



Mineralogical Society of America

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MINERALOGY: AN INCH DEEP AND A MILE WIDE?



Michael Hochella Jr.

Sure, why not. In so many important cases, the science that the world most needs is about making the right connections.

You have often heard it said, really good science is an inch wide and a mile deep. Science must have the “depth” to push the envelope of knowledge and peer into the world of the unknown. In many cases, that is certainly the case. But that was not the experience of Gerd Binnig and Heinrich Rohrer, two European physicists (German and Swiss, respectively) who in 1981 invented the scanning tunneling

microscope. Their first publications on the method, in 1982, were each only a few pages long, but four years later, they were awarded the Nobel Prize for their discovery. Why? The key components of their new microscope (both instrumentation and the underlying quantum mechanics) were all known previously. However, their supreme triumph came from putting all these pieces together into a package, a package that nobody had ever imagined before them. With this microscope, they were the first to measure electron tunneling currents between a metallic tip and a semiconducting surface as a function of the tip-to-surface separation, which they could control with angstrom-level precision. Then, by adding lateral controllability of the tip, they realized that they had stumbled upon an atom-resolving microscope that required no lenses. Their astonishing achievement, with monumental consequences, resulted from thinking that was much, much broader than it was deep. And that was pure genius.

Look at some of the most influential and valued achievements of mineralogy in the past, which are, in my opinion, remarkable and positively key to the development of civilization. Yet they involved exceptionally broad thinking rather than deep probing of a single phenomenon:

- Early humans, including in all likelihood *Homo erectus* as early as several hundred thousand years ago, acquired the ability to make and utilize fire on demand by striking together a very hard mineral and an iron sulfide, like quartz and pyrite. This was certainly one

of mankind’s most important early inventions, allowing the development of cooking, providing protection and warmth, and permitting expansion of their livable geographic range.

- The writings of German physician Georg Bauer (Georgius Agricola) in the 16th century were the beginning of modern mineralogy and environmental science. His statements, such as “When the ores are washed, the water which has been used poisons the brooks and streams and either destroys the fish or drives them away,” were extraordinarily broad and sophisticated observations and conclusions at the time.
- We have realized very recently that iron, a critical limiting nutrient of the phytoplankton of the world’s oceans, can be provided by iron oxide nanominerals supplied by the weathering of continents. This process is an important factor in controlling the populations of these organisms, which in turn plays a critical role in global temperatures due to their dramatic influence on the amount of atmospheric CO₂.

Science from an integrated point of view is a vital part of the future of mineralogy. From an educational standpoint, we should change our questioning from how much mineralogy is taught in mineralogy courses to how much mineralogy is taught in an integrated Earth science curriculum, and in certain courses in the chemistry, physics, and biology curricula. But it goes further. At Virginia Tech, an undergraduate will soon be able to *major* in nanoscience, an integrated science, and in several of the courses in this four-year curriculum, these science majors of the future will learn mineralogy. This is a great example of how mineralogy is not becoming less important in higher education, but much more important, and in fact, absolutely critical. Sure, the framework has changed, but it needs to.

As I argued in my last president’s letter (volume 7, page 420), MSA will align itself better with the future of science by, for example, instituting changes having to do with how we interact with other societies, how we publish and what we publish, and how we are perceived by the outside world. In my next letter, using integrated science as a key to the future, I will describe what MSA is doing to move in these critical directions, while, in part, being an inch deep and a mile wide.

Michael F. Hochella Jr. (Hochella@vt.edu), MSA President

MSA, CHANTILLY, AND US HISTORY

2011–2015 is the US Civil War Sesquicentennial (150th anniversary). Chantilly is located in what was the border area between the two sides and where the Union’s Army of the Potomac and the Confederacy’s Army of Northern Virginia battled for 5 years. You cannot go very far in any direction from the MSA office without encountering a battlefield of some sort. This coming September 1 is the Sesquicentennial of the Battle of Chantilly (or Ox Hill).

Confederate Brigadier General T. J. “Stonewall” Jackson hoped to cut off the Union army retreating through Chantilly from the nearby Second Battle of Bull Run (or Manassas Junction). On September 1, 1862, Jackson sent his divisions against two Union divisions under Major General Philip Kearny and Brigadier General Isaac Ingalls Stevens. The Confederate attacks were stopped by fierce fighting during a severe thunderstorm, but both Union generals were killed. Recognizing that his army was in danger at Fairfax Courthouse just beyond Chantilly, Union Major General John Pope ordered the retreat of Union forces back to Washington, D.C.

With Pope no longer a threat to northern Virginia, Confederate General Robert E. Lee turned his army west and north to invade nearby Maryland, initiating the Maryland Campaign to attack Washington. The battles of South Mountain and Antietam took place a few days later. Antietam was the bloodiest single-day battle in American history, with about 23,000 casualties. Although the battle was tactically inconclusive, it was just

enough of a victory to give President Abraham Lincoln the confidence to announce his Emancipation Proclamation, which might have discouraged the British and French governments from any plans to recognize the Confederacy.

There is another MSA connection, aside from geography: Washington A. Roebling was in the Army of the Potomac throughout the war. Starting as a private, he advanced through the ranks of the artillery to the level of major in the engineering section assigned to building bridges. He was addressed as colonel in later years, a rank he received by brevet commission upon discharge. Roebling was at a number of important battles, including Bull Run, Gettysburg, Cold Harbor, and the long Siege of Petersburg, which eventually ended the war. He was in a shore battery and saw the battle of the ironclad warships Monitor and Merrimack up close. He also described the aftermath of the Battle of Chantilly.

Roebling apparently did not cut a dashing figure in uniform. He was also described as curt, appearing indifferent, and laconic (General Meade: “What’s that redoubt doing there?” Roebling: “Don’t know; didn’t put it there.”). He was the typical soldier, grouching about officers. But aside from surviving the war, he also had the good fortune to meet his wife, Emily, at a military ball in Washington later in the war.

Alex Speer

NOTES FROM CHANTILLY

- MSA will use electronic balloting for its 2012 election of officers and councilors. The slate of candidates follows. President: John M. Hughes; vice president: David J. Vaughan and Harry Y. McSween Jr.; treasurer: Edward S. Grew and Howard W. Day; councilors (two to be selected): Joshua M. Feinberg, Horst R. Marschall, Isabelle Daniel, and Kirsten P. Nicolaysen. Andrea Koziol continues in office as secretary. Continuing councilors are Pamela C. Burnley, Guy L. Hovis, Christine M. Clark, and Kimberly T. Tait.
- New at MSA: A revised MSA statement on asbestos has been accepted by the Council and posted on the MSA website: www.minsocam.org/MSA/policy.html?policy=Asbestos.
- New at MSA: Open access teaching, research, and historical publications have been made freely available by either the authors or MSA. These can be reached by selecting the "Open Access Publications" link on the MSA home page: www.minsocam.org/msa/openaccess_publications.html. Among the first postings are "Guide to Thin Section Microscopy," by Michael M. Raith, Peter Raase, and Jurgen Reinhardt, and the out-of-print "Teaching Mineralogy," edited by John B. Brady, David W. Mogk, and Dexter Perkins III.
- The death of Jim Thompson (Fellow, 1950) on November 15, 2011, was announced on MSA-Talk. Several follow-up messages showed the enormous positive effect he had on our professional and personal lives. It was proposed that donations be made in honor of Jim Thompson to the MSA Grants for Student Research in Mineralogy and Petrology. This will put contributions to work in the areas that were central to Jim's life (students, mineralogy, and petrology) and in an organization that was central to Jim's career (MSA president, MSA Roebling Medalist).

If you wish to make a donation, you can do so when you renew your 2012 membership, or, if you have already renewed, you can make a contribution at https://msa.minsocam.org/donations_online.html, or contact the MSA business office; please mention Jim Thompson in your donation.

- Remember, for a sneak peak at upcoming articles, select "American Mineralogist Papers in Press" (the clay tablet) on the MSA home page: www.minsocam.org/MSA/Ammin/AM_Preprints.html.
- All 2010 and 2011 MSA members have been contacted by mail, electronically, or both about renewing their membership for 2012. If you have not renewed your MSA membership, please do so. If you have not received a notice by the time you read this, please contact the MSA business office. You can also renew online at anytime.

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NOMINATIONS FOR 2013 AWARDS

Remember the 1 June 2012 deadlines for 2013 MSA awards and honors: **Roebling Medal**, **Dana Medal**, **Mineralogical Society of America Award**, **Distinguished Public Service Medal**, and **Fellowship**.

Submission requirements and procedures:
<http://www.minsocam.org/>

IN MEMORIAM

JOHN L. BAUM – Member, 1957
JOHN F. BURST – Fellow, 1950
WALTER BARCLAY KAMB – Life Fellow, 1962
JAMES B. THOMPSON JR. – Fellow, 1950

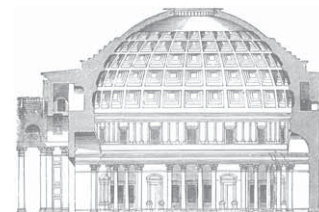
Mineralogical Society of America and Geochemical Society
SHORT COURSE ANNOUNCEMENTS

Applied Mineralogy of Cement and Concrete

21–22 June 2012 (after ICDC 2012)
Trondheim, Norway

CONVENORS:

Maarten A. T. M. Broekmans,
Geological Survey of Norway
Herbert Poellmann,
Martin Luther Universitaet



The course will be held in conjunction with the 1st International Congress on Durability of Concrete (ICDC), Trondheim, Norway, June 18–21, 2012. The course will cover the mineralogical and geochemical aspects of clinker and cement production, cement hydration, and concrete damage. Selected topics represent both "hot issues" (reduction of CO₂ emissions, alternative cements) as well as "long-standing problems" (rebar corrosion and "deleterious alkali-silica reaction" (ASR), first described in 1940).

Information and registration: www.minsocam.org/MSA/SC/#concrete

Environmental Arsenic Mineralogy,
Geochemistry and Microbiology

5 August 2012 (preceding 34th IGC),
Brisbane, Australia

CONVENORS: **Rob Bowell**, SRK Consulting, **Dave Polya**, University of Manchester, **Dave Crow**, University of Otago, **Jack Ng**, University of Queensland, **Petr Drahota**, Charles University

The short course will provide a comprehensive understanding of arsenic geochemistry in the near-surface environment. It will follow on from recent arsenic conferences, such as the Aquatrain series, the most recent being in July 2010 in Manchester, and the EPA conference on arsenic in Denver in 2001. The short course will cover the mineralogy and geochemistry of arsenic and their implications in assessing arsenic geochemistry in natural groundwaters, mine-associated impacts, the interaction of arsenic with biological cycles and its consequences, and the management and mitigation of arsenic related impacts in the environment.

Information and registration:
<http://www.minsocam.org/MSA/SC/#arsenic>

THE MINERALOGICAL SOCIETY OF AMERICA

2013 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 as judged from a written proposal, and the likelihood of success of the project. There are three US\$5000 grants with no restrictions on how the funds may be spent, as long as they are 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 June 1, 2012.