Mineralogical Society of America

www.minsocam.org

PRESIDENT'S LETTER

Carol Frost

MSA Joins with the Geoscience Community for the Inaugural Minerals Day!

Many of you may recall a discussion earlier this spring on the MSA-Talk list-serve that arose from a post calling attention to stock photos of mineralogists. Some were in laboratory coats and surgical masks and were holding up beautiful, euhedral crystals. Others peered through hand-lenses or down petrographic microscopes. But what exactly were these mineralogists *doing*, and why? This led to a question: How much do members of the general public, students, and even scientists in other disciplines understand about mineralogy? Ours is a field that is not part of the required K-12 curriculum in most US states. As a result, relatively few students arrive at university already wanting to study mineralogy and petrology. Clearly, it falls to us to increase understanding and awareness across all levels. In short, we need to explain the following:

- what a mineralogist does,
- what career opportunities exist,
- the kinds of scientific questions mineralogists pursue, and
- the uses of mineral resources in modern society—for infrastructure, advanced technologies, and all sorts of everyday products (including fertilizer, which allows us to eat!).

The Mineralogical Society of America (MSA) is working with the American Geosciences Institute (AGI) and other geoscientific societies to launch a new outreach opportunity to help do just this: we are launching the first-ever Minerals Day on Monday, 12 October 2020. Minerals Day is being organized to raise awareness and appreciation of minerals among the general public, not to mention students and teachers of all ages and at all levels.

Minerals Day falls on Monday of Earth Science Week 2020. This year's theme for Earth Science Week is "Earth Materials in Our Lives," which is a perfect focus for the launch of Minerals Day as part of this international celebration of the geosciences. Both the AGI and the MSA are currently developing materials, organizing outreach, and collaborating with geoscience partners in government agencies, professional associations, private corporations, and other groups (including museums, libraries, and rock and mineral clubs) to gear up for the October 12 premiere of Minerals Day.

Minerals Day educational resources and activities will celebrate the beauty of minerals, highlight their uses in a wide range of products and technologies, explain the role of raw materials in the lives of individuals and society, and inform on the many different careers that are available to experts in mineralogy.

What can MSA members do to help celebrate Minerals Day?

Mark October 12 on your calendar and get ready to celebrate!

- Visit the Earth Science Week website (www.earthsciweek.org) and MSA website (www.minsocam.org) to view the resources available, including the first-ever downloadable Minerals Day poster.
- Order the Earth Science Week Toolkit, which includes a calendar with activities from MSA and other societies (https://www.earthsciweek.org/materials).
- Participate and involve your students in the 2020 Earth Science Week video and photography contests on the topics "Earth Materials Around the World" and "Earth Materials in My Community" (https://www.earthsciweek.org/contests).
- Volunteer to give a virtual talk on rocks and minerals to a school or community organization, and be sure to be recognized as an MSA Ambassador on our website (http://www.minsocam.org/MSA/Ambassador/MSA_Ambassadors.html).

All of our activities can inform and catalyze interest in our field and contribute to a successful launch of Minerals Day. This should be fun and informative for all!

Carol Frost
2020 MSA President

NOTES FROM CHANTILLY

- MSA membership renewals for 2021 will start in August 2020 with renewal notices sent electronically, followed by several electronic reminders, before a paper copy is sent to those who do not renew online by the end of October 2020.
- Member subscription rates to the print version of the 2021 *American Mineralogist* will increase. The U.S. member print subscription price will be $165 (currently $150), and the foreign member print subscription price will be $185 (currently $165). The U.S. institutional subscription price (paper and electronic) will increase to $1,300 (from $1,200); foreign institutional subscriptions will be raised to $1,325 (from $1,225). The institutional electronic-only subscription will increase to $1,225 (from $1,125). Included in the institutional subscription will be all current-year (2021) print issues of *American Mineralogist*, *Reviews in Mineralogy and Geochemistry*, *Elements*, as well as access to the electronic version of these publications on the MSA's website, starting with volume 1, number 1. The GeoScienceWorld subscriber price for *American Mineralogist* is $270, that for the *Reviews* is $250.
- 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.
- If you subscribe to other journals through the MSA, please **renew early**: the MSA needs to forward your renewal to those publishers before your subscription expires. These journals include the following: *Gems & Gemology*, *Journal of Petrology*, *Mineral News*, *Physics and Chemistry of Minerals*, *Mineralogy and Petrology*, *Rocks & Minerals*, and *Journal of Gemmology*.

CONTRIBUTORS AND BENEFACTORS

Many members contribute 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 newly re-named J. Alexander Speer Outreach Fund, the MSA Mineralogy/Petrology Fund, the J. B. Thompson Fund, the Edward H. Kraus Crystallographic Research Fund, the F. Donald Bloss Fund, or the General Operating Fund. The income of these funds is used to support MSA's research grants in crystallography, mineralogy, and petrology; the MSA Undergraduate Prize; 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 contributing at the next opportunity. Here, we want to extend our gratitude to the individuals and organizations that have contributed to the MSA between 1 July 2019 and 30 June 2020. These contributors are listed on the MSA website and can be found by selecting "Contributions to MSA" on the MSA home page (http://www.minsocam.org/) under "About MSA."

MSA STUDENT GRANT AWARDEES

Md Abu Raihan Chowdhury (Kent State University, Ohio, USA) is the winner of the 2020 Grant for Research in Crystallography, as funded by the Edward H. Kraus Crystallographic Research Fund. His proposal is entitled "The Role of Mineral Surface Coatings on Colloids in Controlling Metal Transport in Acid Mine Drainage-impacted Areas."

Colloidal metal transport is regarded as an important mechanism for metal transport from a mining-impacted site. The typical pathway for Fe-bearing colloid (1–10 µm) formation in a mine-impacted site is considered to be the oxidation of pyrite and the subsequent oxidation of the aqueous Fe. However, Mr. Chowdhury suggests that the weathering and erosion of pyrite-bearing materials present in the mine spoils or mine tailings can generate colloidal pyrite. When the pyrite comes in contact with water and/or oxygen it oxidizes and produces acid mine drainage, which can acidify surface and groundwater near a mine site. Preliminary studies have revealed evidence of Fe-bearing mineral surface coatings (MSCs) on the pyritic colloids formed by the oxidation and reprecipitation of aqueous Fe released during pyrite oxidation. Mineral surface coatings are heterogeneous with respect to composition and thickness, and they can facilitate trace metal (e.g., As and Cu) sequestration due to high adsorption capacity. Mineral surface coatings can potentially inhibit further oxidation of the pyrite core by restricting water access to the core. However, pyrite oxidation and acid mine drainage formation still may take place due to the porous structure of MSCs.

Further study is needed to understand the continuous oxidation of the pyrite core and MSC transformations on colloidal pyrite. Moreover, the pyritic minerals can also contain traces of As and Cu, which are released when the pyrite is oxidized. The role of MSCs on the fate of trace metals is also not clear. Mr. Chowdhury plans to investigate the transport of colloidal pyrite coprecipitated with As and Cu in a sand column, to observe the impact of transport on the colloids (dissolution and/or MSC formation), and to observe the release and/or resequestration of As and Cu on MSCs. He hypothesizes that some of the Fe released from colloidal pyrite oxidation will reprecipitate on the colloids as Fe-oxide and so form an MSC which will act as a sink for the As and Cu initially released from pyrite dissolution.

Behnaz Hosseini (Montana State University, Montana, USA) received one of two 2020 Grants for Student Research in Mineralogy and Petrology for her proposal "Reentrants: Reliable Recorders of Magma Decompression Rates?"

Magma decompression rates play a critical role in modulating the explosivity of volcanic eruptions, but they remain difficult to quantify for highly explosive eruptions. Although slower magma decompression rates (<~10 kPa/s) have been estimated using amphibole breakdown and microlite growth rates, ascent timescales characterizing explosive silicic eruptions are often so short that they remain difficult to constrain using these conventional petrological methods. The estimation of decompression rates for explosive eruptions, therefore, requires a geospeedometer that can record short timescales and that can be quenched rapidly after fragmentation. One such tool is the reentrant or embayment—a melt-filled imperfection in a crystal that can record changing external magmatic conditions.

Volatile diffusion gradients in embayments have been used to estimate magma decompression and ascent rates at several volcanoes, often with the assumption of constant decompression rate over time. However, no studies have yet experimentally evaluated the information that embayments record during different magma decompression scenarios (e.g., single-step, stalling, two-step). The research group of which Ms. Hosseini is a part has developed a new experimental approach to evaluate whether embayments can record a more complete magma decompression history, and, if so, how these signatures are recorded. In her study, Ms. Hosseini will conduct ten high-pressure experiments under variable decompression conditions, analytically measure volatile diffusion gradients recorded in embayments, and evaluate whether current numerical models can retrieve known decompression rates.

Hannah Tompkins (University of Rochester, New York, USA) is the winner of the second 2020 Grant for Student Research in Mineralogy and Petrology for her proposal "Understanding Zr Stable Isotope Fractionation in Magmatic Environments: Insights from Experimental Systems."

Zirconium (Zr) is classified as a high field-strength element. These elements are a group of transition metals that are widely used as tracers of magmatic differentiation and of the coevolution of the Earth's mantle and crust. Zirconium exhibits relative mass differences among its isotopes which are comparable to many other fourth- and fifth-period transition metals, such as Ti, Cr, Fe, Ni, and Mo, all of which show natural stable isotope variations. For example, resolvable titanium fractionations have been documented in both terrestrial and lunar materials and have the potential for furthering our understanding of magmatic differentiation and plate tectonics. The similarities between Zr and Ti, coupled with the significance of zircon in the study of geologic time, underscores the importance of Zr's behavior in magmatic environments and processes. Although mass-independent Zr isotopic variations have been previously studied, mass-dependent variations remain poorly understood. Understanding of the mechanisms responsible for Zr isotopic fractionation in magmatic environments will provide insight into Zr's geochemical behavior and will be fundamental for interpreting the petrogenetic significance of fractionated isotopic compositions.

Previous investigations of Zr stable isotopes have resulted in conflicting observations. One study on bulk igneous rocks argued that zircon is isotopically "light" relative to the coexisting melt; a different study from a closed igneous system showed zircon and baddeleyite are isotopically "heavy" with respect to the melt from which they crystallize. To resolve this discrepancy and to better understand Zr's stable isotope behavior in magmatic systems, Ms. Tompkins will conduct a controlled zircon crystallization study to i) experimentally constrain the isotopic fractionation coefficient (αZr) between zircon and melt, and ii) to explore Zr's variability with temperature and melt composition. She hypothesizes that equilibrium fractionations will be resolvable but they will be smaller in magnitude compared to those inferred from natural systems.