Galápagos finches. He thus recovers the conventional association of Romanticism with the tardy embrace of modern specialist sciences in the British Industrial Revolution.

Few of the central figures in *Natures in Translation* had the initiative and accomplishment of Henry Thomas Colebrooke in South Asia, Carl Friedrich Philipp von Martius in Brazil, Philipp Franz von Siebold in Japan, Richard Francis Burton in the Middle East and Africa, and Alexander von Humboldt in the Western Hemisphere from top to bottom; of the Spanish and French navigators (eminently enlightened Lapérouse does make an appearance); or indeed of Napoleon in Egypt or Raffles in Southeast Asia. The hugely influential Benjamin Franklin, a colonial British investigator of Nature (and a womanizer but no Romantic), gets short shrift (p. 125). Missing are Dutch and Spanish savants and their publications. Romanticism spanned Europe, Asia, and the Americas, but reference to Bartram's well-known impact on the polyglot Coleridge (p. 208) projects British Romantics as anglomaniac.

Writers in *Natures in Translation* sought, following Horace, to delight and to instruct. Also Horatian in respecting *Natura*, the singular natural world, they sported the jersey of naturalist Continentals: Linnaeus or Buffon (the latter of whose strictures on literary style appear in William Strunk and E. B. White's guide to composition taught today in U.S. schools). If young Charles Darwin was a profound Linnaean, young Mary Shelley was surely Buffonesque. Darwin shed his mental set, *Lebenswelt*, or *habitus* (notions still current by Ernst Gombrich, Jürgen Habermas, and Pierre Bourdieu that are appropriate to introduce here), but most of the others inched along in the shell of their prejudice.

Lewis Pyenson

Lewis Pyenson is Professor of History at Western Michigan University. He is studying common features of art and science in modernity.

Modern

Jürgen Teichmann. *Der Geheimcode der Sterne: Eine neue Landschaft des Himmels und die Geburt der Astrophysik*. 372 pp., illus., bibl., index. Munich: Deutsches Museum, 2016. €20 (cloth).

The focus of *Der Geheimcode der Sterne* is on the history of spectral analysis and its use in astrophysics. The author draws a line from the work of Joseph Fraunhofer at the beginning of the nineteenth century to that of Gustav Robert Kirchhoff and Robert Wilhelm Bunsen in the middle and also looks ahead to further developments in the first half of the twentieth century. In the first half of the nineteenth century the common opinion among astronomers was that astronomy should deal only with the motion of the celestial bodies (i.e., Friedrich Wilhelm Bessel, 1832 [p. 13]). That means that physical properties—as, for instance, Fraunhofer's black lines or Friedrich Wilhelm Herschel's observation of the infrared radiation—were not of interest for astronomers of the time (and of just a little interest for physicists). It was not imaginable to astronomers that experimental research could be helpful in their work. Jürgen Teichmann shows how this position changed—very slowly—during the nineteenth century and under the influence of spectroscopic success. Especially after Kirchhoff and Bunsen showed that the dark lines in spectra are something like a fingerprint of elements, it appeared possible for astronomers to investigate the distribution of elements in the Sun (and in stars more generally). Spectral analysis enabled astronomers to devise a new classification of stars, and they began to look for their evolution. Observation of the sky attained a new quality.

By looking at the case of William Wollaston, Fraunhofer, and the dark lines in the solar spectrum (as one among numerous further examples) the author emphasizes (p. 64 ff.) that it is not sufficient to observe a special phenomenon; it is also necessary to explain or to classify it plausibly. Other researchers had in fact already seen what Fraunhofer saw, but they could not offer a meaningful interpretation. In addition,

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Teichmann demonstrates the dependence of the progress of knowledge on the development of instruments and measuring equipment. Furthermore, he notes parallels between Fraunhofer's new approach to the sky and the development of Romantic and Impressionistic painting at the time. From the 1860s onward, in astrophysics as in painting, photography became increasingly important (p. 231 ff.).

Teichmann presents numerous historical facts to demonstrate that there is no straight path to new knowledge and its acceptance (despite what is presented in textbooks, which mostly show a direct line from one discovery to the next). There is a repeated focus on missed opportunities, like that of Johann Lamont, who used Fraunhofer instruments at the Bogenhausen observatory but did not continue Fraunhofer's research, delaying the start of astrophysics for twenty years (p. 120 ff.). Whereas such expositions about science in practice are rather significant for the historiography of science, other speculations—apparently aimed at a general audience—are less fruitful, like the question of who among the discoverers of spectral analysis—Bunsen, Kirchhoff, Stewart, Stokes, Thomson, or others—should have been awarded a Nobel Prize (never mind that these prizes have been awarded only since 1901). This strategy of if-, but-, and maybe-speculations, and the jumping back and forth in time, also requires a lot from the reader.

In the final chapter the author presents and discusses several pieces (most with illustrations) from the collection of the Deutsches Museum München, artifacts with which—as an exhibition designer at that museum—he is very familiar.

Teichmann makes use of primary and secondary literature on physics, astrophysics, and the history of painting. The accompanying index and the substantial bibliography are quite useful. The book, aimed at a general audience, not only offers an inspiring look at the history of spectroscopy and astrophysics during the nineteenth century but also suggests views about connections with other sciences and arts (painting, photography, etc.).

Horst Kant

Horst Kant has been a research scholar at the Max Planck Institute for the History of Science since 1995 and a visiting scholar since 2011. His main subjects of interest are history of physics in the nineteenth and twentieth centuries (especially institutional, social, and biographical aspects) and history of atomic physics.

Courtney Fullilove. *The Profit of the Earth: The Global Seeds of American Agriculture*. 280 pp., figs., index. Chicago/London: University of Chicago Press, 2017. $40 (cloth).

Helen Anne Curry. *Evolution Made to Order: Plant Breeding and Technological Innovation in Twentieth-Century America*. x + 285 pp., figs., bibl., index. Chicago/London: University of Chicago Press, 2016. $45 (cloth).

These books examine the expansion of agriculture over the past two centuries, with a focus on American entrepreneurship. Courtney Fullilove approaches her history of seeds from the vantage point of cultural history, while Helen Curry's approach blends history of science and technology, without neglecting popular culture. Each book explores fascinating tales of American innovation, but without imposing a progressive or linear narrative on events. Each seeks to draw lessons from apparent failures.

Fullilove is a historian and also a collector for seed banks. Her book examines agricultural improvement in nineteenth- and early twentieth-century America through a series of episodes focusing on different institutions, individuals, and immigrant groups. Between chapters she offers "field notes," which use her own seed-collecting experiences and encounters with people as springboards for reflection on various topics, such as how local knowledge of plants is acquired and transmitted and the relationship between biological and cultural diversity.

Her first section examines seed-collecting enterprises in antebellum America, with a focus on the U.S. Patent Office in Washington, D.C. Starting in the 1830s, it was active in collecting seeds obtained through

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