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**Sarah E. M. Grossman.** *Mining the Borderlands: Industry, Capital, and the Emergence of Engineers in the Southwest Territories, 1855-1910.* Mining and Society Series. Reno: University of Nevada Press, 2018. viii + 175 pp. $44.95, cloth, ISBN 978-1-943859-83-2.

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Sarah E. M. Grossman's *Mining the Borderlands* examines the unique and highly significant role that mining engineers played in the development and expansion of the mining industry in the southwestern borderlands between the 1850s and 1910s. General readers may sometimes feel lost in the industry-specific vocabulary, but on the whole, the text is engaging and accessible. Moreover, it offers important insights into mining in a region that has garnered far less attention—academically and popularly—than far western states such as California or Colorado. Grossman also takes several opportunities to situate borderlands mining within a broader historical framework. The social and financial changes encouraged by the Second Industrial Revolution, the economic and political developments that came with late nineteenth-century expansion, the revolutionary growth of the telegraph and electricity, the emergence of a formalized conservation movement and the parallel veneration of scientific expertise—these, and other, historic forces all contributed to the dramatic remaking of mining and mine engineering. Though some of these linkages are made more implicitly or in passing, Grossman does not treat the changes within the mining industry as an isolated incident.

*Mining the Borderlands*, however, is not so much a history of mining as it is a history of the mining engineers who facilitated that extraction, and Grossman makes clear that the work of these engineers was both highly fluid and often ill-defined. Mining engineers surveyed and evaluated potential sites on behalf of investors, mapped the infrastructure and resources of extant mines, selected machinery and installed it in the mines, wrote operational plans for the mines, served as managers on and consultants to the site, published scientific papers about mining processes, and balanced budgetary concerns with the need to turn a profit. More importantly (in terms of the historical narrative), mining engineers also served as a bridge between investors (socially advanced, wealthy, and often educated) and laborers (who, depending on the period, might be skilled or unskilled but were usually poorer and less educated). The demands of the job, the requisite requirements for the job, and the public esteem granted to the job varied from year to year and site to site, but Grossman leaves no doubt that mining engineers served a number of roles and ultimately acted as "critical mediators who enabled the growth, bureaucratization, and corporate consolidation of the borderlands mining interest" (p. 157).

Grossman opens the book with Ellsworth Daggett's decision in the late nineteenth century to manage a group of silver mines in Chihuahua, Mexico. This is one of many case studies and vignettes worked into the book, and as is true elsewhere, Grossman leverages Daggett's history to support a broader point. In this case, Grossman uses Daggett to illustrate how the American presence in the borderlands (as measured by exploratory parties and investment monies) increased in the second half of the nineteenth century. The end of the Mexican-American War and the addition of new lands via the Mexican Cession led to a dramatic increase in mining along the US-Mexican border as dispirited miners from California, tenderfeet from the East Coast, local miners from extant sites, and foreign-trained graduates converged, along with an assortment of people chasing the proverbial glitter of western mining stories, on what are today the states of Arizona, Mexico, Sonora, and Chihuahua. Despite the seemingly obvious mineral wealth in the region, capitalizing on the extractive opportunities would ultimately prove difficult. It required tremendous capital to start up new mines or to resuscitate struggling mines, which is why American investments grew so dramatically. In turn, investors increasingly began to rely on mining engineers (hoping that they might better guarantee a return of profit).

Although not the most central argument in the book, Grossman's study of the professionalization of mining engineering is particularly fascinating. In the 1850s-60s, most miners in the American West (and in the borderlands) were self-trained and lacked any formal education except what they might have learned through apprenticeships. But, specialized university programs were beginning to define and to set apart mining engineers during the last decades of the nineteenth century, and the graduates of these mining programs benefited inordinately not only from the education they gained but also from the networking that their degrees facilitated. The introduction and expansion of educational programs at domestic universities helped to professionalize the field of mine engineering, but it did not immediately change the deeply held belief that on-site, practical training was crucial for miners of all stripes. As a result, on-the-site training would continue to be important into the twentieth century for proving the mettle of the earliest engineers, despite the increasing importance that employers and investors placed on those college degrees.

In chapter 3, Grossman elaborates on this tension between on-site training and university training and introduces a gender analysis that is both very interesting and very welcome. Locals and long-time workers sometimes viewed the engineers as "university-trained ninnies—Easterners brought in to tell the locals what to do" (pp. 10-11), so mining engineers risked some amount of emasculation if they relied too heavily on their academic credentials. Moreover, the education was itself an indicator of social class because not everybody could afford to pursue such an education, which further threatened a more rough-and-tumble version of masculine identity. To assert and protect claims of masculinity, Grossman argues, mining engineers focused on the hard work required of their job and cultivated a frontier identity (which, theoretically, countered accusations that university learning had made them soft or had linked them too closely to the upper class).

There are many things to appreciate in ***Mining the Borderlands***. Despite some minor issues with repetition, the information is relayed clearly, and the story is both significant and intriguing. The theoretical concepts (technocracy and the performance of objectivity, for example) are applied very well. Moreover, Grossman complicates our understanding of scientific expertise around the turn of the century by pointing to the uneven and socially negotiated ways in which mining engineers used and/or leveraged their expertise on-site. It is simply refreshing to read a history of mining that focuses attention away from California to the borderlands, away from pure veins of gold to low-

er grades of copper, away from placer miners and the hard rock miners to the engineers that helped to increasingly guide that work.

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