

Los Angeles that they found the Searles Lake water “to be a wine color, and so strongly alkaline as to be slippery to the touch.”

Those “slippery” brines failed to slake Manley’s thirst, but subsequently have produced major riches in the form of sodium carbonate, sodium sulfate, common salt, and several borate products. In addition, the brines contain huge, but currently sub-economic, quantities of potassium, lithium, and even tungsten.

John Searles (1828-97) was the first person to exploit borates on an industrial scale from the lakebed in the 1870s, and was probably the first to identify borax (and tincal) there, in the 1860s. This book highlights his career, with its many tortuous stages prior to his involvement with California borates.

A native of upstate New York farming country, he moved to California in 1852. He and his brother Dennis farmed in rural, northwestern Trinity County, during which time they witnessed placer mining for gold near their properties. Following legal and title problems, the brothers departed the area in 1858.

By 1860, John and Dennis had transferred their energies from the lush, forested mountains of Trinity County to the barren Slate Range in the desolate Death Valley region, focused on mining silver. Initial success there turned into eventual bankruptcy, and reduction to modest circumstances for the brothers.

The Searles brothers were able to turn their silver-mining “lemon” into “sweet lemonade” due to the serendipitous proximity of Searles Lake to the Slate Range mines. During the 1860s John’s attention was drawn to the presence of borax in the surficial salt crust on the lakebed, and by 1873 the brothers were producing 38 percent of the total U.S. borax output, this increasing to 53 percent by 1876.

After the death of Dennis, John controlled the San Bernardino Borax Mining Company, which continued production through 1895, as-

suming his fortune. During this period, John Searles developed the legendary “twenty-mule-team” borax wagons, to haul product to the railhead at Mojave, California.

John W. Searles retired in 1895 to Napa County, where he died in 1897, aged 69. The book recounts his descendants, as well as side-lights of his career in California, including his dealings with Native Americans and his near-death adventures with a grizzly bear in the Tehachapi Mountains.

Even a work as well-executed as this has some room for improvements. First, the text would flow more smoothly if much of the detailed genealogy dating back to 1645 in New York were placed in an Appendix. While this information is of great interest to the Searles family itself, it is less pressing for readers seeking information about John W. Searles himself or California mining history. Second, a brief technical chapter on Searles Lake’s origins and chemistry would be of inestimable value in placing this marvelous chemical storehouse in context within California mining history. Author Fairchild, a long-time chemical company employee and resident of the Searles Valley, is in a unique position to do this in a subsequent edition.

Fred Barnard
Golden, Colorado

Kristin Ranestad. *Knowledge-Based Growth in Natural Resource Intensive Economies: Mining, Knowledge Development and Innovation in Norway 1860-1940*. Cham, Switzerland: Palgrave Macmillan (Palgrave Studies in Economic History), 2018; 299 pp., notes, ref., 6 append., ind., cloth \$119, eBook \$89. ISBN: 978-3-319-96411-9 cloth; 978-3-319-96412-6 eBook.

Kristin Ranestad’s book is noteworthy for its methodology, as well as its substance. Unknowingly, she aligns herself with Charles Tilly’s call for comparative research covering long periods

of time. (*Big Structures, Large Processes, Huge Comparisons*, 1984.) Notwithstanding Norway's featured place in the book's title, the scope of the book is broader. Ranestad's insights come from her comparison of mining in Norway with Chile, as well as Australia, Britain and England, Canada, France, Sweden, and the United States. Lesser mentions are made of Angola, New Zealand, Nigeria, Sudan, and Venezuela. This approach provides the foundation for her challenge to the notion that natural resource-based development is a path to economic ruin—the so-called “resource curse” or “Dutch disease.”

The idea that abundant natural resources inevitably leads to economic distortions and slowed economic growth is first addressed in an overview of economic development literature, from older dependency theory work to more recent publications by economists and historians. This analysis sets the stage for her spotlight on the role of knowledge in national economies, with foreign capital considered a secondary matter. Opening the author's case to correct the tendency of many economic histories to characterize mining as inevitably a harmful experience, Ranestad reminds us that there are countries with positive mining outcomes, among them Norway. Her focus on Norway, as a small country case-in-point, is to demonstrate how mining can contribute to long-term national economic growth. Canada, Australia, Sweden, New Zealand, and the United States are also brought into the discussion as examples of economic success based on natural resources. She does not mention that “success” in a few of these countries is disputed on the basis of regional disparities. The author further contrasts Norway's natural resource-based economic development with Chile's nineteenth century copper mining boom—four decades dominating world copper markets that in the end failed to support long-term national economic growth. (Her 2015 University of Geneva Ph.D. thesis compared Norway and Chile: “The mining sectors in Chile and Nor-

way from ca. 1870 to 1940: the development of a knowledge gap.”) Ranestad asks why are there these different outcomes? “Why, then, have some natural resource-intensive economies experienced strong economic growth, while others have not?” (p. 12).

The answer is developed over the rest of the book, with the chapters organized around one of six themes: innovation, scientific knowledge, higher education, mining companies, capital goods, and geological surveys. In each chapter Ranestad elaborates on the idea of “knowledge organizations,” by examining how one or the other theme is expressed by an institution or network—publications, associations, universities, technical schools, and companies.

Knowledge is characterized as the foundation of innovation. Norwegian companies imported foreign technology, followed by innovations adapting imported methods to local conditions. In this way, mining operations, over time, became up-to-date despite an initial lag. The point is stressed that there are critical underlying relations between learning and knowledge-based organizations. In the case of Norway, the record shows how the country, and the companies making up the national mining industry, caught up with the world's scientific knowledge by investing in the country's knowledge base. Norway's mining knowledge organizations focused on chemistry, metallurgy, mechanical construction, electro-engineering, and subsequently business administration. The author sees special benefits in the coordinated effort by Norway's knowledge organizations to place engineers abroad so they might see and learn first-hand about innovations in metallurgy.

The chapter on universities is longer than the others, with a comparison of training for mining engineers around the world. State support for education, not just mining education, is emphasized—including travel scholarship programs. Norwegian mining companies sought to promote practical work experience, even as there were questions

about how much scientific background was necessary or helpful for a career in mining. Job-switching is identified as another method of knowledge transfer—job mobility is characterized as a key element building knowledge networks.

Domestic and foreign mining companies, mining journals, industrial exhibitions, geological surveys, mechanical workshops, and programs for study and work experiences abroad all build-up the knowledge base required for mining to add long-term to national economies. Ranestad argues that the capacity to innovate is reinforced by interactions between knowledge organizations. She positions geological surveys as a foundational institution for such interactions. A small detail she missed, but relevant to understanding large countries, is the nature of federalism. In the table of geological surveys, for the United States she references the relatively late federal effort (1879) focusing on the western states (p. 204). She would have been more accurate to mention the significant and very influential state surveys that began much earlier in the nineteenth century, in particular the two 1836 geological surveys in Pennsylvania and New York.

The book is a useful addition to global mining history. While mining and copper are the detail, the larger ideas fit into innovation studies. The comparative treatment of mining fills a gap in the English language sources for Norway and Scandinavian countries generally. The book opens up the Norwegian experience to a wider audience. The work on Chile is well done, relying largely on secondary sources, but not entirely. Chile is given the most extensive treatment in the chapters on universities and mining companies. Ranestad leaves the reader with no doubt that Norway's continuous economic growth is based on knowledge-based mining, as one the country's several natural resource industries. She reports that in forestry and fishing, just as in mining, foreign technology and engineering were converted into domestic know-how.

Ranestad has demonstrated how mining in Norway became highly innovative and dynamic, resulting in a positive national impact. She finds that in countries with less success there were difficulties in spreading scientific and engineering ideas and thus innovation. The tables and appendices convey a wealth of fascinating detail. Appendix 4 lists all mining companies operating in Norway up to 1940, with years, number of engineers and workers, nationality of the company, and mineral. Appendix 5 lists all "travelling" Norwegian mining engineers, showing the year, funding, destination, and their activity.

William W. Culver

State University of New York, Plattsburgh

Sarah E. M. Grossman. *Mining the Borderlands: Industry, Capital, and the Emergence of Engineers in the Southwest Territories, 1855-1910*. Reno: University of Nevada Press, 2018; 183 pp., 8 b&w illus., 2 maps, notes, bib., ind., cloth, \$44.95. ISBN: 9781943859832

Mining the Borderlands is a useful addition to Borderlands literature. Sarah Grossman, who began her study while a student at the University of New Mexico, has contributed a well-researched, broad view of mining engineering during the emergence not only of the profession, but of the United States-Mexico border mining districts within Arizona, Sonora, Chihuahua, and New Mexico. She writes that the Borderlands serves as "a microcosm of North American metals mining" (p. 13), which evolved from the 1850s pioneer phase to mass production by 1910. The mining engineer, both as technical expert and informed adviser to investors, played a critical role in this transformation.

The book follows, for the most part, a chronological sequence. During the 1850s and 1860s, mining engineers were few, mostly from Europe or European-educated, part of Eastern corporate