Imaging and Analysis of Artifacts

Working in the analytical laboratories in the Department of Mineral Sciences provides plenty of challenging problems just involving geologic materials. Requests from other departments within the museum and elsewhere are growing as the understanding spreads to other disciplines of how our tools can be applied to an even wider variety of materials. Tim Rose has been actively involved in collaborative studies with Jane Walsh (Anthropology) of cultural artifacts from ancient Mesoamerica. These studies used Mineral Sciences’ variable pressure field emission FEI NovaNanoSEM 600 to obtain images and non-destructive qualitative chemical analyses on uncoated whole specimens or fragments and tiny samples removed from the surface or from deep recesses of objects. A recent collection of spectacular artifacts, which included carved stone figurines and masks and ceramic pieces with various surface coatings, was delivered to the museum with a request to provide information as to their authenticity. The objects were photographed, measured and placed into groups based on their apparent cultural affinity. Initial observations were made using optical microscopy with particular attention paid to tool marks. Very few objects showed evidence of modern tools at either the optical or SEM scale. Chemical compositions of minerals in and surface coatings on, stone artifacts were determined in order to characterize the rock type and other materials. Rock types included jadeitite, serpentinite and syenite.

A carved stone figurine (17 cm long) in the Department of Mineral Sciences’ nanoscale scanning electron microscope chamber awaits imaging and analysis. Photo by Tim Rose.
Imaging and Analysis of Artifacts (cont.)

One group of several syenite masks were partially coated with a probable modern tan gypsum plaster. Several ceramic artifacts of unique design have complex surface decorations. A small cross-sectional multicolored fragment of the coating on one object was studied in detail revealing five chemically distinct layers. Tim & Jane interpret this as original Olmec fresco paint. The results of the ongoing research indicate that the large majority of the artifacts are authentic pre-Columbian objects belonging to the Olmec, Maya, Teotihuacan and Mezcala civilizations which date from 1500BC to 600AD. In the first comprehensive study of the iconic stone “masks” from Teotihuacan (100 BC to 600AD), we examined nearly 200 masks. Sampling of the artifacts was prohibited, however silicone molds taken ostensibly to study tool marks and carving methods also removed tiny grains from deep in drill holes. Study of these grains reveal that some are very likely residue from the original carving and polishing of the stone.

Education & Outreach

Geologist Michael Wise makes classroom visits

During the last few months of fall and winter, DMS geologist, Michael Wise was extremely busy making classroom visits to elementary schools in the metro Washington D.C. region. Within the Fairfax County Public School System, Mike visited 5th grade classes at Glen Forest, Oak Hill, Herndon, Newington Forest, Laurel Ridge, and Halley Elementary Schools. Mike also addressed a group of 3rd and 6th grade classes at Westbriar Elementary’s Career Dream Day. In the District of Columbia, Mike visited and spoke to an enthusiastic group of second-graders at Bridges Public Charter School. For good measures, Mike managed to squeeze in a visit to a second-grade class at Lisa J. Mails Elementary (Murrieta, California) while he was on vacation in southern California. All totaled Mike spoke to 36 classes—that equates to nearly 900 students!

During the classroom visits, Mike talked about the NMNH, the Mineral & Gem Collections and what’s it like to work at The Smithsonian. Mike also gave presentations to all the classes about minerals, rocks and gemstones. He introduced the students to some basic concepts like the difference between a rock and a mineral, how minerals get their color and the importance of minerals in everyday life. Mike brought with him a few rock and mineral specimens that the students were allowed to touch and examine closely.
New Acquisitions

Tucson Gem & Mineral Show

- New gem and mineral specimens recently acquired during the Tucson Gem & Mineral Show. The top photograph is a suite of tourmalines from Mozambique. The suite consists of six stones ranging in weight from 21.90 (peach-colored) to 45.33 (lavender-colored) carats. These magnificent gems were a gift from David Yurman Company. Bottom left photograph is an exquisite example of the cobalt-bearing mineral erythrite from Morocco (Specimen is 4.8 cm high). Bottom right photograph is a new occurrence of fluorapophyllite on heulandite. (Specimen is 8.2 cm high). Both minerals are colored deep green by inclusions of the mineral celadonite. Photos by Michael Wise.
New Acquisitions (cont.)

*Tucson Gem & Mineral Show*

The Smithsonian recently acquired during the 2015 Tucson Gem & Mineral Show, a new piece for the National Gem Collection. Award winning gem carver Sherris Cottier Shank donated her sculpture, "Southwest Sunset" to the Smithsonian at the American Gem & Trade Association Show (AGTA). The sculpture consists of a 443 ct Ametrine (purple and yellowish quartz from Bolivia) Sun sinking into 1407.77 cts of rose (pink) quartz (from Madagascar) clouds. Ms. Shank has won 8 Cutting Edge awards and this sculpture was recently displayed at the Carnegie Museum in Pittsburgh. Photo courtesy of Sherris Shank.

In case you haven’t seen them yet, a few “new” specimens have been placed on display in the Janet Annenberg Hooker Hall of Geology, Gems and Minerals. In our Recent Acquisition case (located next to the Pegmatite Section of the gallery) we have added a very nice gold specimen from the Mockingbird mine, California (#1); a corundum crystal (variety ruby) from the Muzzafar mine, Pakistan (#2); and a fabulous matrix specimen of emerald in biotite schist from the Kagem mine, Zambia (#3).
Kudos

❖ At the 2014 NMNH Peer Recognition Awards Ceremony, several Mineral Sciences staff members were recognized. Career Service awards went to Glenn MacPherson (30 years), Jeffrey Post (30 years), and Linda Welzenbach (20 years). Liz Cottrell won the Multiplicity Award for her exemplary work as Director of the Global Volcanism Program. Liz also garnered a Science Achievement Award for her 2013 publication entitled “Redox Heterogeneity in Mid-Ocean Ridge Basalts as a Function of Mantle Sources”. The paper was co-authored by Katherine Kelley (University of Rhode Island) and published in Science magazine.

❖ Brendan McCormick has won the Geological Society of Washington's Bradley Prize for Best Paper in 2014. Brendan’s presentation “Ten Years of Satellite Observations Reveal Highly Variable Degassing at Anatahan Volcano, Marianas Islands” was the best talk out of about 60 this year.

❖ Liz Cottrell’s presentation “The Ontakesan Eruption” won the Geological Society of Washington's Great Dane Award for Best Informal Communication.

❖ Mineral Sciences NHRE intern Kellie Wall won best student paper at the American Geophysical Union Fall meeting. She was one of 9 student winners in the Volcanology, Geochemistry and Petrology Section – out of hundreds of participants.

❖ At the Tucson Gem & Mineral Show held on February 12-15, 2015 (Tucson, AZ), the Smithsonian display “Minerals from Western Europe: Highlights from the National Gem & Mineral Collections” was awarded the Betty & Clayton Gibson Memorial Trophy for Best Museum Exhibit. Following the show theme “Minerals of Western Europe”, the display featured one mineral from 28 different European countries. Three gem pieces, a sphalerite from Spain, smithsonite from Greece, and garnet from the Czech Republic rounded out the award-winning display. The case design, graphics and specimen selection was done largely by Michael Wise and Paul Pohwat.


Selected Publications


Education & Outreach (cont.)

Dear Dr. Wise,

Thank you for coming to my class on career day. I was very interested in your job! I think that I might consider studying geology when I grow up. Thanks to you, I have started a rock collection and it is very fun with room to see new types of rocks. Well, thank you again!

From Nicole

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Dear Dr. Wise,

You are very wise! (about rocks)

I loved your presentation.

My favorite rocks are quartz and amethyst.

Oct 22, 2011

XOXO (lots of hugs) - Samelle

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Dear Dr. Wise,

Thank you for coming into my classroom and help us learn all of us for science. Thanks to you.

Science is my favorite subject. I never knew how fun science was.

Thank you!

Dr. Wise

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Lunchtime Q & A with Newington Forest Elementary School students. *Photo courtesy of Cheryl Nelson.*