

languages like Esperanto and Ido in the period before World War I, and the bitter conflicts and rivalries they engendered, are gripping. Whereas the aftermath of World War I saw the decline of German and the rapid ascent of English, the aftermath of World War II saw a spike in the use of Russian as a result of the creation of the enormous Cold War Soviet scientific establishment. Solutions to the problems this posed for scientists and science policy in the West were sought, for example, in mechanical translation, in various education programs, and in a soon-to-become-bloated system of cover-to-cover English translations of Russian journals (see graph on p. 258). But nothing could stop the juggernaut that was English, the ultimate global ascendancy of which is analyzed and assessed at length in the book's penultimate chapter, "Anglophonia." The pages on the linguistic backgrounds of Nobel laureates in chemistry during the period between the fall of the Soviet Union and 2011 are perhaps typical of the book's approach to the analysis of the current "ubiquity of English" and its exploration of the personal consequences of this phenomenon for individual scientists (pp. 303–305).

This is in no way a simplistic, triumphalist history. Anglophonia did not follow any straight line of inevitable development, though the author does not foresee the likelihood of English's ascendancy being challenged by current geopolitical developments, such as the rise of China. The book's accounts of scientific events and personalities are complex and subtle. They involve engrossing historical twists and turns, though these sometimes seem to loosen the tightness of narrative construction. The book is abundantly documented with formidable, assured, multilingual scholarship. While its informal, conversational writing style is attractive, it can be quirky and may already be a bit dated. But this is to quibble about an imposing piece of scholarship that is at the same time a "great read."

**W. Boyd Rayward**

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**Silke Fengler; Carola Sachse** (Editors). *Kernforschung in Österreich: Wandlungen eines interdisziplinären Forschungsfeldes, 1900–1978*. (Wissenschaft, Macht und Kultur in der modernen Geschichte, 1.) 411 pp., illus., tables. Vienna: Böhlau Verlag, 2012. €35 (paper).

**Silke Fengler**. *Kerne, Kooperation und Konkurrenz: Kernforschung in Österreich im internationalen Kontext (1900–1950)*. (Wissenschaft, Macht und Kultur in der modernen Geschichte, 3.) 373 pp. Vienna: Böhlau Verlag, 2014. €49 (paper).

Why present the history of radioactivity research and nuclear physics in the national framework of Austria? Two new books—*Kernforschung in Österreich* and *Kerne, Kooperation und Konkurrenz*—do exactly that. The books are the result of a history project on radioactivity research and nuclear science in Austria in the context of international collaboration and competition, headed by Carola Sachse and executed by Silke Fengler. A rather international community of historians of science has already shown great interest in radioactivity research in Vienna. With the Joachimsthal mines (now Jáchymov in the Czech Republic), the Austro-Hungarian Empire held a monopoly over the supply of radioactive material, which in turn created a vibrant international network of traffic in radioactive elements and compounds. The comparatively large number of women at the Institute for Radium Research made it an interesting case for Maria Rentetzi's study on gender and science in the early twentieth century. Roger Stuewer and Jeff Hughes have dealt with the Vienna-Cambridge controversy on scintillation counting. Marietta Blau's nuclear emulsions feature in Peter Galison's *Image and Logic*.

The two volumes under review narrate these histories from an Austrian perspective. The argument to set up the Vienna Institute for Radioactivity Research was a national one: The Austro-Hungarian Empire

should exploit the resources from the largely state-owned Joachimsthal mines economically as well as scientifically. The scientific study of the radioactive material had to be located in Vienna, the Cisleithanian capital of the Empire, thus establishing a clear hierarchy of center and periphery—a key feature of the Austrian radioactivity research community. The nature, the boundaries, and the very existence of the Austrian Empire and the following Austrian nation-state were repeatedly contested and altered during the period examined in the two books. The loss of the Joachimsthal mines after World War I challenged the logic of hosting the Radium Institute for the German-Austrian rump state. Nazi Germany was to annex the Austrian state in 1938 and place Vienna second to Berlin in the new Greater Germany, only to be dissolved again in 1945.

The edited volume *Kernforschung in Österreich* is a mixed bag. Some of the contributions present already well-known histories such as Ruth Lewin Sime's chapter on Marietta Blau and Deborah R. Coen's chapter on the history of radioactive decay, which is a German translation of a paper she published in 2002 in English. Like Coen, Michael Stöltzner discusses the history of radioactivity fluctuations. He compares Egon von Schweidler's work on fluctuations in decay with Marian von Smoluchowski's explanation of Brownian motion around the same time. Stöltzner characterizes Ludwig Boltzmann as someone following only "one single research program" throughout his career, in contrast to Franz Serafin Exner, whose students formed a thought collective from which most of the researchers of the Radium Institute originated. While there might be some truth in this characterization, it does not do justice to Boltzmann's broader scientific agenda, including his work on electrodynamics.

Beate Ceranski tells us how Austria used its position as the sole supplier of pitchblende to become a research center for radioactivity research in the first decades of the twentieth century. Silke Fengler's chapter deals with radioactivity research in the German-Austrian state in the interwar period and the transition to nuclear physics, Austrofascism, and Nazi Germany's annexation of Austria. Rainer Karlsch supplies us with an interesting Soviet view on nuclear physics in Austria during the Third Reich. Christian Forstner informs us about postwar visions and projects of nuclear energy in Austria until the Austrian population voted against nuclear power in 1978, shortly before Austria's first nuclear power plant could begin operating. Vanessa Cirkel-Bartelt's chapter deals with collaboration, or rather the lack of it, in early cosmic ray research in Austria.

Some chapters, like Wolfgang Knierzinger's chapter on the Gastein Research Institute and Ingrid Groß and Gerd Löffler's contribution on the industrialist Carl Freiherr Auer von Welsbach, are original, but one gets the feeling they could be developed more fully. The chapter on Auer and Günther Luxbacher's contribution on the nuclear metallurgist Erich Schmid and the Austrian steel industry supplying reactor materials read like homages and need critical analysis of these crucial episodes in the nuclear industry's history. Alexander von Schwerin's chapter on the economy of radioisotopes in Austria in the 1950s concludes the volume. Schwerin brings the narrative back to the circulation of radioactive material. Around 1900, Austria became the center of an international trading network on account of the Joachimsthal mines. By the 1950s, the situation had been inverted: natural radioisotopes had lost their importance, and big machines, reactors and accelerators, drove the vision, the politics, and the practices of the atomic age. Formerly an exporter of radioactive material, Austria had become an importer of radioisotopes.

Silke Fengler's *Kerne, Kooperation und Konkurrenz* is a detailed history of radioactivity and nuclear physics research in Austria. The narrative is based on the social networks of the Austrian radioactivity community. While she discusses both the Austrian network of Exner's students and the international community of radioactivists, Fengler narrates the history from the perspective of the Vienna Radium Institute and the physics institutes of Vienna University, which sidelines the smaller physical institutes in Graz and Innsbruck and industrial actors like the Auergesellschaft. In the first decades of its existence, the Radium Institute negotiated and manufactured radioactivity standards. International relations ruptured during World War I, but work at the Radium Institute continued without significant disturbance. After the war, American radium production broke the Joachimsthal monopoly. The existence of the many radioactive compounds from before World War I, and Stefan Meyer's collaboration with the Union Minière, which mined uranium and radium ores in the Belgian Congo, consolidated the Radium Institute's position.

With Ernest Rutherford's experiments of 1919, the focus of radioactivity research turned toward nuclear disintegration. The Rockefeller Foundation's International Education Board supported Swedish physicist Hans Pettersson's work in Vienna generously.

The age of the big machines in the transition to nuclear physics in the 1930s put an end to the strong position of naturally occurring radioactive isotopes in research. With electric counters and particle accelerators, the electrical industry became a more important resource than naturally radioactive substances. Pettersson's return to Sweden and the Rockefeller Foundation's redirection of its funding programs to biology hit the Radium Institute's funding. Tensions rose between Germany and Austria in the early 1930s, especially after the Nazi takeover in 1933. After Nazi Germany annexed Austria in 1938, Jewish radioactivists were expelled and Meyer was driven into "inner exile" in the Austrian province. The Berlin establishment challenged Vienna's status as an international authority for radioactivity matters and questioned standards produced in Vienna.

In Fengler's narrative, the big picture sometimes gets lost in the details. The book would have benefited from her reading of the Cambridge-Vienna controversy—instead she discusses in detail its consequences for the Vienna researchers. Fengler does not agree with Rentetzi's position that the termination of Rockefeller funding for the Radium Institute in 1930 meant the beginning of the end of radioactivity research in Vienna. Instead, Fengler argues, Rockefeller money went to the Physics Institute of Vienna University and ceased only in 1936. Nonetheless, Fengler argues, the Vienna radioactivists lost their position as a leading international research center in the early 1930s because of the transition to nuclear physics done with big machines. Fengler also questions Rentetzi's thesis that social democratic "red" Vienna created specifically favorable conditions for women to work in radioactivity research.

After the German annexation of Austria, Fengler tells us, Vienna was on the periphery of the German Uranverein but still received more funding than it had under the Austrofascist regime. While few researchers came from Germany to Austria, the National Socialist period reconfigured the Austrian radioactivity research community, with a new generation of younger Exner students taking over the vacant positions after the expulsion of Jewish and politically unwanted scientists. While offering resources and career opportunities to some, the Third Reich isolated the Austrian radioactivists internationally. Fengler's narrative ends in the immediate postwar period. The United States and France took over in the postwar order, while Meyer and the Radium Institute were completely sidelined by the questions regarding radioactivity standards. As in Germany, many of the researchers who advanced their careers during the Nazi regime and who were active Nazis stayed in power after the war. Unlike Germany, the allied occupying powers did not put any restrictions on nuclear research. While few scientists were recruited to the United States through Operation Paperclip, several researchers were recruited by the USSR or carried out militarily relevant research for the French and British occupying forces in Austria.

The edited volume and Fengler's monograph complement each other. While Fengler's own contributions are rather similar in both books, other contributions of the edited volume bring in different perspectives, especially from industry as well as from outside Vienna. The edited volume also extends the historical period analyzed to the 1970s. The monograph, in turn, is a more detailed and well-written history of the social networks of the Vienna radioactivist community. Fengler's *Kerne, Kooperation und Konkurrenz* is, by the way, part of the open-access basket of the Böhlau publishing house, which is excellent news for scholars worldwide.

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