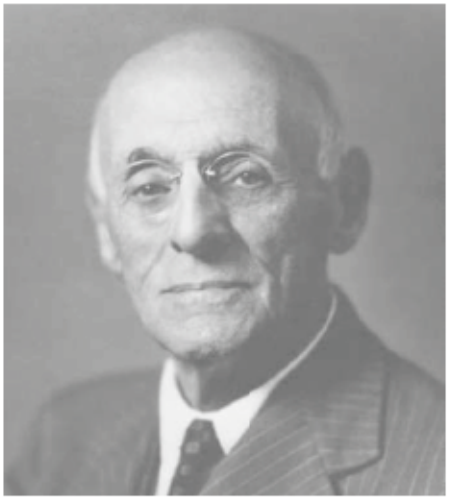
Punching "advanced study" into Google's search engine brings up more than 2 million entries, but heading the list is the Institute for Advanced Study (IAS) in Princeton. Born of the union between private philanthropy and individual vision, the institute was a typically American marriage consciously modelled on the one that gave birth in 1876 to Johns Hopkins University, the first research university in the United States.

The IAS was itself the model for many other centres, including the Mexican Centro de Investigación y de Estudios Avanzados (CINVESTAV), set up 45 years ago, which was typical of the way research on a national scale is sponsored and financed by national governments. (I have spent time at both the IAS and CINVESTAV.) The United Nations University's Institute of Advanced Studies, set up just a decade ago, suggests a possible future pattern, with research being envisaged, controlled and conducted by international agencies on an international scale.

It is interesting to read in *Pursuit of Genius* by Steve Batterson how the IAS fared in the early days under the direction of its founding genius, Abraham Flexner. Flexner made his name with a report in 1910 on the quality of medical education in the United States. His brother Simon, an MD, had persuaded John D. Rockefeller to let him run a medical institute on the Johns Hopkins model; it also employed Flexner for some time. Meanwhile, two wealthy Bamberger siblings, Louis and Caroline, sold their Newark department store just before the 1929 economic crash and wanted to found a medical school. They approached Flexner, but he convinced them to abandon the idea in favour of an institute of higher learning, a hybrid centre with Johns Hopkins' scope and the Rockefeller Institute's methods.

Flexner's first great success, chronicled in detail by Batterson, was the founding of the School of Mathematics, in which he had the unintended help of Adolf Hitler. Einstein had originally agreed to spend half his time at the new institute, but when the Nazis came to power in Germany in 1933, he realized he could not return to Berlin. He was joined by mathematicians Hermann Weyl (after much soul searching and a nervous breakdown) and Kurt Gödel (who see-sawed between Vienna and Princeton) at the new institute's first home in Fine Hall, the Princeton mathematics building.

There were other successes during the decade, such as the building of a separate campus for the institute and the founding of several other schools. But growing friction between Flexner's autocratic methods and the faculty's desire to participate in the institute's governance led to a struggle that culminated in Flexner's resignation in 1939. But the power struggle continued, as Batterson makes clear in a rather perfunctory final chapter giving a high-speed sketch of the intervening sixty-odd years of the institute's history.



IAS ARCHIVES

Abraham Flexner helped to establish the Institute for Advanced Study at Princeton.

The book is based primarily on a meticulous study of the institute's documentary records and the papers of some key players in its early history. Batterson tells a fascinating story, largely unvarnished, including such unsavoury details as the anti-Semitic atmosphere of Princeton at that time. The institute's patrons, its director and much of its initial faculty were Jewish, yet Flexner repeatedly refused to face up to anti-Semitism in the US educational system, let alone do anything to fight it.

More amusing are Batterson's detailed accounts of the turf war between Princeton University, particularly the mathematics department headed by Luther Eisenhart, and the institute's budding mathematics section, headed by Oswald Veblen.

The emphasis on documentary detail does not always generate a feeling for the setting in which these dramas took place. Einstein's letter to Belgium's Queen Elizabeth, written soon after his arrival, better conveys a sense of how incredibly provincial Princeton seemed to someone coming from Weimar Berlin: "Princeton is a wonderful little spot, a quaint and ceremonious little village of demigods on stilts… Here the people who compose what is called 'society' enjoy even less freedom than their counterparts in Europe. Yet, they seem unaware of this restriction since their way of life tends to inhibit personality development from childhood."

The use of Einstein's name in the title seems to be a hook to grab readers. Although he does play an important role in the story, it is no greater than that of many other early faculty, such as Veblen. The account of Einstein's private life is not always accurate and provides fewer new insights than the more fascinating account of Weyl's; those who want a more intimate picture should read Jamie Sayen's *Einstein in America* (Crown, 1985). Readers inclined to accept the myth that Einstein was completely isolated after his move to Princeton will be surprised at the large public role he played in shaping the fate of the institute, particularly in finally bringing down Flexner. ■

John Stachel is emeritus professor of physics and director of the Center for Einstein Studies, Boston University, Boston, Massachusetts 02215, USA.

Display elements

The Periodic Table: Its Story And Its Significance
Eric M. Scerri
Oxford University Press: 2006. 368 pp. £19.99, $35

Bernadette Bensaude-Vincent

The Periodic Table by Eric Scerri is the first major English-language monograph on the history of the periodic system since Jan van Spronsen's *The Periodic System of Chemical Elements* (Elsevier, 1969). Like van Spronsen, Scerri tries to understand the construction of the periodic table within the context of the history of matter theories. And like van Spronsen, he insists that it results from the collective work of many chemists. Chapter 3, which begins with the early triads derived from Prout's hypothesis and presents six co-discoverers of the periodic system, provides a summary of van Spronsen's classic study. However, his superficial overview of successive notions of elements mainly reinforces some popular clichés.

At this point, Scerri departs from van Spronsen. The historical sketch just provides the background for an exposition of his philosophical views on chemistry. Scerri, the editor of the journal *Foundations of Chemistry*, is interested above all in the question of whether chemistry can be reduced to quantum mechanics. He resolutely opposes Paul Dirac's 1929 claim that "the underlying physical laws necessary for the mathematical theory of a large part of physics and the whole of chemistry are completely known". The main purpose of his book is to

demonstrate that the periodic system has not been reduced to physics and cannot be deduced from quantum theory.

Scerri pays attention too to the philosophical choices underlying the construction of the periodic table. The chapter on Dmitry Mendeleev's process of discovery emphasizes that Mendeleev had an abstract 'metaphysical' notion of chemical elements that he clearly distinguished from Antoine Lavoisier's view of elements as simple, concrete substances — a conceptual shift first emphasized some 20 years ago. In addition, Scerri has misunderstood the epistemological status of Mendeleev's abstract notion of the element. Far from reviving a metaphysical notion, Mendeleev did his best to promote a positive, if abstract, notion of the element. Not only did he characterize this invisible entity by an individual quantitative property — its atomic weight — but he defined it by analogy with other basic concepts of chemistry, stating that the distinction between the element and simple substance was like the distinction between atoms and molecules.

Scerri is more original in his detailed account of Mendeleev's famous predictions of unknown elements. He revises the usual success story in pointing out that Mendeleev failed as often as he succeeded. He thus discusses a question first raised by Stephen Brush: whether predictions were a decisive factor in the acceptance of the periodic system. Scerri emphasizes the importance of Mendeleev's ability to fit all the elements into the system.

The core of Scerri's argument is to be found in the chapters dealing with the evolution of the periodic system with regard to changes in atomic theory in the aftermath of Mendeleev's discovery. Here Scerri makes a plea for the autonomy of chemistry. He convincingly argues that the abstract notion of the element was crucial to rescuing the periodic system in the light of the discovery of isotopes. He also rightly notes that Niels Bohr's atomic model relied heavily on spectroscopic data, rather than on theoretical calculations. Against repeated claims that chemistry has been reduced to physics, it is always useful to keep in mind that early quantum physics was based on chemical data.

Finally, in considering a variety of visual representations of the periodic system, Scerri advocates a system known as Charles Janet's left-step table, because it rests on the concept of elements as basic substances, rather than on physical properties.

All practitioners of chemistry, from researchers and teachers to engineers, seem have an opinion about what the periodic table should look like, and many of them continue Mendeleev's work in an attempt to propose better graphic representations. Despite the standard format recommended by the International Union of Pure and Applied Chemistry in 1985, with groups numbered from 1 to 18, new tables are invented every year. In 1973, Edward Mazurs reviewed hundreds of visual representations of the table and distinguished 146 structural types. The periodic system, then, is like a monument, forever inviting new creative designs. ■

Bernadette Bensaude-Vincent is in the Department of Philosophy, Université Paris X, 200 avenue de la république, 92001 Nanterre, France.

SCIENCE IN CULTURE

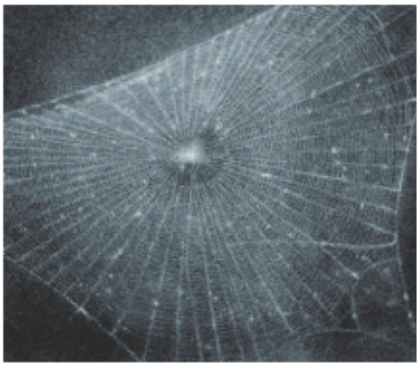
Drawn to nature

Vija Celmins' graphite and charcoal drawings are inspired by the natural world.

Colin Martin

Drawing is central to the work of Latvian-born US artist Vija Celmins. Her haunting, monochrome depictions of limitless expanses of ocean, nocturnal skies and deserts lack a point of reference, such as the horizon, or a depth of field. Usually copied meticulously from photographs she has taken herself, each image takes months to draw. 'Vija Celmins: A Drawings Retrospective', an exhibition originally shown at the Centre Georges Pompidou in Paris and on view at the Hammer Museum in Los Angeles, California, from 28 January (www.hammer.ucla.edu/exhibitions/119), brings together 68 of Celmins' drawings made over a 40-year period.

V. CELMINS/ADAGP, PARIS



V. CELMINS/ADAGP, PARIS

In 1968, Celmins began using photographs of outer space to translate the idea of the night sky into an abstract composition, an approach she then adopted in her ocean drawings. "The sight of the waves miles out, their dutiful and frenetic solitude, their dull indifference to their fate," mused novelist Colm Tóibín in his catalogue essay.

Celmins drew *Untitled (Big Sea #1)* (shown above, left image) in 1969 using graphite on a sheet of paper covered with a light grey acrylic ground, a technique she favours to avoid digging her pencil into paper. By leaving a thin grey border around her images (not shown here), Celmins signals that her subjects are clearly defined objects and not fragmentary images. The subject matter is clearly her photograph, not an actual seascape. "I don't imagine the ocean and try to recreate a memory of it when I'm doing the art," Celmins said in 1992. "I explore a surface through drawing it. The image gets controlled, compressed and transformed."

Over time, Celmins' ocean drawings became denser and she created perspective by using thicker layers of graphite to darken the lower parts of her drawings. Repetition became more significant in her work, and she began producing series of similar images.

In 1983, thinking she had exhausted drawing as her medium, Celmins returned to painting. But she began drawing again in 1994, using a different technique. She applied charcoal by hand directly onto paper, and used erasers to rub through the charcoal to create images by exposing the white surface of the paper.

The subjects of Celmins' latest series of drawings are delicate, light spider webs, shown against dark charcoal backgrounds. *Web #1* (shown above, right) from 1998 conveys the translucent quality of a web in an image that has a sense of discovery and wonder. The series was inspired by a scientific publication, James Henry Emerton's 1902 book *The Common Spiders of the United States*. "If I wasn't an artist, I think I would have liked being a scientist," said Celmins.

Colin Martin is a London-based writer.