Mineralogical Society of America

PRESIDENT'S LETTER

In this letter I would like to reflect on the state of mineralogy in the USA in the context of our university education system. I suspect the situation is similar in other parts of the world, however I think it wisest to focus my discussion on what I know best.

In 2021, the Mineralogical Society of America launched a baseline study examining the status of mineralogy and petrology teaching in the U.S. colleges and universities. A survey was sent to MSA members working in academic positions. Seventy-four completed surveys were returned from 73 institutions in 37 states. One of the study's principal findings is that over the past five years, fewer geoscience departments are offering separate mineralogy, petrology, and optical mineralogy courses; with nearly a third reporting the deletion of either a mineralogy or optical mineralogy class from their curriculum. For those familiar with U.S. academic institutions, this should come as no surprise. University curricula have finite sizes, often imposed by the institution, to ensure that it is feasible for a student to complete a degree in four years. As the world of science expands, there is less time in the curriculum to teach any given topic. Therefore, mineralogy and optical mineralogy get squeezed into one class or mineralogy and petrology are combined into a single earth materials class. This consolidation is to make space for topics such as Geographic Information Systems (GIS) and global climate change, which are essential in the modern world. Perhaps more worrisome is that 40 percent of respondents saw a decreasing demand for the skills taught in mineralogy and petrology courses, while only 20 percent saw increasing demand, and 20 percent perceived a steady demand (the remainder didn't know). Recommendations from respondents for bolstering mineralogy and petrology classes included the need to involve more research instrumentation (SEM, XRD, etc.); making more connections to society and the broader geological context; teaching more applied and transferable skills, including field work and real-world projects; and making classes more fun for students.

For me, this topic is personal, as I have taught mineralogy for many years. I have spent quite a lot of time pondering which topics are most important to teach, and which I can skip over in the interest of not completely snowing my students. At one point, I was willing to stake my career on the importance of teaching stereonets and the phase rule, but more recently, have abandoned both in favor of more intuitive approaches. Some years ago, I had to adjust my course to the loss of an optical mineralogy course, which required more tough decisions regarding the contents of the lecture as well as the lab. Much to my consternation, X-ray diffraction landed on the chopping block. Having taught remotely during the pandemic and recorded all my lectures, I now teach in 'flipped mode', which gives me an even clearer picture of what sticks in my students' brains and what slips quickly away. I tell my students repeatedly that the skills they learn in mineralogy are very important and that their mineralogical knowledge will be the foundation of their understanding of rocks. However, as I look into their entirely baffled faces as we work through the beauty and intricacy of Si/Al ordering in feldspars, I sense that what I am teaching is still not well aligned with their needs or even my own priorities. There is a lot of inertia that comes from teaching what is in the book, teaching what I was taught, and teaching what is most intriguing to me.

One of the things I have learned over the years is that if you want students to learn something, it has to be front and center of your course organization. For example, at one point I realized that my students could finish mineralogy and have no clue what quartz was composed of or where you might expect to find it, but instead have randomly retained the formulas for galena, molybdenite, and hydrogarnet. Even though I lectured on associations, they would forget that calcite is not likely to show up in granite. So, I reinvented my mineralogy lab to center around associations, rather than systematic mineralogy. Because the lab covered the minerals in a specific rock type (e.g., felsic igneous rocks, mafic igneous rocks, sediments, hydrothermal deposits), the students would see the common rock-forming minerals like quartz, feldspar, and pyrite over and over again and through experience get very good at identifying them. They also had a much better feeling for how minerals fit into rocks. I was nervous about throwing away the time-honored adherence to Dana's classification of minerals, but, to be honest, how useful is that particular nugget of information compared to the relationship between rock bulk composition and which minerals occur in them?

Is it possible to envision radical reform of what is taught in mineralogy courses that would put mineralogy front and center on the list of highly relevant topics that all geoscience majors want to take? To connect mineralogy to modern scientific questions and applications, is it sufficient to just point out to students that there are connections, or should we instead build our course around those connections? Perhaps we should spend more time on zeolites and less on pyroxenes, more time on clay mineralogy and less time on muscovite and biotite. Living on a warming planet, perhaps we should use the methane clathrate phase diagram rather than the Si phase diagram to introduce phase equilibria; after all, stability between alpha and beta quartz is not likely to have nearly the impact on humanity as the destabilization of clathrates stored in permafrost. Are crystallographic forms and the wooden blocks made to teach them (nearly sacred objects to the mineralogy professor) really more important to teach than the function of cryptocrystalline materials in the weathering environment?

Changing how we teach mineralogy to put the value of understanding mineralogy front and center will take some work. As a community, we will need to convince ourselves that modifying, or even abandoning, the traditional course structure is OK. We will need to think critically about the topics that we currently teach, identify and prioritize new topics which key better into new modern scientific and societal needs, and figure out how to weave everything into coherent course structures. Finally, we will need to gather or create curriculum materials to support this new way of teaching mineralogy. I hope the new baseline study will convince people that this is an effort well worth undertaking.

Pamela Burnley
2022 MSA President

NOTES FROM CHANTILLY

- The MSA 2021 Annual Report is now available via a link on the homepage of the MSA website: www.minsocam.org. The Report details highlights in the past year, including awardees, Fellows, grantees, publications, communications, programs, and events.
- MSA 2023 membership renewals have begun. Please renew today using the link on the MSA home page (www.minsocam.org) if you have not already done so.
- Members and Fellows who are in the senior, honorary, and life categories are sent renewal notices. They need not pay dues, but are sent notices as the best way to prompt an update of membership information, particularly mail and e-mail addresses.

CONTRIBUTIONS

Many members make a gift to MSA by including a contribution with their annual dues and/or by responding to special appeals. Depending on the wishes of the member, the money is deposited with the principal of the MSA Endowment, the J. Alexander Speer Outreach Fund, MSA Mineralogy/Petrology Fund, J. B. Thompson Fund, Edward H. Kraus Crystallographic Research Fund, F. Donald Bloss Fund, General Operating Funds, or the new Peter R. Buseck Lecture Fund. These Funds are used to support MSA's research grants in crystallography, mineralogy, and petrology; the MSA Undergraduate Prizes; the Mineralogical Society of America Award; the Distinguished Public Service Award; the Dana Medal; the Roebling Medal; the website; and the Distinguished Lecturer program. If you have not done so previously, please consider making a tax deductable gift at the next opportunity.

REVIEWS IN MINERALOGY AND GEOCHEMISTRY (RIMG): VOLUMES 87 AND 88

MSA is pleased to announce the 2022 publication of two new *Reviews in Mineralogy & Geochemistry* volumes: Volume 87: *Geological Melts* (D.B. Dingwell, G.S. Henderson, and D.R. Neuville, Editors) and the open access Volume 88: *Diamond: Genesis, Mineralogy & Geochemistry* (K. Smit, S. Shirey, G. Pearson, T. Stachel, F. Nestola, and T. Moses, Editors). More information on Volumes 87 and 88 is on the MSA website under the Publications tab.

RiMG is a series of multi-authored, soft-bound volumes containing concise reviews of the literature and advances in theoretical and/or applied mineralogy, crystallography, petrology, and geochemistry. The series is jointly published by the Mineralogical Society of America (MSA) and the Geochemical Society. Volumes are available both in hard copy and online via the MSA website: www.minsocam.org/publications.html

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EVENTS

MSA will be hosting a virtual Short Course on Diamonds on October 26 and 27, 2022. The course is designed to accompany *Reviews in Mineralogy and Geochemistry* Volume 88: *Diamond: Genesis, Mineralogy & Geochemistry* (2022). For more information, visit the MSA website at www.minsocam.org.

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