

BOOK REVIEW

**Mining the Borderlands: Industry,
Capital, and the Emergence of Engineers
in the Southwest Territories, 1855–1910**

Sarah E. M. Grossman. Reno and Las Vegas: University of Nevada Press,
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MANY HUNDREDS OF BOOKS have been written about the fascinating subject of mining in the American Southwest. Sarah E. M. Grossman's *Mining the Borderlands* takes a distinctive approach by focusing on the history of mining engineers in Arizona in the United States and the state of Sonora in northern Mexico. With this focus she reveals not only an underappreciated aspect of American mining, but also describes issues pertaining to the penetration of capitalism into the Southwestern frontier.

The book is the result of Grossman's 2012 history dissertation at the University of New Mexico and is divided into six chapters plus an introduction, conclusion, bibliography, and eight illustrations and two maps (as well as a photograph of an historical map). The University of Nevada Press has done an excellent job of layout and printing, making an attractive and short book that will appeal to both the specialist and the aficionado and student of Southwestern history and mining history. The book will hold interest for geographers, not only for its regional aspect, but because the mining industry and mining engineers helped shape economic, political, and cultural factors in the region as well as having a serious and problematic environmental impact. And geographers will no doubt recall that Alexander von Humboldt started out as a mining engineer, receiving his education at the Royal Saxon Academy of Mining in Freiburg, Germany, the same institution where many of the first mining engineers discussed in Grossman's book also studied.

The American Southwest was, during the period under investigation (1855–1910), a remote frontier, from the perspective of capitalists and investors on the East Coast of the United States. But despite this remote location from the centers of investment capital, the mining industry in the region flourished because of a cadre of mining engineers who formed a technocratic class

with mining expertise. These mining engineers served as intermediaries between capital and labor and shared aspects of each. Mining engineers were a mobile class that moved from mine to mine as circumstances warranted, which meant that they might have lived in other parts of the country such as Michigan and California before ending up in the Southwest borderlands. (Wallace Stegner's classic novel *Angle of Repose* relates the life of one such mining engineer.) These mining engineers helped expand the American economy into these border regions and helped incorporate them into the overall economy, serving as (often unwitting) agents of economic hegemony.

Mining was, and still is, a high-risk, capital-intensive industry. Investors wanted assurance that they were investing in something profitable, and mining engineers were positioned to provide that assurance. As technocratic experts, they and their reports could reassure investors in a way that mine owners, brokers, and bankers could not. After all, mining engineers knew all about mines and their potential output and profitability, or so investors believed. As mining shifted from placer mining to hydraulic mining and then to underground mining, a greater level of expertise was required, and thus mining engineers became more crucial to the industry as it sought to attract investment capital. The Southwest borderlands were rich in gold, silver, copper, and other metals, but it was copper that eventually became king, largely because of the development of electricity and the electric grid, which required copper wiring, and which penetrated into almost all aspects of manufacturing, lighting and heating, transportation, and indeed most aspects of people's lives. Grossman's selection of the United States-Mexico border region in the late-nineteenth and early-twentieth centuries thus allows her to focus on both the rise in importance of copper and the trans-border aspect of the industry.

The book's first chapter examines the early days (mid-nineteenth century) in the Arizona-Sonora borderlands, focusing especially on the Santa Rita Mine, one of the region's first major mines. Using this example, the author explores how mining engineers first became important as a way to reassure skittish investors, with the industry promoting their educations at prestigious mining schools (especially at the Royal Saxon Academy of Mining in Freiberg, then considered the world's leading educational institution for mining engineering). If a graduate of this leading center said that a mine would be profitable, investors tended to believe that it would. In this sense, as experts certified by mining academies, mining engineers were able to insinuate themselves as crucial players in the mining industry.

Chapter two further explores the importance of a formal education at a mining academy and the eventual establishment and growth of mining programs at such universities as Harvard, Yale, the University of California at Berkeley, and the University of Nevada, among many others. Americans realized the need to create their own centers of mining education, building on the structure and training of the Freiberg school. The growth of these American mining engineering programs increased the professionalism of the mining field, and soon degrees and certification from such programs were essential for a career as a mining engineer. But in addition to being credentialed from a mining program, mining engineers needed to demonstrate field experience, which in any case most mining students were eager to do. This brought them in contact with mine laborers, as mining engineers shared the same life in remote mining camps. Most mining programs provided this form of experiential learning as part of their requirements. Most programs also adapted to the increasing professionalism of the times by eliminating such earlier requirements as Latin, other languages, and botany, updating the curriculum to reflect the new applied engineering focus.

Chapter three looks at the topic of masculinity in the mining industry, and the need for mining engineers to prove themselves not only as engineers, but also as men (as nearly all of them were), demonstrating the ability to conform to the norms of masculinity of the times, and adopting appropriate clothing, headgear, and footwear that reflected their rugged and outdoor-adventure-oriented self-perception. Chapter four is a case study of the Copper Queen Mine in Bisbee, Arizona, and the importance of mine prospectuses and reports, the writing of which gave mining engineers considerable power and influence with investors. Their honest assessments of mines could bring mining engineers into conflicts with mine owners, who naturally wanted to put the best possible spin on their mine and its potential to reward investors, and mining engineers were expected to share in the rosy vision that mine owners had of a mine's future. Grossman explores the writing of mine reports in some depth, examining the use of rhetoric and perspective, and what she calls the "performance of objectivity."

The book's final two chapters look at the evolving role of the mining engineering profession, in which the profession became more democratic with the increase in the number of university mining programs (with many of these at public land-grant institutions in the western United States). In the mid-nineteenth century, most mining engineers came from elite East Coast backgrounds and had the wherewithal to study at the prestigious Royal Saxon Academy of Mines in Europe, but in the early-twentieth century,

mining engineers often came from less elite backgrounds and from western mining states. The book concludes by emphasizing the significant role the mining engineers played in the development and capitalist penetration of the Southwest borderlands, incorporating this region into the larger American economy, and how, in tandem, the mining industry became more technocratic and rationalized as it continued to extract metals from the soil of the borderlands.

The book contains few errors, but geographers will pick up on things that an historian might not, such as when on page 8 the author refers to the Gadsden Purchase as “a large swath of land in present-day Arizona south of Tucson,” when in fact Tucson, far from being to the north of the Gadsden Purchase, is just about in the middle of it. And the community of Cucurpe in Sonora, where the San Francisco Mine was located, is spelled as “Cucerpe” on the map on page 24. Geographers might also be disappointed by the scarcity of maps in the book, with only two (other than one in an historical photo), and those quite small and simple. These minor points, however, do not detract from Grossman’s achievement, which has shined light on the important role that mining engineers played in the Southwest borderlands, as agents who helped facilitate the development of this region and its incorporation into the American economy. The book will be enjoyable and informative reading for all geographers and anyone else interested in the Southwest borderlands and in the growth of the mining industry.