Sven Rinman’s *Bergwerks lexicon* (1788–1789) and the emergence of mining encyclopedias in preindustrial Europe

LINN HOLMBERG

In 1788, the Swedish metallurgist Sven Rinman (1720–1792) published an illustrated dictionary entitled *Bergwerks lexicon*.¹ A contemporary review praised it as a lexicon that “did not just explain terms of art, but concisely treated the very science itself.”² In this respect, it was one of the first specialized alphabetical encyclopedias fully realized in Sweden, and the very first devoted to mining and metallurgy.

While specialized dictionaries exploded in number on the European continent in the eighteenth century, Sweden’s lexicographical output was quite meager.³ Many practical arts and sciences had to wait until the twentieth century before they got their first vernacular dictionaries and encyclopedias.⁴ Against this background, Rinman’s

1. This article builds on research funded by the Swedish Research Council (dnr: 2016–03039), the Swedish Foundation for Humanities and Social Sciences (dnr: RFP12–0357:1), and Åke Wibergs Stiftelse. I want to thank Göran Rydén, Chris Evans, Måns Jansson, and Jacob Orrje for invaluable input on this subject over the past five years. In this Open Access contribution, initial references will be given in shortened form (typically without subtitles), but with enough detail to identify them. For more bibliographical detail, see the book’s bibliography below, p.415–54.

The Open Access version of this chapter will be available on the Liverpool University Press website.


2. *Stockholmsposten* (August 29, 1789): “ej allenast förklarade konst-orden utan ock uti korthet afhandlade sjelfwa wettenskapen.” All translations from Swedish, French, German, and Latin to English are my own.


Bergwerks lexicon was something of an anomaly. Even in a wider European context, it was one of the most elaborate works of its kind. What, we may ask then, were the circumstances that brought forth an encyclopedia of mining and metallurgy in late-eighteenth-century Sweden? And how did it distinguish itself from and relate to similar works on the continent?

To answer these questions, I will start by situating Rinman’s Bergwerks lexicon within a longer history of the development of metallurgical writing, the mining industry, and mining dictionaries in Europe. Thereafter, I will turn to the circumstances in Sweden that shaped the Bergwerks lexicon’s history of production and publication. By combining an international, big-picture overview with a close-up study of an individual enterprise, we can get a deeper understanding of the processes that gave rise to specialized encyclopedias on the practical arts in the eighteenth century.

Situating the Bergwerks lexicon

The Swedish term bergwerk (from the German Bergwerk) has no real equivalent in English. It is often translated as “mine,” but it has much wider connotations. Berg literally means “mountain,” while werk means “works,” or “workplace.” In the course of the early modern period, bergwerk came to denote a group of industries related to mining and metal-processing: not only mines themselves, but also adjacent metalworks, stamping mills, foundries, smelteries, and the communities that grew up around them. In a sense, the meaning of bergwerk expanded as the business did. The history of the Bergwerks lexicon is thus closely related to the development of the metal industry as well as to changing attitudes toward the mechanical arts and workers’ language, not to mention attempts to combine and improve practical skills with theoretical knowledge.

For millennia, metals have played a crucial role in the global development of agriculture, warfare, medicine, engineering, and numerous other arts, crafts, and cultural expressions. But, even though metals have always mattered as commodities, their extraction and production have not always been viewed positively by the literate classes. Ancient Greek and Roman authors such as Aristotle, Theophrastus, Dioscorides, and Pliny the Elder described a wide range of minerals and how they could be used, but the concrete

5. This is also how Rinman understood the word. See BL, vol.1, “Bergwerk.”
processes of mining and metallurgy typically fell outside their range of interests—as did most manual labor. Disparaging attitudes toward the mechanical arts would persist well into the early modern period. Although traces of metallurgical “recipe books” from antiquity onward show that some practitioners put their skills into writing, know-how related to mining and metallurgy was primarily transmitted through oral and manual culture.\(^6\)

Above all, it was after the diffusion of print technology that vernacular booklets on mining, assaying, and metallurgy started to appear in greater numbers. Some of the oldest known examples are the anonymous Nützlich Berghüchlein and the Probierbüchlein, printed and disseminated in German-speaking mining districts in the early sixteenth century, which were followed by a series of practice-oriented “books of secrets” in several European languages.\(^7\) Not long after came half a dozen foundational works on which generations of later compilers would rely: Vannoccio Biringuccio’s De la pirotechnia (1540); Georgius Agricola’s De re metallica (1556); Bernardo Pérez de Vargas’s De re metallica (1568); Lazarus Ercker’s Beschreibung allerfürnemisten mineralischen Ertzt und Berckwercksarten (1574) and Aula Subterranea (1574); and Alvaro Alonso Barba’s Arte de los metales (1640).\(^8\)

Mining and metallurgy in Europe had developed substantially since the early Middle Ages, with important proto-industrial centers emerging in the eastern Alps, Saxony, Bohemia, the Rhineland, Tuscany, Spain, and Sweden.\(^9\) Increasingly, from the seventeenth century onward, state institutions sought to control these profitable


\(^{8}\) For an overview of German mining literature from the 1500s onward, see Sabine Paehr, “Kupfer-, Blei- und Silbergewinnung,” doctoral dissertation, Gottfried Wilhelm Leibniz Universität, 2018.

\(^{9}\) For general histories, see Mining and metal production through the ages, ed. Paul
industries, to make national inventories of natural resources, and to streamline processes of manufacturing. In the mining districts of Saxony, Bohemia, and the Rhineland, state-controlled mining offices (Bergämter in German) were already established in the fifteenth century. Inspired by their organizational structure, a Swedish mining agency, the Bergskollegium, was created in the mid-1600s. Similar institutions followed in other countries, especially from the late eighteenth century onward.

In this transnational process of institutionalization and professionalization, mining sites turned into dynamic hubs where materials, people, competences, and ideas converged: where well-educated chemists and assayers worked closely with skilled miners and artisans, where practitioners from different countries came to exchange experiences, where naturalists came to collect minerals and observe the interior of the earth, and where knowledge about nature was challenged and refined. In German and Swedish mining districts, these convergences gave rise to the notions of Bergwissenschaft and bergswetenskap, often translated as “mining science,” but literally meaning “mountain science.” In the course of the eighteenth century,

---


With the rise of mountain science, knowledge, skills, and languages that had been leading separate lives for centuries became increasingly entangled. This process can be observed directly by looking at how information and nomenclature relating to metals, mining, and metallurgy changed in lexica between the early sixteenth and the late eighteenth centuries—a development supported by rising interest in miners’ language and one that led to the first dictionaries of mining.

**Mining in dictionaries, and dictionaries of mining**

From the sixteenth century onward, basic information about kinds of “minerals”—a term then encompassing all naturally occurring, non-living solid substances—can be found in Latin lexica of medicine and alchemy, such as, for example, Otto Brunfels’s *Onomastikon, lexicon medicinae* (1534); *Dictionarium artis alchymiae* (1571); Gerhard Dorn’s *Dictionarium Theophrasti Paracelsi* (1584); Martin Ruland’s *Lexicon alchemiae* (1612); and William Johnson’s *Lexicon chymicum* (1652–1653). These works showed little interest in nomenclature relating to mining and metallurgy.

In the same period, however, a number of vernacular, technical booklets from German mining districts included lists of miners’ terminology, among them Ulrich Rülein von Calw’s *Eyn wolgeordent und nützlich büchlin, wie man Bergwerck suchen und finden sol* (1518). From the mid-seventeenth century onward, such “appendix-dictionaries,” as I will call them, became increasingly common in practice-oriented literature.\footnote{Appendix-dictionaries in practice-oriented works other than mining and metallurgy include *Mémoires pour la navigation et le commerce de France et des pays estrangers* (1665), Nicholas Venette’s *Art de tailler les arbres fruitiers* (1683), and...} Instead of drawing their information from authori-
tative books, the compilers often collected vernacular words directly from the practitioners’ environments. This practice of lexicographic “fieldwork” represented a sharp divergence from the traditional mode of scholarly compilation, based on book-learning. It was not a new phenomenon, but it would be increasingly common from the 1650s onward.

A well-known example is *Des principes de l’architecture* (1676), by the French court historian André Félibien. In the preface, Félibien reflected on misunderstandings that often arose between architects and various craftsmen. If an architect did not use the same words as the workers, he could easily end up with a completely different product from what he had ordered. To reduce the risk of such an outcome, Félibien concluded his treatise with a dictionary of technical terms used by artisans regularly hired by architects: stonemasons, carpenters, plumbers, smiths, metalworkers, and so on. He claimed to have approached the artisans directly, to have “entered their stores, visited their workshops, considered their machines and tools, [and] asked them about their different uses.” Fieldwork stories of this kind would be repeated in numerous dictionaries and encyclopedias over the next hundred years, including the *Encyclopédie* (1751–1772) of Denis Diderot and Jean D’Alembert. To what extent compilers really relied on craftsmen for information is not easy to determine. In the case of Félibien’s *Des principes*, the bulk of his material simply reflected the opinions of authoritative books, many of them ancient.

Another example comes from late-seventeenth-century London, where Thomas Houghton published *Rara avis in terris, or the Compleat miner* (1681), a collection of laws and customs that governed work...
in a lead mine in Derbyshire.21 The book also provided a technical manual, followed, at the very end, by an “Explanation of the miners terms of art used in this book.”22 Here, over nine pages, Houghton defined some forty terms in alphabetical order. The conciseness of the definitions, in combination with the absence of Latin synonyms and literary references, suggests that Houghton had indeed “collected” the terms from workers. Certainly, the definitions seem to reflect the miners’ discourse—for example, “Cavers are any poor people that go about the Mines to beg or steal Ore from the Miners,” or “Pick is a Tool the Miners use to cut down the Cliffs and Rocks of stone to make passages in the Earth.”23 With these brief definitions, Houghton did not seek to explain the whole art of mining, nor to make a complete inventory of miners’ language. His “Explanation” was just a complement to his technical manual.

Nowhere would interest in miners’ terminology be keener than in German mining districts. From the 1670s onward, an increasing number of technical books came to include appendix-dictionaries with terms and expressions employed by miners.24 Many of them were written by mining officials. Of these, three in particular deserve to be mentioned: first, the Interpres phraseologiae metallurgiae (1673), or Translator of metallurgical phrases, by the mining official Christian Berward. This was a thin booklet of forty-seven pages, devoted solely to explaining the language of “mountain people” (“Bergleute”). The headwords were organized not alphabetically but rather thematically by kinds of work, such as “work in the pits,” “terms and tools for drilling,” “at the pumps,” and so on.25 The fact that Berward avoided

21. Little is known about Thomas Houghton. Many library catalogs simply refer to him as a “writer on mining,” even though he also published works on economy and trade. In four of his books—Royal institutions (1694), The Alteration of the coyn (1695), Europe’s glory (1695), and Book of funds (1696)—he signs as “Thomas Houghton, of Lyme-Street, Gent.” The specification “Gent” suggests that he belonged to a high social class and thus, most likely, to a family of landowners or shareholders in a mine.

22. For the “Explanation” see Thomas Houghton, Rara avis in terris (London, Cooper, 1681), f.F1r–F5r. The work was printed in two versions the same year, one with a word list, the other without.


alphabetical order suggests either that he was unfamiliar with it or that he found it cumbersome. Clearly, he did not think of his work as belonging to a budding dictionary genre. A second example is the *Speculum metallurgiae politissimum*, or *Most polished mirror of metallurgy*, by the mining official Balthasar Rössler. It was compiled sometime before 1673 (when Rössler died), but not published until 1700. Compared with Berward’s brief “phrase-translator,” the *Speculum* was a comprehensive, thematic encyclopedia of almost three hundred pages, capped off with a thirty-five-page appendix-dictionary: “Mountain people’s terms and expressions clearly explained.”

Here, headwords were arranged in alphabetical order, with concise definitions and occasional references to sections in the main text of the book. A third example is the *Berg-Information* (1690) by the mining official Abraham von Schönberg. Like Rössler’s *Speculum*, this book provided a comprehensive overview of the mountain industries, but included an even longer appendix-dictionary, entitled “Expressions in mines and smelteries.” Over 137 pages, it defined more than a thousand headwords in alphabetical order. In the appendix’s opening paragraph, the author remarked that understanding the language of miners and metalworkers was crucial to anyone aspiring to become a mining official.

Berward, Rössler, and Schönberg were all addressing a specialized audience—those involved in the mining business. None of their appendix-dictionaries supplied literary references, which might mean that their nomenclature and definitions were based on what they had heard and experienced—that they practiced lexicographic fieldwork, in other words. In contrast to Houghton, the German compilers attempted to document miners’ language comprehensively, though their explanations remained brief. It is also clear that they avoided mixing workers’ terminology with concepts drawn from mineralogical or (al)chemical authors. Even though Rössler and Schönberg treated such subjects in the main part of their books, the appendix-dictionaries were reserved for miners’ language alone. None of the compilers referred to their works as dictionaries or lexica, whether in titles or prefaces. However, all this would soon change.

In the following decades, the works of Berward, Rössler, and Schönberg appeared in several revised editions, but they also formed

---

Rinman’s Bergwerks lexicon

the basis for new publications on mining and metallurgy, with their own dictionary-appendices. Some were written by mining officials,\(^{28}\) and others by scholars in nearby university towns, who spent time in the mountains observing the miners’ work.\(^{29}\) One such scholar was the “Minerophilus Freibergensis”—an anonymous “mineralogist from Freiberg”—who published the first work explicitly defined as a mining dictionary: the *Neues und curieux Bergwercks-Lexicon* (1730).\(^ {30}\) In the preface, the compiler explained that he had decided to call his work a lexicon “because this title now prevails in the literary realm.” His sensitivity to literary trends was further underlined by the inclusion of the word “curieux” in the title, which had become something of a buzzword to make books appealing to a wider audience.\(^ {32}\) More specifically, he may have been trying to capitalize on the success of Paul Jacob Marperger’s *Curieuses Natur-Kunst-Gewerck- und Handlungs-Lexicon* (1712), which included articles related to mining and metallurgy.\(^ {33}\) Minerophilus acknowledged that he had no personal experience of mining (nor did anyone in his family), but he had long been fascinated by it. Over the years, he had visited several mines, smelteries, and metalworks in the regions around Freiberg and Chemnitz, and gathered a large mineral collection in the process. His lexicon therefore paid great attention to various kinds of gemstones and metals as well as to the practical work in mines and workers’ terminology. His articles were mostly based

28. One was Christoph Herttwig’s *Neues und vollkommenes Berg-Buch* (1710). See also Jones, *German lexicography*, p.607.

29. Georg Kaspar Kirchmaier’s *Institutiones metallicae* (1687), for example, includes a forty-page appendix-dictionary, largely based on Berward, Rössler, and Schönberg. It was later republished as a freestanding book: *Erklärung derer Bergmännischen Wörter und Red-Arten* (1750). Paul Jacob Marperger’s *Neu-eröffnetes Berg-Werck* (1707) also relied partly on Schönberg.

30. The compiler has been identified as the mineralogist Johann Caspar Zeisig, later a high-ranking member of the miners’ court system. Wendell E. Wilson, “Johann Caspar Zeisig, the mysterious ‘Minerophil Freibergensi,’” *Mineralogical record* 48 (2017), p.419–25.


on other books—including Schönberg’s *Berg-Information*—but also on “discussions with the workers, and what I could learn from them,” the compiler claimed.34

In combining mineralogy with mining and metallurgy, Minero-philus’s *Bergwercks-Lexicon* was the first of its kind. By calling it a lexicon—and a “curious” one—he consciously addressed himself to a wide audience. The dictionary sold well and appeared in two revised editions, in 1743 and 1784, under the modified title *Neues und wohlein-gerichtetes Mineral- und Bergwercks-Lexicon*. All were published by the Stössel family in Chemnitz.

In 1778, the same publisher printed an anonymous *Bergmännisches Wörterbuch*.35 Appearing almost a hundred years after the appendix-dictionaries of Berward, Rössler, and Schönberg, it was the second specialized lexicon of mining and metallurgy in German. At this point, however, dictionaries had become a well-established genre on European book markets. Before treating the content of the *Bergmännisches Wörterbuch*, let us review the wider lexicographical landscape.

For decades, information about metals had filtered into an increasing number of vernacular dictionaries of natural history, medicine, pharmacy, and chemistry—especially in French.36 Although there were no French dictionaries exclusively focused on the mining business, descriptions of mines and metal-processing were recurrent in historical-geographical dictionaries—for example, in Claude-Marin Saugrain’s *Dictionnaire universel de la France ancienne et moderne* (1726)—as well as in dictionaries of commerce and industry such as the *Dictionnaire universel de commerce* (1723–1730) and Henri Gabriel Duchesne’s *Dictionnaire de l’industrie* (1776). Furthermore, since the late seventeenth century, metals, mining, and metallurgy had become standard areas of coverage in general dictionaries of arts and sciences. In the first three decades of the eighteenth century, these texts’ treatment of practical work was nonetheless quite limited. Descriptions of steel and steel production, for instance, never occupied

34. Minerophilus, *Neues und curieuses Bergwercks-Lexicon*, f.[a]4v–[a]5r (“Vorrede”): “mit denen Arbeitern discouriret, und was ich von ihnen erfahren können.”
35. *Bergmännisches Wörterbuch* (Chemnitz, Stössel, 1778).
36. For example, Elie Bertrand’s *Dictionnaire universel des fossiles* (1763), Jacques-Christophe Valmont de Bomare’s *Dictionnaire raisonné universel d’histoire naturelle* (1764), Pierre-Joseph Macquer’s *Dictionnaire de chymie* (1766), and Pierre-Joseph Buc’hox’s *Dictionnaire minéralogique et hydrologique de la France* (1772) all deal with metals.
more than a column—neither in French,\textsuperscript{37} English,\textsuperscript{38} nor German dictionaries of arts and sciences—and mostly concerned trade.\textsuperscript{39}

From the 1740s onward, however, dictionary articles on steel and steelmaking started to expand in several languages. The main reason seems to have been the introduction of a new, scholarly, standard work on steelmaking: \textit{L’Art de convertir le fer forgé en acier, et l’art d’adoucir le fer fondu} (1722), by the French academician and polymath René-Antoine Ferchault de Réaumur. In the preface, Réaumur had argued that scholars needed to penetrate the secret world of metalworkers, develop a coherent, rational language for their practices, perform experiments to refine the art of metallurgy, and disseminate their findings widely for the universal advancement of the arts.\textsuperscript{40} With these lines of argument, Réaumur managed to make metallurgy relevant to men of letters. Although his treatise had little effect on language or practices in forges, it changed how educated people thought, spoke, and wrote about the metal industry—especially dictionary compilers, as we shall see.

Between 1723 and 1748, the article “Acier” in the \textit{Dictionnaire universel de commerce}, for example, grew by two columns with the introduction of material from Réaumur.\textsuperscript{42} Similarly, in the supplement (1753) to Ephraim Chambers’s \textit{Cyclopaedia} (1728), the article “Steel”

\begin{itemize}
\item \textsuperscript{37} Antoine Furetière, \textit{Dictionnaire universel}, 3 vols. (The Hague, Leers, 1690), vol.1, “Acier.” Furetière largely based his article on Félibien’s descriptions of steel. For the next fifty years, all subsequent French universal dictionaries reproduced Furetière’s article, including Henri Basnage de Beauval in the revised \textit{Dictionnaire universel} of 1701 and the \textit{Dictionnaire de Trévoux} (formally entitled the \textit{Dictionnaire universel françois et latin}) in 1704, 1721, 1742, and 1752.
\item \textsuperscript{38} I have examined the article “Steel” in John Harris’s \textit{Lexicon technicum} (1704) and Ephraim Chambers’s \textit{Cyclopaedia} (1728).
\item \textsuperscript{39} I have examined the article “Stahl” in the 1712, 1722, 1741, and 1746 editions of Marperger’s \textit{Curieuses Natur- Kunst- Gewerck- und Handlungs-Lexicon}; in Johann Theodor Jablonski’s \textit{Allgemeines Lexicon der Künste und Wissenschaften} (1721); and in Adrian Beier’s \textit{Allgemeines Handlungs- Kunst- Berg- und Handwercks-Lexicon} (1722). See also Gorissen, “Politique,” p.141–56.
\item \textsuperscript{41} Similar arguments have been made about Agricola. See Isabella Barton, “Georgius Agricola’s \textit{De re metallica} in early modern scholarship,” \textit{Earth sciences history} 35 (2016), p.265–82 (269–70).
\item \textsuperscript{42} Compare Jacques Savary Des Bruslons and Louis-Philémon Savary, \textit{Dictionnaire

expanded by almost five columns with respect to the first edition, again thanks to Réaumur. Réaumur was also the principal source on steelmaking in Johann Heinrich Zedler’s *Grosses vollständiges Universal-Lexicon* (1732–1750), as well as in Gianfrancesco Pivati’s *Nuovo dizionario scientifico e curioso sacro-profano* (1746–1751). In the same decade, moreover, Benedictine monks in Paris began compiling a new universal dictionary of arts, crafts, and sciences in which all the articles on steelmaking were drawn from Réaumur’s work. The main editor, Dom Antoine-Joseph Pernety, even copied the majority of Réaumur’s illustrations, which allowed him to describe complex metallurgical procedures in detail. Réaumur would also play a central role in the article “Acier” compiled by Diderot for the first volume of the *Encyclopédie*, even though the *philosophe* did not consult Réaumur firsthand. At sixteen columns, Diderot’s article was the most elaborate description of steelmaking published in a dictionary of arts and sciences to date.

Still, in the mid-eighteenth century, there remained a lag between the state of European technological knowledge and its representation in most dictionaries of arts and sciences. The fact that it took twenty or even thirty years before dictionary compilers started using Réaumur’s work is illustrative. In part, the lag was due to the background of compilers. As polymaths, academicians, philosophers, clergymen, mathematicians, booksellers, publishers, and journal

---


Rinman’s Bergwerks lexicon

editors, they were often well educated in the liberal arts, but few had any significant experience of manual labor. In basing their accounts on the “best” books available, many turned to the best-known authors, rather than trying to evaluate recent technical publications.

Let us now return to the anonymous *Bergmännisches Wörterbuch*, published in Chemnitz in 1778. In the preface, the compiler declared that “the present work was not initially written with the intention of presenting it to the public.” As a “Bergbedienter”—a mining official of lesser rank—he had simply “found it necessary to learn the miners’ language when he took up his duties.” For several decades, he had gone through the nomenclature used by authors such as Pliny, Theophrastus, Agricola, Ercker, Schönberg, Rössler, and Minero-philus. He had revised and enhanced their descriptions, and supplied German terms with French and Latin equivalents. Only upon reaching old age did he decide to publish his manuscript. By then, his declining memory and strength prevented him from verifying the accuracy of his material, for which he apologized. Regardless, he believed that his *Bergmännisches Wörterbuch* encompassed everything relevant to the mountain sciences, especially mineralogy, surveying, and the construction of mines and metalworks.

Although it appeared in the late 1770s, the *Bergmännisches Wörterbuch* was thus based primarily on nomenclature in older mining literature. Like those dictionaries of the early eighteenth century, most of its definitions were just a few lines long, and focused on translating German phrases into Latin and French. The article “Stahl,” on steel, barely occupied a column. In this sense, as its main title suggested, the *Bergmännisches Wörterbuch* was very much a “word book.” It could hardly match the amount of information that would soon appear in large-scale encyclopedias of arts and sciences in other languages.

In the thematically organized *Encyclopédie méthodique* (1782–1832), the subseries devoted to chemistry, pharmacy, and metallurgy occupied six whole volumes, edited by the chemist Louis Bernard Guyton de Morveau. The article “Acier” (1789) took up eighty-seven columns and provided long theoretical accounts of the conversion of iron into steel, detailed descriptions of steel production in various geographical

49. *Bergmännisches Wörterbuch*, f.1r (“Vorerinnerung”): “Gegenwärtige Schrift ist anfänglich gar nicht in der Absicht aufgesetzt worden, daß sie dem Publikum vorgeleget werden solle,” “Ein Bergbedienter fand bey Antretung seiner Dienste für nöthig sich die Bergmannsprache bekannt zu machen.”

50. *Bergmännisches Wörterbuch*, f.1r–2v (“Vorerinnerung”).
areas, and illustrations of furnaces, tools, and materials. Attentive to ongoing shifts in the European metal trade, the article also stressed that, while the seventeenth century had been dominated by German steel, British and Swedish steel were now raising their profiles. Concomitantly, the compiler turned to new scientific authorities in the north: Swedish chemists and metallurgists such as Johan Gottschalk Wallerius, Torbern Bergman, and Carl Wilhelm Scheele. Nevertheless, the Swedish metallurgist whose definition of steel got the honor of opening the entire article was none other than Sven Rinman.  

At this point, Rinman’s *Bergwerks lexicon* had just appeared in Sweden. It was thus the first comprehensive, specialized encyclopedia of mining and metallurgy in Europe compiled by someone acknowledged as an international authority in the field.

**Making the *Bergwerks lexicon***

Today, Sven Rinman is popularly known as the “father of Swedish mining and metallurgy.”  Historians have frequently described his *Bergwerks lexicon* as an exceptional source on the history of metallurgy, chemistry, and technology in the late eighteenth century. As such, it has often been mentioned, used, and cited, but it has rarely been studied as a work in its own right or as a work with a history of production.


52. See the presentation of Rinman’s *Bergwerks lexicon* on the website of *Jernkontoret* (the Swedish Steel Producers’ Association), https://www.jernkontoret.se/en/about-us/library/bergwerkslexicon/ (last accessed September 14, 2023).

Since most eighteenth-century dictionaries of arts and sciences strived to base their coverage on the “best” books available, their makers often described themselves as editors or compilers rather than as authors. Indeed, the century’s two German mining dictionaries—Mineralophilus’s *Bergwercks-Lexicon* and the *Bergmännisches Wörterbuch*—were published anonymously. Against this background, the Swedish *Bergwerks lexicon* sent a strong, contrasting message. The title page not only stated that the dictionary was “authored by Sven Rinman” but it was also adorned with a celebratory portrait of the author, in the shape of a classic bust on a coin (see Figure 12). Unlike most previous lexicographers of mining, Rinman was not a polymath visiting the mines. He was a high-ranking mining official of the Swedish state, the national director of the production of crude metalware, a member of the Swedish Academy of Sciences, a knight of the Royal Order of Vasa, and an internationally acclaimed author—all at once.

In the preface, Rinman asserted that he had completed the lexicon “in little more than two years.” This was an achievement that impressed even foreign reviewers. The British *Analytical review*, for example, claimed to be “astonished” that Rinman had “completed, in so short a time, so copious and extensive a work.”

The Swedish archives reveal a far more complicated story, however: the story of a project that gestated for almost forty years, involved two compilers and several crucial supporters, gave rise to early versions that never reached print, and suffered unexpected turns of events

---

54. There were exceptions, of course. Chambers introduced the term “dictionarist” to create a new respectable, scholarly category that acknowledged the dictionary-maker as something more ingenious than a simple compiler. Diderot and D’Alembert were visibly inspired by the same ideas when introducing the term “encyclopedist.” See Linn Holmberg, “Encyklopedisten: striden om upplysningen,” in *Historiska typer*, ed. Peter Josephsson and Leif Runefelt (Möklinta, 2020), p.99–120; Caspar Hirschi, “Compiler into genius,” in *Scholars in action*, ed. André Holenstein et al. (Leiden, 2013), p.145–72.

55. Rinman, *BL*, title page: “författadt av Sven Rinman.” The term *författadt* means “authored” (from *författare*, or “author”), in contrast to *sammanställdt* (“compiled”).

56. Marco Beretta has suggested that Rinman “marked the emergence of a new professional figure in Sweden—that of a mining officer who was engaged in both academic research and its practical applications.” See Beretta, “Rinman, Diderot, and Lavoisier,” *Nuncius* 26 (2011), p.355–79 (356).

57. Rinman, *BL*, vol.1, fa3r–v (“Företal”): “något mer än tvenne år.”

such as a manuscript-consuming fire. Unravelling this story offers an intimate look not only at the development of the Swedish mountain sciences in the second half of the eighteenth century, but also at the very formation of the dictionary genre.

The Bureau of Mines

The history of the Bergwerks lexicon can hardly be told without first evoking the organization within which all the main actors, including Rinman, moved and worked: the Swedish Bureau of Mines (Bergskollegium).\footnote{Bergskollegium has sometimes been translated as the “Board of Mines.” However, as Hjalmar Fors argues, it is useful to distinguish between the governing board} Founded in 1637, this governmental agency was created to
Rinman's Bergwerks lexicon oversee and improve the metal trade. Its structure was inspired by German mining offices, but adapted to Swedish circumstances. By the mid-seventeenth century, the Swedish Empire controlled large parts of the Baltic region (including current-day Finland) and thus spanned a much wider geographical area than any of the German states. As various parts of Sweden were naturally rich in iron and copper ore, mining had been practiced there since the fourteenth century. From the mid-seventeenth century onward, however, Sweden rose to become one of the biggest exporters of iron in Europe. For this reason, the mining industry became a matter of great interest and importance to the Swedish state. With the foundation of the Bureau, a state-controlled agency was thus slowly established within a context of already existing local organizations, social relations, legal regulations, and cultures of work. Its creation also entailed the formation of a new professional category: the mining official.  

By the mid-eighteenth century—when the story of the Bergwerks lexicon begins—the Bureau had developed an effective organization and chain of command. At the top of the hierarchy was the executive board, which consisted of a president (often recruited from the nobility), two mining councilors, and five assessors. The board, in turn, controlled a central administration in Stockholm, divided into nine departments. Five were administrative, and four were technical, devoted to advancing the art of assaying, land and mine surveying, chemistry, and mechanical engineering respectively. Next, the kingdom was divided into twelve mining districts (bergmästardömen) with their own local administrations. Within these districts, the mining inspector (bergmästare) constituted the top of the hierarchy. Assisted by lower officers, he was responsible for overseeing the practical work and reporting back to the central administration.

To become a mining official, one had to apply to the Bureau of Mines to be admitted as an auscultator, a kind of intern. The

and the organization itself. He therefore introduced the term “Bureau of Mines” to designate the whole of the Bergskollegium, “staffed by a number of officials with specialist functions, and endowed with a number of local branches.” See Fors, Limits, p.15.


successful applicant typically needed an academic degree as well as basic experience in the mountain sciences. In addition, it helped to have the right connections or family name. Once admitted, the auscultator spent several years engaged in wide-ranging training, which included practicing assaying and other arts at the Bureau’s technical departments, accompanying mining inspectors to various locations across the country, sitting in on board meetings in Stockholm, and making transcriptions of protocols and other mining documents in the Bureau’s archive. Toward the end of the internship, the auscultator could apply for funds to undertake a study tour abroad. These trips, which passed through some of the most prominent mining districts and metal industries in Europe, were extremely important to the Bureau’s activities, not to mention the advancement of the mountain sciences.

In the eighteenth century, most would-be mining officials received their early education at Uppsala University, where Sweden’s first professorship in chemistry was inaugurated in 1750. The first to hold the chair was Johan Gottschalk Wallerius, who had been teaching chemistry and physics at the university since 1741. He was succeeded by Torbern Bergman in 1767. Both became international scientific celebrities in their lifetime, along with several of their students, including Axel Fredrik Cronstedt, Carl Wilhelm Scheele—and Sven Rinman. The Swedish Bureau of Mines thus included elaborate institutions of education and research by the mid-eighteenth century, which most mining districts on the continent would not see until the very end of the century. This context is crucial for understanding the elaboration of a Swedish encyclopedia of mining and metallurgy from the 1740s onward.

Rinman’s Bergwerks lexicon

Sven Rinman

When Rinman published his Bergwerks lexicon in the late 1780s, he already had a long career behind him. He was born in Uppsala in 1720, the son of the well-connected land surveyor and treasurer Gustaf Rinman and of Magdalena Leijonmark, the daughter of the vice president of the court of appeals in Åbo. According to his own autobiographical notes, he displayed a precocious appetite for both book studies and handicrafts. His father therefore made sure that he got a thorough education in mathematics, mechanics, physics, drawing, and languages. At Uppsala University, he studied under the mathematician and natural philosopher Samuel Klingenskierna and eventually Wallerius. Through his father’s connections, he also got to work with some of the leading instrument makers in Sweden. At the age of seventeen, he was sent to the mining towns of Sala and Falun to be educated in assaying. Having demonstrated great talent in this art, he was assigned to establish an assaying house at the large ironworks (bruk) in Leufsta, north of Uppsala. There he developed a close relationship with the owners, the De Geer family, who had become a force to be reckoned with in the Swedish iron trade.

In December 1740, at the age of twenty, Rinman was officially admitted as an auscultator to the Bureau of Mines. In the coming years, he continued to cultivate his contacts with the De Geer family and thereby pursued a specialization in iron and steel. In the early eighteenth century, the iron trade had represented almost 85 percent of the total value of the mining industry in Sweden, followed by copper at 12 percent. In the 1730s, however, the iron business had been shaken by an economic crisis. As a result, in 1744, the owners of the Swedish ironworks joined together to found a new office: the Ironmasters’ Association (Jernkontoret). Its role was to coordinate, improve, and help finance the national trade. In subsequent decades, the Association often collaborated with the Bureau of Mines, but it was not officially a part of it.

In 1746, Rinman received a stipend, financed by several influential ironmasters, which allowed him to leave Sweden for a study tour abroad. The purpose of the trip was

66. Tekniska museets arkiv (TMA), Stockholm, Rinmans arkiv, F1R, “Sven Rinmans lefverne och meriter,” typescript (dated 1924) of the original manuscript, compiled in 1789, unpaginated. See also Lindroth, Svensk lärdomshistoria, p.398.
to observe, learn, and compare new methods for metal-processing, especially those relating to iron and steel. Rinman visited numerous mines and manufacturing sites in the Netherlands, Germany, and France. In Paris, he also got the opportunity to meet with some of the most prominent scholars of the time, including Réaumur and the chemist Guillaume-François Rouelle. He intended to continue his trip on to England, but the outbreak of war demolished his plans. He headed home in the autumn of 1747.69

After his return to Sweden, Rinman advanced rapidly in the hierarchy of the Bureau. As the new Swedish expert on iron and steel, he also became a crucial asset to the Ironmasters’ Association. In 1751, he was appointed the national superintendent of blast furnaces (övermasmästare)—a brand-new position that turned him into an eighteenth-century equivalent of a consulting engineer, constantly traveling between the country’s ironworks to oversee the construction of furnaces and improve their production. The following year, he was admitted to the Swedish Academy of Sciences. During this period, metal production in Sweden was organized around two offices, devoted, respectively, to the making of “crude” and “fine” metalwares (svartsmide and finsmide). The first category, the most extensive, involved the production of all kinds of coarse iron, brass, and steel goods, used for farming, shipbuilding, forestry, and other crafts. The second category involved finer, smaller, polished products that required further refinement.70 In 1760, Rinman became the national director of crude-metal production. For the next decade, he was deeply involved in experimental steel-testing and technical improvement at several establishments across the kingdom, while also making further inquiries into assaying.71

In 1772, Rinman published a systematic treatise on steelmaking, entitled Anledningar til kunskap om den gröfre jern- och stål-förädlingen och des förbättrande (Guidance on knowledge about coarser iron and steel processing and its improvement). Above all, the work stressed

the importance of a more systematic or holistic understanding of metallurgy, from “the extraction and processing of raw materials,” to “the chemical reactions of metals under treatment or when combined, and the various methods and manual skills used in different stages of finishing.” A decade later, he published a major treatise on the history of iron, *Försök till järnets historia* (1782). These two works were the first comprehensive treatments of iron and steel to be published in Europe since Réaumur’s *Art de convertir le fer forgé en acier* in 1722. Consequently, they attracted the attention of many chemists on the continent, and were translated into German in 1785. One year later, the *Encyclopédie méthodique* declared Rinman the international authority on steel. At this point, he was already far advanced on his own encyclopedic project.

The genesis of the *Bergwerks lexicon*

The *Bergwerks lexicon* was the last big publication that Rinman completed. He died in 1792, three years after the second and last volume appeared. But the *Bergwerks lexicon* was also the project that had been with him the longest—at least as an idea. Still, it might never have come to fruition without stimuli from powerful supporters.

In the preface to the lexicon, Rinman explained that it was the count Nils Adam Bielke—president of the Bureau of Mines—who had charged him with the task of making a lexicon “with fairly complete, educational explanations of all the names, terms of art, and phrases used in the mining business, and all its related areas.” Bielke had been recruited as the new president of the Bureau in 1782. Born into one of the most renowned noble families in Sweden, he had long served on the Council of the State (Riksrådet), but he had no prior experience of mining and metal-processing. As someone who had recently taken charge of the most profitable industry in Sweden, he must have recognized the value of a specialized encyclopedia of mining and metallurgy. No such work had been printed before, but—as we shall see—there was a manuscript ready.

74. Rinman, *BL*, vol.1, f.a2v–a3r (“Företal”): “med någorlunda fullständiga och undervisande förklaringar öfver de vid hela bergshandteringen, och uti alla dess tillhörande delar, brukeliga namn, konstord och talesätt.”
Archival sources show that Bielke and the board of the Bureau contacted Rinman to request a dictionary in late 1783. At this point, however, they did not ask him to make it from scratch. Instead, they asked him to revise and publish an already existing manuscript, compiled by a former mining inspector at the Sala silver mine: the late Anders Robert Bellander (1726–1772). Bellander had passed away eleven years earlier and left behind a comprehensive manuscript for a dictionary of mining and metallurgy. His family had handed over the material to the Ironmasters’ Association, where it collected dust until the board sent it to Rinman.\footnote{Riksarkivet (RA), Stockholm, Jernkontorets arkiv, Fullmäktige D VI:2 “Sakregister,” p.31, “Bergwerks lexicon.” It is unclear when the manuscript was submitted to the Ironmasters’ Association. It is not mentioned in any registers before May 21, 1784, but it was clearly in their care long before that.}

Rinman responded to the board’s request a few weeks later, in January 1784.\footnote{TMA, Rinmans arkiv, F1E:54 (January 15, 1784).} By then, he had skimmed through Bellander’s manuscript. Not only did he accept the task of revising and publishing it, but he also informed the board that he was already acquainted with Bellander’s work. In fact, he and Bellander had known each other since the 1740s, when they were both auscultators at the Bureau of Mines. Sometime during this period, Rinman vaguely recalled, the board had sent out a circular urging mining officials from across the country to take stock of the terminology used in mines and metalworks and to submit their findings to the central office in Stockholm.\footnote{Unfortunately, no such circular letter has been preserved. See RA, Bergskollegiums huvudarkiv, C2: “Utgående diarier” (reports for the years 1741–1744 are missing); B1:105–109 “Registratur” (1740–1746); B2: 66–77 “Koncept” (1740–1746).}

As we have seen, there was a long-standing tradition of documenting miners’ language in German mining districts. Although some of the resultant publications found their way into Sweden,\footnote{According to Jones, German lexicography, p.607–11, Schönberg’s Berg-Information was printed and sold in Stockholm. Moreover, a handwritten transcription of Rössler’s Speculum metallurgiae politissimum can be found in the Funck family archive at the Swedish National Library. The transcription was made by Carl Funck, an auscultator at the Swedish Bureau of Mines who died in 1709—nine years after Rössler’s work was printed. See RA, Funckskå släktarkivet, L70:66.} there are no traces of similar works written in Swedish before the second half of the eighteenth century—neither printed works, nor manuscripts.\footnote{To the best of my knowledge, no such word lists exist in the archives of the Bureau of Mines. The earliest example is an eight-page booklet entitled Ordalag
A call to collect mining terminology on the part of the Bureau of Mines in the 1740s may thus have been a first attempt to change the situation. According to Rinman, it inspired Bellander and him to start working on their own collection of technical terms, or konst-ord, as they were called in Swedish. Rinman even asserted that they began the project together, as a joint venture. He did not specify how long their collaboration lasted, but, since their paths diverged naturally when Rinman went abroad on his study trip in 1746, they must have decided at some point to continue the work apart.

Bellander did not have as stellar a career as Rinman, but his trajectory was typical for a mining official in the mid-eighteenth century. Like many others, he was practically born into the business. His father, Torbern Bellander, had long served as a mining inspector in Uppland. At the age of ten, Anders was enrolled at Uppsala University, where he, like Rinman, studied under Klingenstierna and Wallerius. He was enrolled as an auscultator in May 1743 at the age of seventeen. Thus, it must have been over the next three years that the two auscultators began collecting terms of art together. After Rinman left the country, Bellander acted as the Bureau’s assisting notary for two years, which, among other things, involved taking minutes at board meetings in Stockholm. In 1748, he assumed the role of vice geschworner, a kind of overseer, in the Sala silver mine.

Sala was one of the oldest mining districts in the country, with records of silver mining dating back to the late fifteenth century. Once considered the most prestigious mine in Sweden, it registered a declining silver output by the mid-eighteenth century. Overall, extracting precious metals did not generate nearly as much value as

som vid jern- och stål-manufactur-verkens beskrivande, uti relationer och längders upprättande bōra i akt tagas (1767) (Phrases that should be used when describing iron-and steelworks in reports and records), attributed to the mining official Daniel Tilas.

81. TMA, Rinmans arkiv, F1E:54 (January 15, 1784). Rinman uses the word samfällt, which in eighteenth-century Swedish meant “joint” or “collaborative.” He thus clearly claims that he and Bellander worked together on one collection, not that they worked on two separate collections “at the same time” (samtidigt, in Swedish).

82. In the 1740s, a total of eighty-eight young men were admitted as auscultators, about half those who applied. See Orrje, “Mechanicus,” p.87–88.


84. Almqvist, Bergskollegium, p.168. The geschworner (from the German word schwören, meaning “to swear, to vow”) acted as the right hand of the mining inspector (bergmästare) and helped monitor work in the mines.
the extraction of iron or copper. Still, the Sala silver mine employed from 150 to 180 specialized workers between 1735 and 1778. This was the place where Bellander would spend most of his professional life. After five years as the vice geschworner, he returned to Stockholm temporarily to serve as the Bureau’s assisting fiscal officer. Two years later, in 1755, he returned once more to Sala, now as the primary geschworner. In 1761, he was promoted to mining inspector, thereby reaching the top of the local hierarchy at the age of thirty-five. He remained in office until his death in 1772. He left behind a dictionary manuscript, but, unfortunately, no correspondence or personal notes where he described the origin of the work, or his plans for it. Rinman’s testimony is thus the only source of information about how the two men’s lexicographical efforts were interrelated.

After the initial collaboration with Bellander ceased in the mid-1740s, Rinman continued to collect technical terminology for almost twenty years. In the 1760s, he made a first attempt to publish. After six years in office as the national director of crude-metal-making, he completed the manuscript of an illustrated “Jernwärks lexicon” (“Ironworks lexicon”), dedicated to the Bureau of Mines. In a preserved draft of a letter—written by Rinman in January 1765 and intended to accompany the dictionary manuscript—the forty-five-year-old mining official outlined the background of the project. Ever since his days as an auscultator, he had collected terms of art with short descriptions. At first, he explained, it was mostly for his own instruction and as a “memory aid.” Gradually though, he had realized that a dictionary of the mountain sciences would be an invaluable asset for people entering the profession. Unfortunately, “to complete a work deserving the name of Bergwerks lexicon,” he had, at the moment, “neither the time nor the capability.” For this reason, he had merely gathered some extracts from his collection, with the goal of making a dictionary focused on his area of expertise: ironworks. He hoped that it could be seen as “a beginning and an aid

86. Almqvist, Bergskollegium, p.168.
87. TMA, Rinmans arkiv, F1E:8 (January 1765): “til min egen underrättelse och minnets underhielpande.”
88. TMA, Rinmans arkiv, F1E:8 (January 1765): “uppställa ett så fullständigt arbete som kunde få namn av Bergwerks lexicon, thertil har jag icke sedt mig äga hwarken tid el. förmåga.”
to a more comprehensive work,” one that he would have the time to complete later. At the end of the letter, Rinman drafted a title page for the work, with the full title: “Ironworks lexicon, or collection of words and phrases that are in use at coarse ironworks, arranged in alphabetical order, and explained with illustrations, by Sven Rinman, director of manufacturing” (see Figure 13).

89. TMA, Rinmans arkiv, F1E:8 (January 1765): “en början och hilpreda til en widloftigare afhandling.”
80. TMA, Rinmans arkiv, F1E:8 (January 1765): “Jernwärks lexicon, eller samling af namn och ordasätt som wid grofware jernwärken egenteligen brukelige äro, uti alphabetisk ordning upstålt och förklarat med bylogade ritningar af Sven Rinman, manufactur directeur.”
The fate of Rinman’s first dictionary manuscript remains something of a mystery. No ironworks lexicon ever appeared under his name, and the manuscript seems to have been lost. Archival sources confirm that Rinman submitted the manuscript to the board of the Bureau in late 1765, and that it was eventually deposited at the office of the Ironmasters’ Association. The protocols of the latter confirm receipt of the manuscript in 1767, and even state that it was supposed to be sent out for printing. However, despite these promising steps, nothing happened. When Rinman retold this story to the board of the Bureau in 1784, he still had no idea why the lexicon had never been published. He guessed that it was still lying around in the archives of the Ironmasters’ Association.

The fact that his ironworks lexicon never got published was not Rinman’s only disappointment. In 1766—the year after he had submitted the manuscript—Uppsala was struck by a fire that devastated large parts of the city, destroying Rinman’s house and all his belongings: his library, his mineral collections, and all his manuscripts—including the art-word collection. Within hours, he had lost the fruits of twenty years of lexicographical work. After this terrible setback, he seems to have stopped collecting terms of art and focused on other work and publications.

Under these circumstances, when asked to revise Bellander’s manuscript twenty years later, Rinman must have accepted with mixed emotions. On the one hand, he was being given the opportunity to resume work that he had pursued passionately for more than two decades in the early days of his career, but whose fruits had been traumatically lost. On the other hand, the manuscript he was being asked to revise and publish was not his—it was Bellander’s. Perhaps this was why he recounted the project’s origins in his letter to the board, to show how he had been involved all along, albeit without having anything to show for his work.

Four years later, in the preface to the Bergwerks lexicon, Rinman claimed that his long-lost ironworks lexicon had somehow found its


92. TMA, Rinmans arkiv, F1E:54 (January 15, 1784): “som ännu lärer finnas der[ledes] i förvar.”

93. TMA, Rinmans arkiv, F1E:54 (January 15, 1784): “det övriga av mina samlingar förgicks sama år uti den olyckliga Upsala branden.”
way to Bellander, who incorporated it into his dictionary manuscript. This is a curious statement. If true, it would explain why the ironworks lexicon was never published, but then someone at the Ironmasters’ Association would have to have forwarded Rinman’s draft to Bellander without telling the former. Considering the prestige that Rinman enjoyed by 1765 already, especially in the eyes of the ironmasters, they would probably not have approved of working behind his back in this way. Whether or not Rinman was mistaken (or bent the truth), the very fact that he made this claim in the preface suggests that he wanted to stress the longevity and importance of his own lexicographical efforts. In asserting that Bellander had relied on his earlier work, Rinman rejected the notion that he was the only one revising the work of somebody else.  

Revising Bellander’s manuscript

When Rinman accepted the invitation to revise Bellander’s manuscript in January 1784, he gave the board a preliminary review of its merits. It was not a positive report. Rinman complained that Bellander had “transcribed anything that he had found curious during moments of reading” and thus collected words and information primarily “for the sake of his own learning”—just as Rinman himself had done in the early days. Many articles were too long, others too short, and the drawings of deplorable quality. The manuscript was filled with irrelevant content such as descriptions of fossils, alchemical terminology, and names of medical mixtures. “A Swedish bergwerks lexicon,” declared Rinman, “should only contain explanations of the Swedish words and terms of art that are used by skilled men and workers, and [subjects] in mineralogy, metallurgy, mechanics, economy, and jurisprudence that are of direct relevance to the mountain industries, as well as all operations and practices in mines and smelters, and in the production of metals.”

94. Rinman, BL, vol.1, f.a3r (“Företal”).
95. TMA, F1E:54 (January 15, 1784): “annotera allt hvad han under böckers läsning funnit märkvärdigt,” “till sin egen underrättelse.”
96. TMA, F1E:54 (January 15, 1784): “et Swenskt Bergwärks Lexicon, […] icke skulle innehålla annat än förklaringar på alla Swenska namn och konstord som brukas af Bergsförståndige män och af arbetare, hörande till de wid Bergwärken directes nödige kundskaper uti bergs-, mineralogie-, metallurgie-, mechanique, -oconomie och -juridique samt till alla de maneuvrer och handteringer
wanted a proper “bergwerks lexicon,” it would be necessary to make “an almost wholly new work.”

The project officially got the green light in May 1784 when the Swedish ironmasters convened in Stockholm and decided to finance the publication and compensate Rinman for his efforts. About nine months later, Rinman made a first report on his progress. Since May, he had worked on the lexicon every day, but, even so, he was nowhere near finishing, for the project had grown more extensive than he could ever have imagined. Many of Bellander’s accounts were based on outdated sources and needed to be completely rewritten in light of more recent publications. There were also troublesome gaps. Some parts of the mountain industries were not covered at all, which meant that additional terminology needed to be “tracked down, included, and explained.” Rinman estimated that the new articles that he had written amounted to about 120 pages. Still, he required more time to complete the work.

Another year later, in early 1786, the finish line was still far away. For this reason, Rinman asked for help from his two sons: Gustav (1762–1825) and Carl Rinman (1763–1826). Both were following in their father’s footsteps and had been admitted as auscultators to the Bureau of Mines in 1782. In the spring of 1786, Gustav and Carl undertook a two-month trip throughout Bergslagen (a mining region in the middle of Sweden) to collect terms of art and information that were missing from Bellander’s manuscript. According to Rinman’s report, they visited mines and metalworks in Sala, Garpenberg, Falun, and Stjärnsund. Rinman described his sons’ assistance as invaluable. Not only did they collect terminology, but they also wrote articles and drew illustrations. When he fell ill in the autumn of 1786, Gustav seems to have taken over responsibility for the project for

---

97. TMA, F1E:54 (January 15, 1784): “nästan et nytt arbete.”
98. TMA, F1D:55 (July 13, 1784). Bielke and the board informed Rinman of the positive news in July.
99. TMA, F1E:56: “Berättelse om gröfre Jern-manufacturen för år 1784.” This concept report is undated but was likely composed in early 1785 (the annual reports for the succeeding years are all dated in February). Paragraph 8 is devoted entirely to work on the lexicon.
100. TMA, F1E:56, §8: “sammanletas, införas, och förklaras.”
102. TMA, F1E:58 (February 12, 1787), “Relation för 1786,” f.2v.
several weeks. During the final months of work in 1787, father and son engaged in intensive correspondence as Gustav helped Rinman add last-minute findings.

Comparing the two dictionaries

The National Archives of Sweden hold a ten-volume dictionary manuscript, registered as “Rinman’s Bergwerks lexicon.” This has long been assumed to be either the handwritten version of Rinman’s printed lexicon or material that the author prepared but discarded along the way. In fact, it is Bellander’s original manuscript, catalogued erroneously under Rinman’s name (see Figure 14). Bellander’s handwriting is recognizable in all the main texts, but here and there—at the end of articles or in the margins—Rinman has added variously short and long notes, often signed with an “R.” On some occasions, he has simply marked “revised” (“omskrifvit”) in the margin. In these cases, the corresponding articles in the published Bergwerks lexicon look radically different.

By comparing Rinman’s printed Bergwerks lexicon with Bellander’s manuscript, it is possible to take an intimate look at the two compilers’ work and examine how Rinman proceeded when revising Bellander’s work: what he kept and discarded, added or changed. Did the famous metallurgist write “an almost wholly new work,” as he claimed?

First, some reservations should be noted regarding the state of the sources. Bellander never finished his dictionary. He left many pages

103. TMA, F1E:58 (February 12, 1787), f.3r.
106. On the cover of the first volume, someone has characterized the manuscript as being “discarded articles of Bergwerks lexicon” (“casserade articlar af Bergwärks lexicon”). See RA, Bergskollegiums huvudarkiv, D8:1.
107. This conclusion is based on a full handwriting analysis of the dictionary collection, which I carried out in 2015. For comparative handwritten material signed by Bellander, see RA, Bergskollegiums huvudarkiv, E2b:12, E2b:16. For comparative material signed by Sven Rinman, see E2a:17.
108. In sum, when going through Bellander’s material, Rinman must have been working on a separate manuscript into which he transcribed the articles he wanted to keep and added new ones. Unfortunately, this manuscript, which the printed Bergwerks lexicon is based on, has not been preserved.
half-empty, to save space for more headwords and definitions. Some headwords are simply followed by references to pages in other books, which suggests that he planned to add information later. None of the volumes is perfectly alphabetized, nor are the sheets paginated. Some volumes, moreover, contain loose sheets inserted in the wrong order by parties unknown. These features make it difficult to refer to articles in Bellander’s manuscript in such a way that future readers can easily find them.

With these reservations in mind, we can still make some general comparisons between the printed lexicon and the manuscript. To begin with, I will focus on the letter “A.” In this section, Rinman’s Bergwerks lexicon has 242 unique headwords. Of these, 70 refer to another entry or merely give a synonym. The remaining 172 headwords are followed by a definition. Some are little more than a line, while others occupy several pages. Seventeen articles are longer than one page in quarto.109 Bellander’s manuscript, for its part, lists 351 unique headwords for the letter “A.” Of these, 170 refer to another

entry, give a synonym, or indicate a source for further reading (or perhaps for Bellander to compile from at some future date). The remaining 181 headwords are followed by a definition, some little more than a line, others occupying several pages. Sixteen articles are longer than two (handwritten) pages in quarto.\textsuperscript{110}

This quantitative overview points to a number of conclusions. Bellander’s manuscript contains more headwords than Rinman’s lexicon, but his “extra” headwords are overwhelmingly Latin terms followed by cross-references to Swedish equivalents. The number of headwords followed by a definition is quite similar: 172 versus 181. Among the longest articles, the two dictionaries have eleven in common, which highlights their kinship. All in all, they share 120 headwords under “A.” In other words, Rinman appropriated 120 terms from Bellander’s manuscript and then added another 120. He did not wholly discard the rest of Bellander’s entries, though. Some were transformed into subentries.\textsuperscript{111} In other cases, he copied content from Bellander’s articles under slightly different headwords.\textsuperscript{112} These patterns seem to hold for all parts of the alphabet.

Overall, the two dictionaries largely cover the same areas of knowledge: mineralogy, mining mechanics, engineering and architecture (the construction of tunnels, lifts, and so on), furnaces, tools, and the processing of all kinds of metals. Both provide general definitions of arts and sciences of relevance to mining and metallurgy, notably chemistry, and they give lengthy descriptions and histories of various metals such as iron and steel.\textsuperscript{113} Finally, both provide

\begin{itemize}
\item “Amalgamation” (4.5), “Ankarasmide för skeppsankare” (1.5), “Antimonium” (9), “Arsenik” (6), and “Asbest” (2).
\item For example, in Bellander’s manuscript, “Alunhaltiga träd” appears as an independent headword, followed by a definition. In the Bergwerks lexicon, most of this definition is reproduced in a subentry to “Alunjord.”
\item Parts of Bellander’s “Afrad” and “Afradsskrivare” have been included in Rinman’s article “Afradskoppar,” for instance, and content from Bellander’s “Afradsmalm” reappears in Rinman’s “Afradshopar.”
\end{itemize}
information on legal, economic, commercial, and organizational aspects of the Swedish Bureau of Mines.

Bibliographically, each of the two dictionaries mentions hundreds of sources, of which they have many in common. The most frequently cited authors are Swedish chemists, mineralogists, and metallurgists. In Bellander’s case, Wallerius’s *Mineralogia* (1747) and Cronstedt’s *Försök til mineralogie* (1758) take center stage, followed by works by Georg Brandt and Magnus von Bromell. Bellander also refers to numerous Swedish academic memoirs published up to 1770, as well as to legal documents from the Bureau of Mines. Among foreign authors, he most frequently mentions Flemish and German physicians, chemists, and mineralogists active in the seventeenth and early eighteenth centuries, among them Anselmus de Boodt, Herman Boerhaave, Johann Heinrich Pott, and Johann Friedrich Henckel.

There are occasional references to German dictionaries such as those of Minerophilus and Marperger, but they are present in a minority of articles. Nor is there any evidence that Bellander used a lexicon to create a list of headwords. Rather, for the most part, he seems to have mined monographic works for specialized terminology.

Rinman reproduced many of Bellander’s references, but he also made several updates, citing Swedish and foreign sources published since Bellander’s death. Among the most noteworthy are the works of Bergman and the mining official Johan Jacob Ferber, published from the mid-1770s onward; articles in the newly launched *Chemische*

114. RA, Bergskollegiums huvudarkiv, D8:2. In the second volume of Bellander’s dictionary manuscript, there is a twelve-page bibliography of “Books on the mountain sciences,” which lists close to a hundred dissertations, academic memoirs, and other publications from the early seventeenth century to 1770. The list focuses on works by Swedish authors, but also includes a multitude of foreign publications, including an overview of relevant volumes in the Parisian *Descriptions des arts et métiers* (1761–1788). Rinman offered no similar bibliography in the *Bergwerks lexicon*, but he easily cites more than one hundred works.

115. Bellander mostly refers to Pott’s *Lithogeognosia* (1746), Henckel’s *Pyritologia* (1725), and Boerhaave’s *Elementa chemiae* (1732). He never gives the title of the work by de Boodt, but the *Gemmarum et lapidum historia* (1609) was on a relevant subject.

116. See for example RA, Bergskollegiums huvudarkiv, D8:1, “Alamandin,” “Askblåsare.”

117. Rinman mostly refers to Bergman’s *Opuscula physica et chemica* (1779–1790) and *Sciagraphia Regni Mineralis* (1782). He also regularly cites Henrik Theofilius Scheffer’s *Chemiska föreläsningar*, which Bergman revised and published in 1775.
Annalen (1778–); and Rinman’s own treatises on iron and steel. Likewise, where Bellander cited Wallerius’s Mineralogia, Rinman cited Wallerius’s more recent Systema mineralogicum (1772–1775).

Rinman did not just rely on publications, though. In the preface, he wrote that he had enriched the lexicon “with several of my own new findings, which cannot be found in any printed books, whether on mineralogy or mechanics.” For instance, he included accounts of steel tests he had participated in since the 1760s, notably experiments with cementation furnaces fueled by wood instead of charcoal or mineral coal. He also seems to have drawn information from the unpublished travel diaries of fellow mining officials, describing their study trips abroad. For example, previous studies have called attention to the fact that the Bergwerks lexicon was the first work from outside England to give a detailed description of the innovative puddling method. Introduced in the mid-1780s, this new technique for producing large quantities of bar iron played a crucial role in the expansion of the British iron trade and, consequently, in the industrial revolution.

All told, these comparisons confirm that Rinman’s revision was indeed substantial. Bellander had passed away during an exceptionally dynamic period in the history of metallurgic chemistry and technology. Had he lived fifty years earlier, his manuscript would not have become dated after only a decade, but, in the 1770s, the industry was changing quickly. At the same time, however, Rinman was exaggerating when he claimed to have made “an almost wholly new work” in “little more than two years.” Bellander’s manuscript gave Rinman a list of headwords with basic definitions. Even though he revised many of the longest articles and replaced outdated sources with new ones, he often kept at least some paragraphs, some references to sources, and opening definitions. In the end, he even reproduced

118. Rinman, BL, vol.1, f.blr (“Företal”): “med åtskilliga egna nya rön, som ej finnas uti tryckte böcker, så väl uti Mineralogien, som uti mechaniske inrättningar.”
sections that he had initially criticized, including Bellander’s accounts of fossils (some of them copied word-for-word). In fact, many of the smaller, less conspicuous articles in the Bergwerks lexicon are directly imported from Bellander’s manuscript. They may not constitute the most innovative parts of the lexicon, but they formed a foundation on which Rinman could build.

One of the most obvious differences between the two compilers concerns alchemy. Bellander’s manuscript contains a great deal of alchemical terminology, and one of his longest articles is “Alchemie.” Rinman excluded nearly all of this material. Alchemy and alchemists are still mentioned at times, but usually in a disparaging way. Alchemy had lost ground among mining officials over the eighteenth century, but it was not yet quite dead. Wallerius—who held Sweden’s first chair of chemistry, and taught both Bellander and Rinman—was a firm believer in the transmutation of metals. Bellander seems to have followed in his teacher’s footsteps, while Rinman clearly did not.

A second difference involves the compilers’ approaches to language. In Bellander’s manuscript, Latin terms are often listed as headwords, even though many are simply followed by cross-references to Swedish headwords later in the alphabet. German and French terms are occasionally noted as synonyms but rarely figure as headwords. Rinman, for his part, reduced the number of Latin headwords significantly, while increasing the number of Swedish ones. German synonyms often appear in the articles, but Latin and French ones are rarer. At the end of the lexicon, Rinman even offers an index of German terms mentioned in the dictionary. These distinctive approaches reflect different ideas about how the dictionaries were supposed to be used. The frequency of Latin

122. See “Anthropolithus” (on a petrified human body), “Astacolithi” (on petrified crayfish), and “Asteria” (on petrified molluscs) in RA, Bergskollegiums huvudarkiv, D8:1; Rinman, BL, vol.1.
terminology in Bellander’s work suggests that he meant his dictionary to facilitate understanding of Latin books on mining, mineralogy, and chemistry. As many Swedish chemists, mineralogists, and naturalists were still publishing in Latin to reach an international audience, this was not a bad idea. However, the official communications, reports, and documents of the Bureau of Mines were all in Swedish. Rinman’s lexicon was thus better adapted to the local work environment: It was a tool not just for navigating among books, but for navigating in the business.

In a way, Bellander’s procedures were similar to those of the anonymous mining official behind the Bergmännisches Wörterbuch, who also turned to established book-learning to collect nomenclature and information. In contrast to the German compiler, however, Bellander did not just gather words and concise definitions. He wrote long essays about the tools, processes, metals, sciences, and arts that he was interested in—some of them twenty, thirty, or even fifty pages long. Had Bellander published his dictionary before his death in 1772, it would have been Europe’s most comprehensive mining encyclopedia to date—the first to appear since Minerophilus’s Bergwercks-Lexicon (1730), and the first ever in Swedish.

What then accounts for the differences in lexicographical orientation between Rinman and Bellander? Personal preferences aside, the two men’s specialties within the mining world offer a good place to start. Specialized in iron- and steelmaking, Rinman spent his entire life trying to streamline, improve, and expand a large-scale industry that was helping to create a new, more efficient society. Iron and steel were the metals of modernity, of tomorrow. Bellander, for his part, spent most of his professional life in Sala, mining for a precious metal with a historical cachet but limited practicality. Silver did not build bridges, buildings, instruments, or machines. It was not a metal that called for innovative responses to the challenges of large-scale production, or constituted a priority for experimentation. Perhaps his focus on silver encouraged Bellander’s interest in alchemy and the transmutation of precious metals, while Rinman, a specialist on industrial metals, repudiated alchemy as useless humbug.
Publishing the *Bergwerks lexicon*

The *Bergwerks lexicon* was printed by Johan Arvid Carlbohm at the Royal Finnish printshop in Stockholm. The text was printed in two rounds. The first part, finished in late 1788, had 1096 pages. The second, finished in 1789, had 1249 pages. The material was bound in either two or four volumes in quarto. A supplement consisting of 34 plates with 234 figures was bound in a separate volume (see Figure 15).

The forthcoming *Bergwerks lexicon* was first advertised in the Swedish newspaper *Dagligt Allehanda* in March 1788. Behind the announcement was the secretary of the Ironmasters’ Association, Lars Segerström. He presented the lexicon as “the first in the mother tongue, the most complete of all.” To keep the price down for the engravings, the Ironmasters had sponsored the printing. For this reason, the *Bergwerks lexicon* cost “half as much as a work of this sort normally does”—but only for those who subscribed in advance.

Subscriptions could be arranged in fourteen towns in the south and middle of Sweden, and the printed copies were to be delivered to the same places. If customers in other areas of the country were interested in ordering copies for resale, they were promised a 10 percent discount, and the copies would be sent to the closest village. The initial deposit for subscribers was 1 riksdaler, but the full price depended on the customer’s choice of paper: 6 riksdaler for a copy on common “print paper” (*tryckpapper*), or 7 riksdaler on thicker “post paper” (*postpapper*). The whole work was advertised as “printed and

126. G. E. Klemming and J. G. Nordin, *Svensk boktryckerihistoria* (1883; Stockholm, 1983), p.238, 242, 397; Henrik Schück, *Den svenska förlagsbokhandels historia* (Stockholm, 1923), p.214–19. The Royal Finnish printshop was responsible for issuing royal proclamations and regulations in the Finnish language (since Finland was at this point part of the Swedish kingdom), for which the printer received an annual salary from the crown. Carlbohm inherited the printshop from his father in 1769. He sold it in 1812 to start a bookshop. Otherwise, not much is known about him.


130. *Dagligt Allehanda* (May 29, 1789).
finished” in the summer of 1789.\(^{131}\) From that autumn onward, several newspapers pronounced it “for sale” at book markets, bookbinders, and bookshops.\(^{132}\)

The *Bergwerks lexicon* was reviewed both in Sweden and abroad. The *Analytical review* (1790) praised it for containing “not only all the technical terms of the miner, but an account of all known mineral productions, the manner of working them, and the instruments necessary to be employed.”\(^{133}\) The *New annual register* (1790) expressed confidence that the lexicon would be highly useful to English mineralologists, “to whose attention we recommend it.”\(^{134}\) Furthermore, a review in the *Annales de chimie* (1791) pointed out that the name of the

---

131. *Dagligt Allehanda* (June 5, 1789): “tryckt och färdigt.”
132. See the notification sections in *Stockholmsposten* (March 8, 1790); *Stockholmsposten* (December 1, 1790); *Dagligt Allehanda* (October 11, 1791); *Norrköpings Tidningar* (December 4, 1793).
133. *Analytical review* 7 (1790), p.110.
author alone was a guarantee that the reader would find “numerous new observations highly useful to practitioners.” Theoretically inclined readers, the review went on to observe, would be satisfied by the large number of references to recently published works.  

Rinman’s *Bergwerks lexicon* was translated into German as the *Allgemeines Bergwerkslexikon* in 1808, which initiated a new wave of reviews. In 1809, the *Jenaische Allgemeine Literatur-Zeitung* declared that the making of mining dictionaries was more important than ever, since the metal industry depended on so many different arts and professions that not even the most experienced mining officials understood them all. Considering the great advances in the mountain sciences made in German states over the previous centuries, the reviewer found it somewhat surprising that German professionals had been outdone by the Swedes in producing a dictionary of mining. Rinman’s *Bergwerks lexicon* was judged the best of its kind, and now better still in the updated, augmented, German version.

Rinman’s *Bergwerks lexicon* never appeared in a second edition in Swedish. Just as a decade had sufficed to make Bellander’s manuscript outdated, the industrial revolution rapidly did the same for Rinman’s lexicon. Nothing similar was published in Swedish in the nineteenth century. Even though encyclopedias of mining and metallurgy appeared in other languages, the many newly founded journals specializing in chemistry, metallurgy, and mining were better equipped to handle the industry’s progress.

Far from being forgotten, however, Rinman’s *Bergwerks lexicon* turned into something of a national classic, whose dissemination went well beyond the libraries of mining officials. Throughout the nineteenth century, it regularly appeared in advertisements from auction chambers, clothing stores, tobacco shops, newspaper offices, and other new sites for selling books. In 1831, a newspaper article described how the locals of a small village outside of Piteå in northern Sweden, despite having no previous training in the mountain sciences,

had managed to provide the authorities with samples of iron ore, guided only by a chemical textbook by Jöns Jacob Berzelius—and Rinman’s *Bergwerks lexicon*. When the next Swedish dictionary to cover the language of miners appeared in 1941, Rinman’s lexicon was still acknowledged as the standard work on the subject.

Conclusions

Descriptions of mining and metallurgy changed significantly in specialized dictionaries in the early modern period. While sixteenth-century Latin lexica often covered metals as useful commodities, they showed little interest in their extraction and production. Although compilers of German mining literature introduced word lists of miners’ terminology early on, they rarely complemented them with nomenclature from theoretical scholarship, or used them as headwords to explain the miners’ art. The languages and perspectives of workers and scholars were largely treated apart.

The emergence of mining encyclopedias in preindustrial Europe depended, on the one hand, on the consolidation of mining and metallurgy as disciplines in their own right—as mountain sciences—a development driven in turn by the bureaucratization and professionalization of the mountain industries from the seventeenth century onward. This trend was particularly strong in the German states and Sweden, which had some of the most active mining districts in Europe, where competences and ideas converged and circulated through travelling artisans and state officials.

On the other hand, the rise of mining encyclopedias was affected by the general evolution of the dictionary genre, fueled by a changing media landscape and expanding public sphere. While sixteenth-century Latin lexica served primarily as linguistic tools for a small elite, the vernacular factual dictionaries of the eighteenth century engaged a greater variety of compilers and targeted more heterogeneous audiences. Still, it would take some time before practitioners started to make specialized encyclopedias about their own arts. Before the late eighteenth century, most dictionary articles about mining and metallurgy were written by compilers with little or no experience of manual labor.

139. *Dagligt Allehanda* (May 2, 1831).
Sven Rinman was the first high-ranking mining official and internationally acclaimed author of metallurgical literature in Europe to publish a specialized, alphabetically organized encyclopedia of mining and metallurgy, supported in the endeavor by the authorities of the Swedish Bureau of Mines. Yet the *Bergwerks lexicon* would never have seen the light of day if Rinman had not inherited the dictionary manuscript of a friend from his youth, the lesser-known mining official Anders Robert Bellander. The forty-year entanglement of the two men’s lexicographic work effectively illustrates the toil and passion of eighteenth-century encyclopedic practice, as well as the continuous renegotiation of the meanings and boundaries of the mountain sciences. Although both compilers drew information from foreign publications, their most common sources were contemporary Swedish chemists, metallurgists, and mineralogists active in the mining industry, whose works were at the forefront of metallurgical knowledge in Europe.

Against this background, it is not so strange that one of the first fully realized specialized encyclopedias in Swedish was devoted to mining and metallurgy. Its creation reflects the mining industry’s exceptional standing in eighteenth-century Swedish society, and its growing importance in Europe.

**List of editions**


**List of translations**