Mineralogical Society of America

www.minsocam.org

MSA PRESIDENT'S LETTER

MSA Members Contribute Online Mineralogy and Petrology Teaching Resources

Carol Frost

Who would have guessed that in March 2020 universities around the world would move from in-person classes to online teaching? The unexpectedness of this change, caused by concerns over public health and welfare, were disruptive enough. Recording lectures or migrating classes to video-conferencing took extra hours in our schedules. For those of us who teach mineralogy and petrology laboratory courses, there was the added challenge of transforming the in-person laboratory exercises that make use of physical materials—rocks and minerals, hand lenses, microscopes, and various other equipment—into effective virtual lessons.

Almost immediately, MSA members came to the rescue. All of us on the MSA-Talk forum enjoyed a vibrant exchange of ideas and approaches to modify lab courses and recommend useful online resources and technologies. People shared their own resources and their favorite websites. They acknowledged the challenges, but offered moral support. One of my favorite comments pointed out that if the *Mars Rover* could identify minerals without handling a rock, surely the rest of us could figure out how do so, too!

The MSA has compiled all the suggested teaching resources contributed to the MSA-Talk discussion on their website under the Education and Outreach tab at http://www.minsocam.org/msa/Teaching_Resources.html. They are now available to everyone. The materials include many 3D models of rocks and minerals (and fossils, too!) that can be examined from all angles and help take the place of physical hand samples. Teaching resources for optical mineralogy, scans of thin sections, and videos of minerals in thin section help to convey the information that we are accustomed to presenting in lab. Links are provided to the online illustrations for MSA's *Mineralogy and Optical Mineralogy* textbook by Dyar, Gunter, and Tasa, and MSA member John Brady has provided access to his online interactive petrology text. Many of the lecture videos from our Centennial Symposium are appropriate for classes: they can be viewed at http://www.minsocam.org/msa/Centennial/MSA_Centennial_Symposium.html.

By the time you read this letter, the spring semester will be over and, hopefully, the coronavirus will be on the wane. But the pandemic may accelerate innovation in teaching and learning. Our familiar model of lecture- and lab-based classes may be replaced with new and creative approaches that integrate learning more seamlessly into our daily lives. We may see continued sharing among faculty members, and more collaboration between faculty, education professionals, and organizations that provide digital platforms. I also hope that a positive outcome of the pandemic will be renewed confidence in the value of science and the problem-solving skills of scientists.

For all these reasons, I'd like to encourage you to continue to share your mineralogy and petrology teaching resources and suggestions with MSA, either on MSA-Talk or via the "Contact Us" button on the MSA homepage at www.minsocam.org. We'll continue to add them to the Teaching Resources page. Please check that page periodically to see what's new!

Carol Frost
2020 MSA President

NOTES FROM CHANTILLY

- **Membership:** All 2018 and 2019 MSA members have been contacted by mail, electronically, or both about renewing their memberships for 2020. If you have not renewed your MSA membership, please do so today. You can renew online anytime.
- **MSA Elections:** MSA will have electronic balloting for the 2020 election of 2021 MSA officers and councilors. The slate of candidates – President: Mark Ghiorso (OFM Research Inc.); Vice President (one to be selected): Pamela Burnley (University of Nevada, Los Vegas) and Craig Manning (University of California, Los Angeles); Treasurer (one to be selected): Glenn Gaetani (Woods Hole Oceanographic Institution, Massachusetts) and Paul Tomascak (State University of New York at Oswego); Councilor position 1 (one to be selected): Robert Bodnar (Virginia Polytechnic Institute) and Michael Williams (University of Massachusetts); and Councilor position 2 (one to be selected): Darrell Henry (Louisiana State University) and Jennifer Jackson (California Institute of Technology).

CALENDAR

The 2020 sixteen-month calendar features the minerals of Colorado. The calendar is published by Lithographie, LLC in cooperation with the Mineralogical Society of America, Fine Mineral Shows, Tucson Gem and Mineral Society, Rocky Mountain Gems & Minerals Promotions, and LLD Productions, Inc. The 2020 calendar, as well as limited numbers from previous years, are available on the MSA website at www.minsocam.org.

RESEARCH GRANTS

The Mineralogical Society of America

2021 Grants for

RESEARCH IN CRYSTALLOGRAPHY

from the Edward H. Kraus Crystallographic Research Fund
with contributions from MSA membership and friends

STUDENT RESEARCH IN MINERALOGY AND PETROLOGY

From an endowment created by MSA members

Selection is based on the qualifications of the applicant; the quality, innovativeness, and scientific significance of the research of a written proposal; and the likelihood of success of the project. There will be up to three US $5,000.00 grants, with the restriction that the money be used in support of research. Application instructions and online submission are available on the MSA website, http://www.minsocam.org. Completed applications must be submitted by 1 March 2021.

VOTE

2020 MSA ELECTIONS

Japan Association of Mineralogical Sciences
http://jams.la.coocan.jp

DID YOU KNOW...?

The MSA has available on its website a collection of fully open access publications. These include *Teaching Mineralogy* (Brady, Mogk, and Perkins 2011); *Mineralogy and Optical Mineralogy Laboratory Manual* (McNamee and Gunter 2014); *Guide to Thin Section Microscopy* (Raith, Raase, and Reinhardt 2012), *Carbon in Earth* (edited by Hazen, Jones, and Baross 2013, RiMG volume 75), and many more. Full-text articles from *American Mineralogist* from 1916 through 1999 are also a part of this collection. The Open Access publications are under the **Publications** pull-down menu on the www.minsocam.org home page.

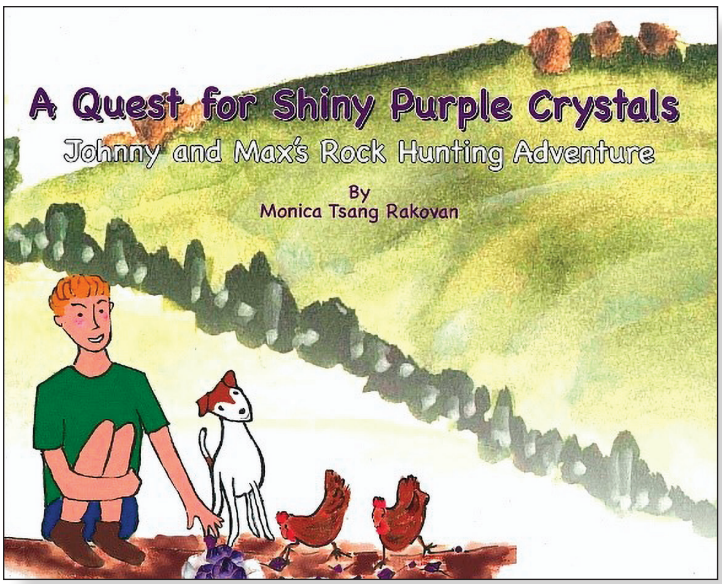
A MINERAL PUBLICATION FOR CHILDREN

***A Quest for Shiny Purple Crystals: Johnny and Max's Rock Hunting Adventure*, by Monica Rakovan, 2018, 32 pp, softcover, ISBN 978-0-9863349-1-7**

The MSA is pleased to be able to offer this exciting publication for children. In this illustrated book, Johnny and his best (furry) friend, Max, become fascinated by the rocks they are finding. To learn more, they visit a nearby rock shop, where the owner, Sal, answers many of their questions. Johnny and Max are invited to go rock collecting with Sal at a farm where the chickens are digging up purple crystals! The hunt begins for more shiny purple rocks and learning about an unusual amethyst find.

Written by Dr. Monica Rakovan, *A Quest for Shiny Purple Crystals* is a great way to teach children about collecting rocks and encourage enthusiasm for the sciences. A helpful glossary in the back helps introduce children to new words, and the colorful illustrations bring the story alive.

Description and ordering online at www.minsocam.org or contact Mineralogical Society of America, 3635 Concorde Pkwy Ste 500, Chantilly, VA 20151-1110 USA phone: +1 (703)652- 9950 fax: +1 (703) 652-9951 e-mail: business@minsocam.org. Cost is $10.



HUNTING MINERAL-CENTERED LIFE FROM THE DEEP ROCKY BIOSPHERE

The emergence of life is generally considered to have been assisted by the power of minerals (Hazen 2012). Modern organisms are equipped with biochemical machineries that might have replaced more primitive mineral parts a long time ago. Given the high energetic costs to operate such sophisticated biochemical machineries, it is speculated that mineral-centered life might have been evolutionarily preserved on modern Earth where the primordial geochemistry prevails with extreme energy starvation. One of the ideal places to hunt possible primitive life is in the deep subsurface because of its restricted supply of energy-rich photosynthetic products. Granite and basalt are geologic giants that have been representative of the continental and oceanic crusts, respectively, since ~4.0 Ga. Energy-starved deep biospheres in granitic and basaltic crusts have been potentially hosting primitive life that is not in competition with biochemically sophisticated microbes.

To explore the granite biosphere, a 69 Ma granite was drilled horizontally from a 300 m deep underground tunnel at the Mizunami Underground Research Laboratory (Tono, central Japan). Pristine groundwater samples were taken and subjected to genome-resolved metagenomic analyses in combination with geochemical and microbiological site characterizations. It was revealed that anaerobic methane-oxidizing archaea were harvesting energy from magmatic methane under energy-starved conditions (Ino et al. 2018). In addition, a diverse phylum within the candidate phyla radiation (CPR), called Parcubacteria, appears to be dominant in the deep granite biosphere. All CPR members are represented by small genomes and cell sizes with restricted metabolic capacities, which might have been inherited from an early metabolic platform for life (Hug et al. 2016).

For the oceanic crust biosphere, the *JOIDES Resolution* research vessel was used to drill into basalts of the following ages: 13 Ma, 33.5 Ma and 104 Ma. This drilling was done during Integrated Ocean Drilling Program (IODP) Expedition 329, which targeted life beneath the seafloor of the South Pacific Gyre (SPG). The South Pacific Gyre is known as an oceanic province where surface photosynthetic activity is exceedingly low (D'Hondt et al. 2015) and which might favor microbes living independent of photosynthesis in the underlying basalt.

Unlike land-based subsurface investigations, it is technically difficult to collect pristine crustal fluid from a borehole drilled from a scientific vessel. Without geochemical information from the crustal fluid, the habitability of the rocky environment remains largely unknown. To understand the nature of the rocky biosphere in oceanic crust, a new life-detection technique was successfully developed for drilled rock cores and used in combination with nanoscale mineralogical characterizations (see Yamashita et al. 2019 and Sueoka et al. 2019). Basalt fractures filled with clay minerals and calcium carbonate were associated with the formation of Fe–Mg-smectite that is compositionally and structurally similar to saponite and/or nontronite, both being indicators of low-temperature basalt–water interactions. Unexpectedly, the dense colonization of microbial cells was directly imaged to exceed ~10^{10} cells/cm^3, a range of cell density typically found in a human gut (Fig. 1) (Suzuki et al. 2020). More surprisingly, there was a dominance of heterotrophic bacteria, as demonstrated by DNA sequences and lipids, from which one can conclude that there is organic matter in the form of carbon and an energy source(s) in subseafloor basalt.

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