

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.

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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

schemes to attract investment out West by assuring investors of the high quality of their skilled staff.

Following this limited but romantic, adventurous period, the next generation of mining engineers were educated individuals committed to “Westering” and to their role as a connection between investors and mine owners during the boom times of the 1870s and 1880s. She writes, this was the era of the consultant engineer. An exceptional case study of risk assessment at the 1880s Copper Queen Mine, Bisbee, Arizona, details these consultants’ work, especially thorough mine reports, and their influence on investors’ decisions, and consequent impact on their own reputations and careers.

As the new century began, increased investment matched increased demand for base metals, which brought the beginnings of mass mining. Grossman writes of engineers who exemplify this evolution, including the work of mining engineer James Colquhoun of the Arizona Copper Company, Ltd., of Clifton-Morenci, Arizona, the first porphyry copper, and legendary Dr. Louis D. Ricketts of the Phelps Dodge-controlled Moctezuma Copper Company of Nacozari, Sonora. Mining engineers had moved from solely technical experts or consultants to creators and managers of major Borderlands copper producers.

Grossman expertly weaves into her narrative a rich collection of original letters, reports, and other primary documents that she has mined from the papers kept by mining engineers and now in repositories such as the Huntington Library, the American Heritage Center at the University of Wyoming, and the University of Arizona Special Collections. She opens with quotes from 1880s letters between James Duncan Hague and Ellsworth Daggett about work at a Chihuahua silver mine. And, also exemplary, near the end of her book, she uses the letters of chief engineer William F. Staunton of the Development Company of America to move us behind the scenes to read

a vitriolic, at times, exchange of letters, 1904 to 1910, with the CEO. These nuggets of gold throughout the text expose real people in real situations. This is the book’s strength.

Important too are her chapters on the definition of the character, broadly defined, of the mining engineer. She discusses the new American mining schools, mostly in the northeast, that produced most of these engineers, a group that stood out among the mining camp community of 1880 to 1910. She defines their work culture, image of masculinity, interaction with labor, and their role as a connection to capital as all part of becoming a professional elite among mine workers. The career of Yale graduate, Rough Rider, and mining engineer John Greenway is an example of this leader who could mingle easily with the crew or with presidents, and manage hundreds of workers or bring in the next millionaire-making Big Mine.

This reviewer has two major concerns. First, why does the book lack case studies of or mention of mining engineers working in New Mexico, a rich region for the mining historian, which the author all but ignores? And, second, why end at 1910? Over the next decade, the mining engineer’s final emergence coincided with major technological innovations, explosive increases in scale of operation, and bitter labor issues, as well as the movement of mining engineers up into the president’s chair in the increasing number of multinational mining corporations.

Lesser concerns are about the text, which, at times, slides into academic jargon and has lengthy unnecessary background endnotes, and the index, which has flaws (many entries are off by a page, e.g. Mary Hallock Foote).

These concerns aside, in *Mining the Borderlands*, Grossman does a superb job of exploring the evolution of the American mining engineer, the transformation of the position and work culture from 1855 to 1910, and provides a glimpse at the development of mining in the Borderlands. Again, the extensive use of original records from

these mining engineers is an asset, as are quotes from other period sources. The University of Nevada Press has included graphics, maps, and photographs in this worthy addition to its respected Mining and Society Series.

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Christine A. Bradley and Duane A. Smith. *The Once and Future Silver Queen of the Rockies: Georgetown, Colorado, and the Fight for Survival into the Twentieth Century*. Louisville, CO: University Press of Colorado, 2019; 323 pp., 206 b&w photos, notes, ind., paper, \$32.95. ISBN: 9781607326076

Together with *The Rise of the Silver Queen* by Liston Leyendecker, Bradley, and Smith, *The Once and Future Silver Queen of the Rockies* provides a wonderful history of the tiny Rocky Mountain mining town of Georgetown, Colorado.

The area that later became Georgetown began its mining journey as a small gold mining camp in the summer of 1859. By the mid-1860s, however, the area's gold return dwindled and rich deposits of silver ore began to support the mining industry in the area.

Over the next thirty-plus years, Georgetown experienced the typical ups and down of the mining industry, but one event, the November 1893 repeal of the Sherman Silver Purchase Act, was a major blow to its economy. The industry struggled into the 1930s and 1940s, but by that time silver mining was nearing an end. The Crash of 1929 helped trigger that destruction.

Georgetown had to then look elsewhere to shore up its economy. Even though the 1890s was a time of financial uncertainty in the silver-producing districts of the West, tourism had already become an important buttress to Georgetown's economy. By the 1960s, the ski industry was burgeoning and historic preservation became

another financial mainstay.

The *Once and Future Silver Queen of the Rockies* provides a good description of life in Georgetown between the 1890s and 1960s. In fact, with the abundant photographs in the book, it is a veritable "Who's Who" of Georgetown's history. The photographs provide grand visual images of the life and times of many of Georgetown's historical figures, and provide a glimpse of the social side of life there.

The inclusion of at least two maps would have aided the reader unfamiliar with the Georgetown area. One map of Georgetown proper, showing streets, historic buildings, and other sites of interest mentioned in text would have helped, as well as another map showing the region, including the Argentine District and the location of significant mines and mills.

As James E. Hansen II suggests in the Dedication of *The Rise of the Silver Queen*, Georgetown's history is more than written records, it is "also the homes where people lived, the business buildings where they earned a livelihood, and the mines where they toiled and sometimes died." With *The Once and Future Silver Queen of the Rockies*, Bradley and Smith complete the story.

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Billy M. Williams. *Playing in a Big Boy's Sandbox: ASARCO's Mission Mining Complex*. Tucson, AZ: Billy M. Williams, 2018; 140 pp., numerous b&w and color photos, ref., append., ind., CD with additional maps, cloth, \$65 (e-mail: cubillw@comcast.net). ISBN: 9780692199626

In thinking of Arizona mining history, locales such as Bisbee, Jerome, Morenci, and even Tombstone come to mind, yet the area a few miles south of Tucson has one of Arizona's oldest recorded mines, which is part of the ASARCO Mission Mine Complex. *Playing in a Big Boy's Sandbox*