

Article

Gender and Library of Mineralogy

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Abstract: Few would expect women to feature often in the literature on mineralogy from the 15th through the 19th centuries, the recorded history of science being what it is. Among the approximately 1500 scholars in a massive catalogue of authors of mineralogy texts from 1439 to 1919 compiled by the independent scholar, Curtis P. Schuh, we count six women as primary entries and three others discussed secondarily. From the documents that Schuh left behind before his death, our database for this investigation, women wrote approximately 0.5% of the texts described. Only very unusual circumstances supported the life of a woman devoted to crystals in centuries past.

Keywords: mineralogy; crystallography; history; Curtis P. Schuh; Martine de Bertereau; Margaret Bentinck; Jane Welsh; Delvalle Varley; Ellen Swallow Richards; Hélène Metzger; Maria Merian; Éléonore de Raab; Claudine Picardet

1. Introduction: Curtis P. Schuh

In a new film [1], The Beatles' Paul McCartney sings, "Jojo left his home in Tucson, Arizona..." John Lennon interrupts his bandmate by asking, "Is Tucson in Arizona?" It is, and was home to Curtis P. Schuh, an independent mineralogy historian. Schuh assembled an unrivalled account of the study of minerals and crystals since the beginning of record keeping until the advent of X-ray crystallography. His labor is preserved in three extraordinary works in progress including volumes I [2] and II [3] of *Mineralogy & Crystallography: An Annotated Biobibliography of Books Published 1469 Through 1919*, as well as *Mineralogy & Crystallography: On the History of These Sciences from Beginnings Through 1919* [4].

In 2007, at age 48, Schuh left his home in Tucson, Arizona. Apparently ill, he ended his life in the nearby desert after leaving a note in his car saying that "my body will never be found." [5]. On the website findagrave.com his friends posted the following: "Curtis Schuh...was very private yet maintained devoted friendships. He was true to his word and his friends. ...We shall miss him...The car from which he walked his last journey was found..." Before this final hike, Schuh posted his mineralogical surveys (617 megabytes, 1562 pages) on the website archives.org.

When we first wrote about our enthusiasm for Schuh's work, we said that "The Biobibliography has too many entries to count accurately." [6] However, for this article, we counted. Schuh discusses 1465 individuals as main entries in his Biobibliography (although it depends precisely on how one counts, since some books are authored by organizations). Of the group of primary authors of some 5170 volumes, six were female: Martine de Bertereau (1600–1642), Margaret Bentinck (1715–1785), Jane Welsh (1783–1853), Delvalle Varley (1800–1859), Ellen Richards (1842–1911), and Hélène Metzger (1889–1945). Two additional women were discussed within entries devoted to male collaborators—Maria Merian (1647–1717) and Éléonore de Raab (fl. 1790s)—and one other, Claudine Picardet (1735–1820), was recognized for her translations of scientific texts. The contributions of these nine women are discussed in the following essay chronologically [7].

Citation: Kahr, B. Gender and Library of Mineralogy. *Crystals* **2022**, *12*, 333. <https://doi.org/10.3390/cryst12030333>

Academic Editor: Elena Sturm

Received: 24 January 2022

Accepted: 15 February 2022

Published: 27 February 2022

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2. Martine de Bertereau

Martine de Bertereau (ca. 1601–1642) is the first female mineralogist to appear in Schuh's work and is remembered generally as the first female mineralogist on record. She came from a noble mining family in Touraine and married a Baron regarded as a mining expert. She became known as the Baroness de Beausoleil [8]. An odd book (*Curiosities of Olden Times*, 1896) [9] says that little is known of Bertereau, an astrologer and alchemist, who came to France from Germany to exercise her profession but ended up dying in prison under orders of Cardinal Richelieu (1585–1642). The book continues:

Such is all that the great French biographical dictionaries have to say concerning a woman of surprising talent, indomitable perseverance, and a martyr of science. She was the first to draw attention to the mineral resources of France, and to indicate the profit that might accrue to the treasury by the working of the mines. How did France repay her services? By despoiling her of her private wealth, by casting her into prison, and leaving her to perish forgotten in its dungeons. Even now, her very name and services are passed over and ignored. A sad chapter is that in the history of science that relates the names of its martyrs, and records their services and the ingratitude and ignominy with which they have been repaid [9].

Our history of women in mineralogy begins poorly. Schuh gives Bertereau's date of birth as ca. 1601, although the author quoted above reports her marriage in 1610. Modern readers will hope that some dates are in error.

The Baroness and her husband lent their mining services to various nobles throughout Europe. Much of what we know of their craft appeared in Bertereau's *La Restitution de Pluton* (Figure 1, [10])—Pluto was the ruler of the underworld in classical mythology—an appeal for funding directed at Cardinal Richelieu, which apparently caused offense for uncertain reasons and had tragic consequences described above. The *Restitution* is nevertheless a rich compendium of descriptions of European mines. It is a road map to an industry promising riches to whomever possessed it.

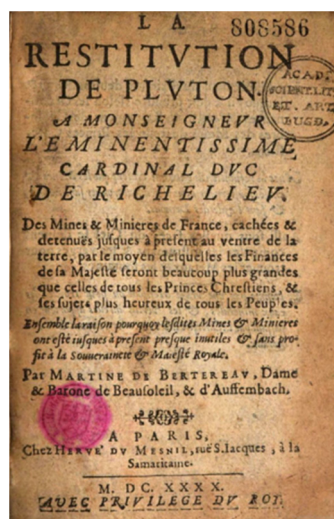


Figure 1. Martine de Bertereau's *La Restitution de Pluton* [10].

Bertereau and her husband were great experts in the use of divining rods and other 'instruments' to locate metal bearing ores. However, these unfamiliar activities invited charges of witchcraft. She generally believed, as was common at the time, that mines were inhabited by tiny underground men just several hands tall. We cannot and are not qualified to parse the nonsense she believed from the nonsense that she was falsely accused of believing. Searching for minerals was a challenging and troubling business in the earliest

days. Chemistry and mineralogy had yet to emerge from alchemy and the science practiced by the Baron and Baroness were consistent with the mythologies of their time.

Still, Bertereau was a great explorer of the natural world. She traveled to The New World and examined the famed silver mine, Cerro Rico, of Potosí, in present day Bolivia, surely an unusual pursuit for a woman in her day, which speaks to her authority on mining matters. Cerro Rico was known as the “mountain that eats men” [11] because of the danger of silver extraction and the abuses of enslaved Amerindian laborers.

Bertereau survived Cerro Rico but died in Vincennes, imprisoned with her daughter. A fellow prisoner remarked that they were poorly dressed and ill-equipped for the cold [8].

3. Maria Sybilla Merian

Maria Merian (1647–1717) was a naturalist and graphic artist from Frankfurt who received training from her stepfather, a painter of still life, and his other pupils. She began by engraving caterpillars raised in her home. Merian’s work was less well appreciated until it was brought forward by several scholars [12,13], followed by an international symposium dedicated to her work in 2017, and an accompanying feature in The New York Times [14]. Her life then inspired a raft of biographies pitched to children; after all, caterpillars become butterflies.

Merian followed her husband to Friesland, and then to Amsterdam, before they divorced, after which she earned a living selling paintings of flowers. Through her connections in Amsterdam, she gained the opportunity to travel with her daughter to Dutch Surinam. Merian’s most famous work is a study of Surinam insects, a fascination that survived from her juvenile attraction to caterpillars [15]. Some of her vividly illustrated observations, such as a spider devouring a hummingbird, were challenged as absurd by later researchers, only to be vindicated subsequently, and the spider was then named in honor of her acumen, *Avicularia merianae*. Her observations are regarded today as major contributions to ecology [16].

Illness forced Merian to return to the Netherlands, where she accepted contract work based on her reputation for observation and illustration. In 1705, Georg Eberhard Rumpf (or Rumphius, 1637–1706) published the first book with hand-colored plates of minerals in a book, *D’Amboinische Rariteitskamer* [17]. Merian was the colorist whose work was characterized as “very accurate and done with an expert hand”, according to Schuh (Figure 2). However, there is little evidence in the *Rariteitskamer* that she was responsible for the illustrations. Schuh learned of her work from some notes made on the half title page in a copy owned by the director of the zoological garden in the Hague. In any case, she is described within Schuh’s entry on Rumpf [3].



Figure 2. Plate of minerals from D’Amboinische Rariteitskamer [17] illustrated by Merian. The colors of this plate are reproduced by Schuh, but poorly in the pdf file ref. [4].

Wilson and Schuh called attention to an even more anonymous mineral illustrator. It is “rumored” that Pierre Buc’hoz (1731–1807), widowed during the French Revolution, settled with a woman who was an illustrator of his mineralogy books, but she is not named [18].

4. Margaret Bentinck

Our understanding of minerals has always benefitted from collectors. Margaret Cavendish Bentinck (1715–1785), known in later life as the Duchess Dowager of Portland, was a champion mineral collector. Bentinck, at one time the richest woman in Great Britain, is remembered for a “nationally known” natural history collection containing many “spars, ores and crystals”. A catalogue for the sale of her collection in 1786 was crafted by her librarian (Figure 3). Horace Walpole (1717–1797) attended the auction and remarked that, “Few men have rivalled Margaret Cavendish in the mania of collecting, and perhaps no woman. In an age of great collectors, she rivalled the greatest.” [19].

The Duchess was a member of the Blue Stockings [20], mostly female intellectuals who gathered to discuss literature and the arts, aimed at creating intellectual opportunities for aristocratic women. Required reading for turn of the 18th century Blue Stockings—after Bentinck’s death—was Mary Wollstonecraft’s (1789–1797) *Vindication of the Rights of Women* (1792). An earlier source for mid-century Blue Stockings may have been the pamphlet *Woman Not Inferior to Man; or, A short and modest Vindication of the natural Rights of the Fair-Sex to a Perfect Equality of Power, Dignity, and Esteem with the Men* (1739) written by “Sofia, A person of quality”, about whom little is known.

Wilson wrote a history of female mineral collectors [21]. The Duchess is the first in his accounting. Among the handful of others discussed are Empress Maria Theresa (1717–1780), Princess Caroline Louise von Baden (1723–1783), Catherine the Great (1729–1796), and Baroness Angela Georgina Burdett-Coutts (1814–1906), who was the richest woman in Great Britain, as was Margaret Bentinck in her day. Money enabled women to compete with, and outcompete, men at auction houses. Wilson also discusses the collector Éléonore de Raab (fl. 1790s, see section 6.).



Figure 3. Frontispiece to *A Catalogue of the Portland Museum*, London, 1786 [19].

5. Claudine Pouillet Picardet

Styled as the Baroness Guyton de Morveau (1735–1820), after her second husband, Louis-Bernard Guyton de Morveau (1737–1816), a chemistry professor at the École Polytechnique, Claudine Picardet made her reputation by the translation of scientific texts from Swedish, English, German, and Italian to French. Even though her husband was a

noted chemist, she was already an experienced scientific translator while married to her first husband, Picardet, a barrister in Dijon. She is of greatest interest to Schuh for her *Traité des caractères extérieurs des Europe*, traduit de l'allemand de M. A. G. [Adolf Gottlob] Werner (1749–1817) [22]. The title page only acknowledges that the work was Par la Traducteur des Mémoires de Chymie Scheele (1742–1786), co-discoverer of oxygen. In an approbation of the Werner translation by the man who would become her second husband, Guyton de Morveau, she is acknowledged as “Mme. P***” (Figure 4). Presumably, this is an obliteration of her maiden name. The Linda Hall Library of the University of Missouri, Kansas City, which acquired a copy of Werner’s *Traité*, acknowledged that “this was more credit than [Picardet] usually got for most of her translating efforts.” [23]. To enrich her translations and ensure their accuracy, she made her own observations of minerals in question, especially when confronted with Werner’s German neologisms, for which only an intimate knowledge of the objects considered would render a proper French alternative [24].

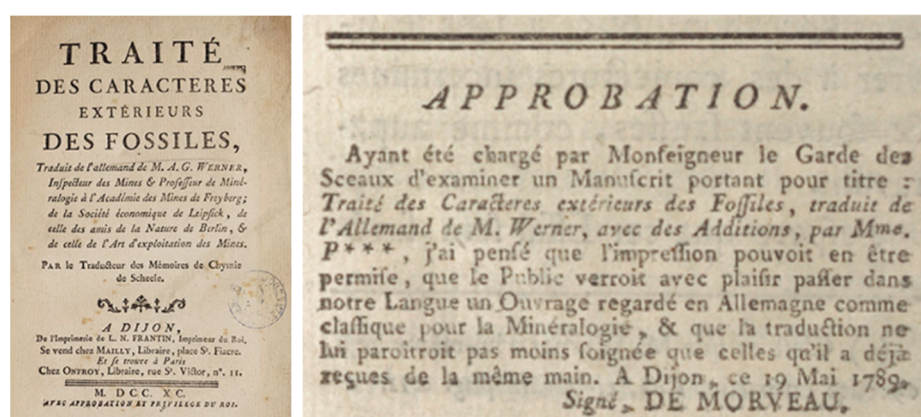


Figure 4. (Left) Werner’s *Traité* translated by Picardet with (right) an approval by her future husband that credits her as Mme. P*** [22].

6. Éléonore de Raab

Éléonore de Raab was an Austrian who assembled a “very fine mineral collection” according to Schuh, although she is not listed in his alphabetical catalogue of authors of books on mineralogy [2]. She is subordinate to the mineralogist Ignaz Edler von Born (1742–1791) who was commissioned to make a study of de Raab’s collection. Seventy copies of his catalogue were privately printed [25]. William Babington (1756–1833) based a new system of mineral classification on the Born/de Raab catalogue (Figure 5) [26].

Schuh did not capture all of the distinguished female mineral collectors either as primary entries such as Bentinck or as secondary entries such as de Raab. One such collector is Henrietta Clive, Countess of Powis (1758–1830). The Countess, like the Duchess Portland, had considerable financial resources and is known as the first female mineral collector in the United Kingdom, and whose specimens are now part of the National Museum of Wales. The museum’s website reports that, “During the late eighteenth and early nineteenth century it was unheard of for a woman to collect minerals. However, the social status of women at that time didn’t stop one Lady Henrietta...who assembled a fine collection of minerals from around the world at a time when activities were dominated by men...The recent rediscovery of Lady Henrietta’s original handwritten catalogues, dated 1817, has revealed the true significance of the collection” [27,28].

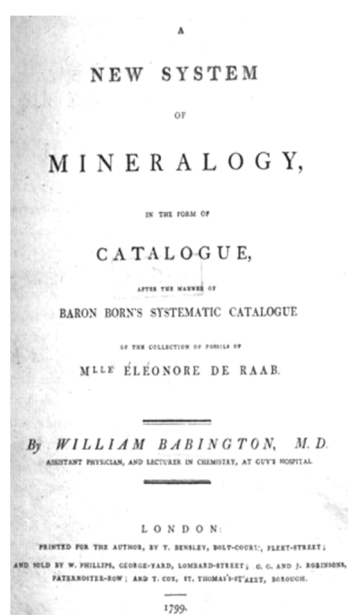


Figure 5. Babington's New System of Mineralogy [26] based on the de Raab collection.

7. Jane Kilby Welsh

Women often wrote about minerals but using a distinct literary style that is known as the familiar format, books written by women for women, children, or working-class men, often in the form of conversations and letters, according to Larsen [29], who gave an admirable analysis of this form of science presentation. Schuh, to his credit, does not overlook familiar format authors as being less serious than those who produced technical monographs, an activity that was the chosen domain of men.

Jane Kilby Welsh (1783–1853) is included by Schuh for her Familiar Lessons in Geology and Mineralogy (Figure 6) [30]. Welsh was orphaned at age 6 and lived her whole life in Massachusetts. She was a prolific writer lived quietly in the town of Northampton. Northampton was on its way to becoming the progressive center that it remains today. Sojourner Truth (c. 1797–1883, Figure 4) joined the Northampton Association of Education and Industry, a utopian community founded by abolitionists that supported racial, gender, and economic equality [31].

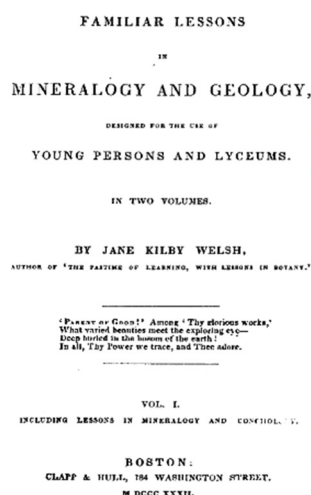


Figure 6. Welsh's Familiar Lessons in Mineralogy and Geology [30].

Welsh was attuned to science by Amos Eaton (1776–1842). Eaton was a student of Yale’s Benjamin Silliman (1779–1864) and gave public lectures on natural history in New York, Connecticut, and Massachusetts, often traveling by foot [29]. Women were welcome. Eaton cofounded the Rensselaer School for the training of teachers. Today, this is the Rensselaer Polytechnic Institute, a widely regarded engineering university. Eaton was impactful. He corresponded with Welsh, from whom she received encouragement that was much appreciated. A notice from the Massachusetts Probate Court unearthed by Larsen reports that Welsh willed \$70 to be split among five men for their “encouragement in publication of my books on Mineralogy and Geology” [29].

8. Delvalle Lowry Varley

Delvalle Lowry (1800–1859) was both a familiar format writer, author of *Conversations on Mineralogy* (1822, Figure 7) [32], and later an author (under her married name, Varley) of more technical works such *The Engineers Manual of Mineralogy and Geology* (1846), and *Rudimentary Treatise of Mineralogy* (1848) [33]. The latter books served a different audience than *Conversations*, “solidly packed with technical information, and meant for the practitioner (presumably male)” [29].



Figure 7. Plate from Varley’s *Conversations on Mineralogy* [32]. From Larsen, ref. [29].

Among the few biographical facts about Lowry that are recorded by Schuh is that “She was apparently of short stature and it is said that when Varley’s apprentices grew bored, they would toss Mrs. Varley back and forth amongst them” [2]. This seems like several forms of contemporary workplace harassment.

Fortunately, we know a great deal more about Lowry today from a chapter by Larsen [29]. Lowry’s artist father, Wilson Lowry (1737–c.1780), specialized in engravings for scientific texts and her mother, Rebecca (Rebekah) Eliza Delvalle (1761–1848), “was well-known in the scientific community, not only for her impressive mineral and fossil collection, but for her ‘considerable reputation as an instructress of mineralogy, and the elements of mathematics’” [29]. From her parents, it is believed that Delvalle received a strong background in science and through whom she was introduced to scientists with excellent mineral collections. A brother became an engraver in the service of the Geological Survey of Great Britain and Ireland, and an artist/geologist. Delvalle was only 22 when she published her *Conversations*. Unlike other authors of the familiar form, Lowry aspired to give her “readers clear ideas of the principles of Mineralogy and Crystallography” without relying too heavily on minerals as “evidence of God’s benevolence.” [29].

9. Ellen Swallow Richards

Ellen Swallow (1842–1911), an autodidact, developed a love of Nature as a farm girl from Massachusetts. She was rescued for a serious study of science by the creation of a college for women, by the brewer Matthew Vassar (1792–1868), who argued that women, “having received from her Creator the same intellectual constitution as man, has the same right as man to intellectual culture and development.” [34]. Swallow was admitted as a

third-year student. At Vassar, Swallow studied with the famed astronomer, Professor Maria Mitchell (1818–1889) and spent a great deal of time in the observatory. She learned analytical mineral chemistry from Professor Charles Farrar (1826–1891).

After graduating, Swallow almost ventured to South America—like de Bertereau and Merian—to work as a schoolteacher, but civil war, of which there were many in Argentina in the 19th century, interrupted her plans. At this time, she learned that yet another new school opened its doors, the Institute of Technology in Boston (MIT today). Women were not formally excluded—it did not seem like a necessary prohibition in 1870, it was just assumed. When Swallow’s application reached Boston Tech, supported by glowing recommendations from Mitchell and Farrar, President J.D. Runkle (1822–1902) was presented with a challenge. His solution, invented amidst the active opposition of the male faculty, was to invite Swallow to come to Boston and study, sans tuition charges. In this way, he could do the right thing for a qualified applicant while maintaining the plausible deniability that he had ever admitted a woman, a concerning precedent for many. Swallow was not allowed to take her laboratory instruction with men. Rather, she reported that, “I was at that time shut-up in the professors’ private laboratory, very much as a dangerous animal might have been. Whenever the classes came into the first year laboratory, the door was kept carefully shut and I was expected to stay in. I was not then allowed to attend classes” [35].

Swallow ultimately earned a degree from Boston Tech and, at the same time, she earned a master’s degree for her Vassar thesis on the analyses of iron ores containing vanadium. In any case, she holds the distinction of being the first woman to earn a degree in chemistry in United States.

Schuh includes Richards (she married an MIT professor) in his catalogue for her First Lessons in Minerals (1882), which remained in print for >25 years [36]. This book was intended for students, but it does not qualify as belonging to the familiar format. It is a beginner’s practical guide to the real chemical analysis of minerals.

Richards had a long career at MIT in creating the science of home economics as a mechanism for giving women science laboratory experience but circumscribed within a simulated home so as not to be subversive (Figure 8). The author is old enough to remember girls and boys being separated in middle school for instruction in home economics and wood shop, respectively, a vestigial practice from 19th century in living memory.

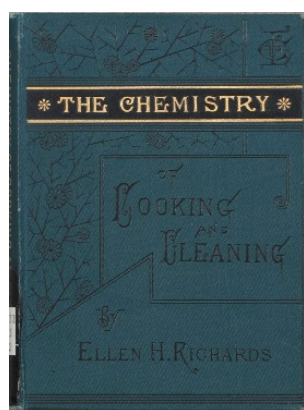


Figure 8. Richards’ The Chemistry of Cooking and Cleaning [37].

10. Hélène Metzger

We previously published a brief biography of Metzger (1889–1945) [38]. We copy it here:

“Hélène Émilie née Bruhl [39] earned a diplôme d’études supérieures under the supervision of [Frédéric] Wallerant [1858–1836] at the Sorbonne in 1912 for the crystallography of lithium chlorate. Her diplôme was a hindrance because it obviated the path to a

doctorat d'État, the credential necessary for a university professorship. In 1913, she married a historian, Paul Metzger, who died during some of the earliest fighting of World War I. Hélène then devoted herself to the history of science and published her first monograph in 1918, *La Genèse de la Science des Cristaux* (Figure 9, Ref. [40]), one of many that distinguished her as a philosopher of the first rank, but for which she earned a lesser doctorat d'université. "La Genèse describes how crystallography separated itself from mineralogy, and how mineralogy separated itself from both the living kingdoms of animal and vegetable, and how it remained, in the 18th century, a subject separate from physics.

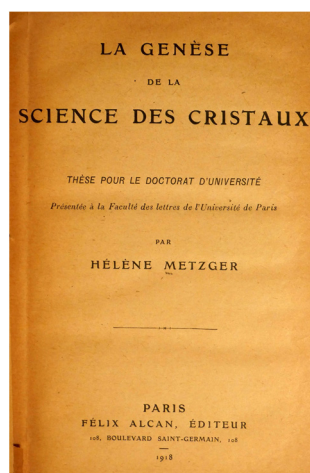


Figure 9. Metzger's *La Genèse de la Science des Cristaux* [40]. "[Metzger] was a founding member and officer of the Académie Internationale d'Histoire des Sciences but was never able to obtain a proper academic position, presumably meeting the impasse that was her gender, codified by the credentials that she was unable to acquire [41]. Metzger, the first woman to make a lasting mark on the developing profession of the history of science, has since become celebrated as a courageous figure for her resounding refusal to accommodate herself to patronizing colleagues [42].

In 1934, Metzger encouraged a boycott of a science history congress in Germany. Accordingly, in 1944, she was 'marked for vengeance', tracked from Paris to a small pension in Lyons, and sent to Auschwitz. She perished en route or afterwards" [42].

11. Conclusions

Domenico Bandini of Arezzo (c. 1335–1418) wrote an encyclopedia, *Fons Memorabilium Universi* [3]. The last section of the last part in table of contents is about "Famous Women" (*De mulieribus Europe*). Among the subjects discussed earlier are hell (*De inferno*), worms (*De reptilibus, serpentibus et vermibus*), and gems (*De lapidibus et gemmis*) [43,44]. This gives some sense of the depth of the ditch that women had to climb out of since the fourteenth century. There were nevertheless some finger holes along the way. Dmitrii Ivanovich Sokolov (1788–1852) welcomed women to his lectures at St. Petersburg University, which Schuh described as "exceptional for the time" [3].

Whether six or nine women are discussed among Schuh's copious list of ca. 1465 contributors, we are speaking of female representation in the library of mineralogy of about one half of one percent (0.5%). How then did this handful of pioneers succeed? Are there any general lessons?

It is harder to imagine Martine de Bertereau exploring the depths of the mines of the world without having the I of her husband, a mining expert. Claudine Picardet was apparently self-taught but her first husband, a member of the Académie royale des sciences, arts, et belles-lettres de Dijon, served Ientree to scientific circles for whom she served as a salonnière. Margaret Bentinck is included in Schuh's Biobibliography as a collector whose specimens were curated and written about by men. Surely, her great wealth enabled her collecting activities. Her legacy is due in part to the barriers that money can erase. Jane

Welsh had the good fortune of exposure to an itinerant science lecturer with an esteemed pedigree. Delvalle Lowry was the daughter of a female mineralogist! This is too rare a heritage to be accidental in Lowry's life's work. In fact, it begs the question as to why Lowry's mother, Rebecca Lowry, was not featured in Schuh's Biobibliography. Although Rebecca had a great reputation for her instruction, she apparently left no written works behind, unlike her daughter Delvalle, who was pioneer in transitioning from authoring mineralogy texts for women and children to authoring texts for men. The confidence that she had in breaking through gender-imposed obstacles surely was, in part, due to her parent's direct influence. Ellen Swallow Richards was in the right place at the right time. If not for the founding of a college for women by Vassar, Swallow's interest in natural history may have been overwhelmed by labors of a rural schoolteacher, the surest alternative plan in her future. In hindsight, Swallow Richards was very skilled at taking best advantage of the opportunities with which she was presented, while not rubbing against the egos of males who were well-equipped to maintain their territory if threatened. Hélène Metzger, although trained in France as a crystallographer, is most famous for making a career for herself in the history of crystallography. In so doing, she played a major role in the professionalization of the history of science, and in creating a new kind of professional space that was unencumbered.

In the aggregate, we do not have enough data points to build a continuous function of the history of women in mineralogy. We see de Bertereau, Picardet, and Lowry enabled by husbands and mothers, and Bentinck enabled by money. Kilby worked in a liberal center where views of gender roles were effectively advanced by several generations. Richards and Metzger invented areas of inquiry, laboratory instruction in the context of home economics, and history, respectively, that supported long-standing engagements with minerals and crystals, but that did not encroach on activities generally assigned to men. There seem to be several reasons that a handful of female pioneers turn up in an accounting that is almost exclusively male, but no one special reason why only 1 in 200 was female.

It is often hard to see social concerns as clearly as we may wish, especially concerns that arise in centuries of practice remote from our present positions. Moreover, any one person has a highly circumscribed experience that further clouds our vision. However, recorded experiences add up to make the history that everyone shares. It may not be as accurate as we may wish, but that is all we have got. For this reason, in the process of engineering the future, we should rely in part on what we can learn from our common heritage, however imperfect. Regarding the problem of gender equity in mineralogy and crystallography, as with any investigation, we should begin with the data we have. Curtis Schuh gave us data, without discernable favor or prejudice. We have reported here what his considerable labor shows.

The female sliver glinting through Schuh's scholarship surely gives the impression that his works were Euro-centric, perhaps exclusively so. However, this would not be accurate. His *History* [4] treats Islamic contributions to mineralogy comprehensively. No women appear there. He also has sections devoted to Asia, Africa, Australasia, and South America, with subsections on Taiwan, Transcaucasia, Thailand, Turkey, Tunisia, and Tasmania, just to name the "T's". No women appear there either. However, they someday may be found and Schuh points to many a trailhead. The massive contributions of women in crystallography first emerged in the early days of X-ray analysis [45,46]. This is where Schuh's labor ended.

In 1821, Aldrich published an admirable chapter on "Women in Geology" [47] and remarked on other forms of mineralogical expression that were taken up by women. These efforts would not have been considered by Schuh. For instance, Felicia Dorothea Browne Hemans (1793–1835) was a mineralogical poet who was admired by the fictional family members in Welsh's *Familiar Lessons* [29] (Section 5). Poetry was an "acceptable" outlet for women who liked rocks. Hemans "imbibed that intense love of Nature" that "haunted

her”, as quoted in Larsen [29]. Among her compositions was an “Epitaph on Mr. W---, a Celebrated Mineralogist,” which is reproduced by Aldrich:

Weep not, good reader! [s]he is truly blest
Amidst chalcedony and quartz to rest.

Funding: This work was supported by the NSF under Award Number DME-2003968.

Institutional Review Board Statement: Not Applicable.

Informed Consent Statement: Not Applicable.

Data Availability Statement: Not Applicable.

Conflicts of Interest: The author declares no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

1. Jackson, P. *The Beatles: Get Back*; Apple Corps Ltd.: London, UK; WingNut Films: Wellington, New Zealand, 2021.
2. Schuh, C.P. Mineralogy & Crystallography: An Annotated Biobibliography of Books Published 1469 through 1919, Volume I. Available online: https://www.si.edu/object/siris_sil_812327 (accessed on 14 January 2012).
3. Schuh, C.P. Mineralogy & Crystallography: An Annotated Biobibliography of Books Published 1469 through 1919, Volume II. Available online: http://www.archive.org/details/BioBib_Mineralogy_2007_Vol_2 (accessed on 14 January 2012).
4. Schuh, C.P. Mineralogy & Crystallography: On the History of These Sciences from Beginnings through 1919. Available online: http://www.archive.org/details/History_Mineralogy_2007 (accessed on 14 January 2012).
5. Wilson, W.E.; Schuh, C.P. Mineralogical Record Bibliographical Archive. 2012. Available online: <http://www.mineralogicalrecord.com> (accessed on 1 December 2012).
6. Kahr, B.; Shtukenberg, A.G. Histories of crystallography from Shafronovskii to Schuh. In *Recent Advances in Crystallography*; Benedict, J.B., Ed.; In-Tech Open Access: London, UK, 2012; pp. 1–34. <https://doi.org/10.5772/48789> (accessed on 18 February 2022).
7. Gender is presumed from the pronoun’s Schuh uses. There are only two sets of pronouns describing all the individuals of centuries past.
8. Valderrama, I.M.P.; Pérez-Pariente, J. Alchemy at the service of mining technology in seventeenth century Europe, according to the works of Martine de Bertereau and Jean du Chastelet. *Bull. Hist. Chem.* **2012**, *37*, 1–12.
9. Baring-Gould, S. *Curiosities of Olden Times*; John Grant: Edinburgh, UK, 1896; p. 153.
10. De Bertereau, M. *La Resitution de Pluton, Chez Herve*; Paris, 1790.
11. BBC News. ‘The Mountain That Eats Men’ in Bolivia, 8 October 2014. Available online: <https://www.youtube.com/watch?v=XHZS74Z9qIM> (accessed on 15 January 2022).
12. Etheridge, K. Maria Sibylla Merian and the metamorphosis of natural history. *Endeavour* **2011**, *35*, 16–22.
13. Pieters, F.F.J.M.; Winthagen, D. Maria Sibylla Merian, naturalist and artist (1647-1717): A commemoration on the occasion of the 350th anniversary of her birth. *Arch. Nat. Hist.* **1999**, *26*, 1–18.
14. Klein, J. A Pioneering Woman of Science Re-Emerges after 300 Years, 23 January 2017. Available online: <https://www.ny-times.com/2017/01/23/science/maria-sibylla-merian-metamorphosis-insectorum-surinamensium.html> (accessed on 15 January 2022).
15. Pomeroy, S.B.; Kathirithamby, J. *Maria Sibylla Merian: Artist, Scientist, Adventurer*; Getty Publications: Los Angeles, CA, USA, 2018.
16. Merian, M.S. *Metamorphosis Insectorum Surinamensium 1705*; Lannoo: Heverlee, Belgium, 2016.
17. Rumpf, G.E. *D’Amboinsche Rariteitskamer*; François Halma: Amsterdam, The Netherlands, 1705.
18. Wilson, W.E.; Schuh, C. Introduction to the new edition, with biographical notes on the author and his works. In *The Marvellous Gifts of Nature, Diversely Colored, in the Mineral Kingdom (1782)*; Buc’hoz, P.J., Ed.; the Mineralogical Record: Tucson, AZ, USA, 2001; pp. 5–11.
19. Walpole, E. H. *The Duchess of Portland’s Museum*; Grolier Club: New York, NY, USA, 1936.
20. Wilson, E.W. An historical look at women in mineral collecting, *The Mineralogical Record*, *46*, 6, 681–687.
21. Eger, E. *Bluestockings: Women of Reason from Enlightenment to Romanticism*; Palgrave Macmillan: Basingstoke, UK, 2012.
22. Werner, A.G. *Traité des Caractères Extérieurs des Fossiles*; Picardet, C., Werner, M.A.G., Frandin, L.N., Translators; Chez les Freres Walther, A Dresde, Dijon, France, 1790.
23. Scientist of the Day—Claudine Picardet, 7 August 2018. Available online: <https://www.lindahall.org/claudine-picardet/> (accessed on, 1 February 2022).
24. Bret, P. The letter, the dictionary and the laboratory: Translating chemistry and mineralogy in eighteenth-century France. *Ann. Sci.* **2016**, *73*, 122–142. <https://doi.org/10.1080/00033790.2015.1034780> (accessed on 18 February 2022).

25. Degen, J.V.; Alberti, I. (Eds.) *Catalogue Méthodique et Raisonné de la Collection des Sels Minéraux, Bitumens, Fossiles, Substances Métalliques*, Tome Second; Degen, Vienna, Austria, 1790.
26. Babington, W. *A New System of Mineralogy, in the Form of a Catalogue*; W. Phillips: London, UK, 1799.
27. Williams, S. Laid Bare the Passions and Obsessions of Lady Henrietta, a 19th Century Rock Chick, 3 December 2010. Available online: <https://www.walesonline.co.uk/news/wales-news/laid-bare-passions-obsessions-lady-1878203> (accessed on 16 January 2022).
28. Cotterell, T. *The Fabulous Mineral Collection of Lady Henrietta Antonia Herbert, Countess of Powis*. Available online: <http://www.visitcardiff.com/events/calendar-highlights/search-products/the-fabulous-mineral-collection-of-lady-henrietta-antonia-herbert-countess-of-powis-p145691> (accessed on 16 January 2022).
29. Larsen, K. *The Women Who Popularized Geology in the 19th Century*; Springer: Cham, Switzerland, 2017.
30. Welsh, J.K. *Familiar Lessons in Mineralogy and Geology*; Clapp and Hull: Boston, MA, USA, 1832–1833; Volume 1–2.
31. Clark, C. *The Communitarian Moment: The Radical Challenge of the Northampton Association*; Cornell University Press: Ithaca, NY, USA, 1995.
32. Varley, D. *Conversations on Mineralogy*, 1st ed.; Longman, Hurst, Rees, Orme, and Brown: London, UK, 1822.
33. Varley, D. *Rudimentary Treatise on Mineralogy for Use by Beginners*; John Weale: London, UK, 1849.
34. Vassar, M. 1 February 1862. Available online: <https://www.vassar.edu/vcencyclopedia/early-vassar/communications-to-the-board-of-trustees/1-february-26-1861.html> (accessed on 18 January 2022).
35. Swallow, P.C. *The Remarkable Life and Career of Ellen Swallow Richards: Pioneer in Science and Technology*; Wiley: New York, NY, USA, 2014.
36. Richards, E.H. *First Lessons in Minerals*; Press of Rockwell and Churchill: Boston, MA, USA, 1882.
37. Richards, E.H. *The Chemistry of Cooking and Cleaning*; Estes and Lauriat: Boston, MA, USA, 1882.
38. Kahr, B.; Shtukenberg, A.G. Seeing molecular configuration in crystal form. *Isr. J. Chem.* **2017**, *57*, 31–38. <https://doi.org/10.1002/ijch.201600002> (accessed on 18 February 2022).
39. Freudenthal, G. (Ed.) *Études sur/Studies on Hélène Metzger*; Brill: Leiden, The Netherlands, 1990.
40. Metzger, H. *La genèse de la science des cristaux*; Félix Alcan: Paris, 1919.
41. Chimisso, C. Hélène Metzger: The history of science between the study of mentalities and total history. *Stud. Hist. Philos. Sci.* **2001**, *32*, 203–241. [https://doi.org/10.1016/S0039-3681\(01\)00006-1](https://doi.org/10.1016/S0039-3681(01)00006-1) (accessed on 18 February 2022).
42. Chimisso, C.; Freudenthal, G. A mind of her own: Hélène Metzger to Émile Meyerson, 1933. *Isis* **2003**, *94*, 477–491. <https://doi.org/10.1086/380655> (accessed on 18 February 2022).
43. Singer, C.; Mme, H. Metzger-Brühl. *Nature* **1946**, *157*, 472. <https://doi.org/10.1038/157472a0>.
44. Hankey, A.T. Domenico di Bandino of Arezzo (?1335–1418). *Ital. Stud.* **1957**, *12*, 110–128.
45. Kahr, B. Broader impacts of women in crystallography. *Cryst. Growth Des.* **2015**, *15*, 4715–4730. <https://doi.org/10.1021/acs.cgd.5b00457>.
46. Kahr, B. Crystal engineering in kindergarten. *Cryst. Growth Des.* **2004**, *4*, 3–9. <https://doi.org/10.1021/cg034152s>.
47. Aldrich, M.L. Women in Geology. In *Women of Science: Righting the Record*; Kass-Simon, G., Farnes, P., Eds.; Indiana University Press: Indianapolis, IN, USA, 1990; pp. 42–71.