As we reach the end of another year, we look back on a time of change and growth for the Department of Mineral Sciences. With the departure of old and the arrival of new colleagues, the Department has been substantially reshaped. Through it all, we remain committed to our efforts in research, collections and outreach across the spectrum of petrology, mineralogy, meteorites and volcanology. It has been a particularly exciting year for us in exhibits. In the latter half of 2011, the “Against All Odds: Rescue at the Chilean Mine” and “More than Meets the Eye” exhibits were joined by “The Evolving Universe”, an exhibit that Glenn MacPherson from our department and colleagues from the Smithsonian Astrophysical Observatory produced. Likewise, collections continued to grow, with the petrology, mineral, gem and meteorite collections all adding spectacular new samples and surviving the earthquake with, thankfully, less damage than could have happened!

Our research efforts have been particularly robust this year. This is in no small part due to the growth of an exciting cadre of postdoctoral fellows who are breathing new life and vitality into our Department. Infused into all areas of the Department and funded by a combination of Smithsonian, NASA grants, NMNH funds and the Buck Fellowship, we are approaching our historical highs in terms of postdoctoral fellows. We are also fortunate to now have two grant-funded Trust scientists working in our Department, fulfilling both our research and collections missions. Through their efforts, we’ve been able to undertake research from the deep interior of Earth to the surface of Mercury and to the outer reaches of the asteroid belt. Later on in this newsletter, you’ll read about some of our newest fellows. I look forward to welcoming many more – and having the admirable problem of worrying about where they will all fit – during the remainder of my time as Chair.

\- Tim McCoy

**Postite, a new mineral.**

The new mineral species, postite, was recently named in honor of our very own Jeff Post. Postite, is a rare vanadium-bearing mineral with the chemical formula, $\text{MgH}_2\text{O}_6\text{Al}_2(\text{OH})_2(\text{H}_2\text{O})_8(V_{10}\text{O}_{28})\cdot 13\text{H}_2\text{O}$. It was first discovered on sandstone blocks from the Vanadium Queen and the Blue Cap mines in San Juan County, Utah. Postite occurs as very thin needle-like golden-yellow, crystals up to 1 mm long and 50 µm in diameter. Crystals often occur in parallel bundles and grow in “jackstraw” masses.

Postite forms from the oxidation of the vanadium minerals montroseite and corvusite in a moist environment. **Photo by Joe Marty.**
Education & Outreach

Cara Santelli visits Cajun Country

In mid-November, Dr. Cara Santelli (Research Geologist, Mineral Sciences), Dr. Hans-Dieter Sues (Curator of Vertebrate Paleontology), Robert Costello (National Outreach Program Manager), and Wally Mertes (Program Coordinator for The Smithsonian Associates) travelled to Lafayette, Louisiana to conduct a workshop for middle school teachers in the Lafayette Parish School System (LPSS) on ‘Origins of Life’ and ‘Organisms and Energy.’ Dr. Scott Wing (Curator of Fossil Plants) and Dr. John Burns (Curator of Lepidoptera, retired) were video-conferenced into the workshop. In addition to discussing her research endeavors at NMNH, Cara gave three different classroom presentations about the earliest life forms, the basics of microbiology, and applied microbiology. Hands-on exercises included a soil microbiology lab and a strawberry DNA extraction lab. Hans presented on Earth’s geological history, the fossil record, and science, religion, and evolution. The teachers were given a variety of fossilized teeth from the collection to determine the functional morphology and diet of the animals.

The Lafayette Parish School System is a recipient of a ‘Magnet Schools Assistance Program’ grant from the U.S. Department of Education to create a competitive ‘Biomedical Academy’ in an existing middle school. The goal of the program is to support the development and implementation of magnet schools and capacity development through teacher training and other activities that will enable the continued operation of the magnet schools at a high performance level after funding ends. As part of the Biomedical Academy magnet program, The Smithsonian Associates, in partnership with other Smithsonian units, is designing and implementing six, three-day workshops for LPSS teachers over three years. Each workshop includes renowned scientists and educators affiliated with the Smithsonian Institution.

Rick Wunderman was quoted in a CNN report about a recent volcano eruption in the southern Red Sea. It began as a submarine event and quickly built an island. The CNN report can be viewed at http://news.blogs.cnn.com/2011/12/29/eruption-creates-new-island-in-red-sea/. GVP staff also fielded press inquiries on the submarine eruption of the El Hierro volcano in the Canary Islands which occurred in early November. If you haven’t seen this eruption, check out the youtube video at http://www.youtube.com/watch?v=gn7WSAZhLY.
**Andrew Beck** received his BA in Philosophy and a minor in Geology from Albion College in 2004. After a short stint as a technician in the Geology Department at Albion, Andrew entered the doctoral program at the University of Tennessee under the advisement of Dr. Hap McSween. His dissertation focused on HED meteorites, a large group of achondrites thought to originate from the largest differentiated body in the asteroid belt, asteroid 4Vesta. Andrew finished his dissertation in August of this year and at about the same time he accepted a postdoctoral fellowship working with Tim McCoy at the Smithsonian. Andrew and Tim work closely with the Dawn mission, a NASA spacecraft which began orbiting asteroid 4Vesta earlier this year. They assist the team both in data interpretations and by utilizing the Smithsonian’s large collection of HED meteorites as laboratory analogs.

**Dominique Chaput** has begun a 2-year post-doc with Cara Santelli. After obtaining her BSc in Biochemistry from Mount Allison University, Dom moved to England to pursue a MSc in Environmental Change and a PhD in Microbial Ecology at the University of Oxford. Her doctoral work examined the structure and function of microbial communities living on exposed granite bedrock in Arctic Norway. While at the Smithsonian, she will be characterizing the microbial communities found in coal mine drainage treatment beds, with the aim of determining how community interactions modulate the efficiency of Mn(II) oxidation.

**Brent Grocholski** studies the properties of Earth materials experimentally under extreme pressures and temperatures to simulate the conditions of planetary interiors. Brent received his B.S. in physics at the University of Minnesota, completed his doctorate in Earth and Planetary Sciences at UC Berkeley, and has recently finished a post-doctoral position at the Massachusetts Institute of Technology. Brent is currently a Peter Buck fellow working with Liz Cottrell and will be measuring the effect of water on lower mantle minerals to understand how the whole mantle participates in the global water cycle.
In late September, 2011, Cara Santelli (Research Geologist & Curator) travelled deep into the Blue Ridge Mountains of western North Carolina and eastern Tennessee to study the geomicrobiology of caves. This research is in collaboration with Dr. Sarah Carmichael (a geology professor also a Research Collaborator in the Department of Mineral Sciences) and Dr. Suzanna Brauer (professor of microbiology) at Appalachian State University where Cara is now an adjunct Research Faculty member.

The overarching goal of this research is to assess anthropogenic impacts on microbial communities and biomineralization processes in caves. Cara’s research group is particularly interested in the role that bacteria and fungi play in the formation of Mn oxide minerals in these caves – contamination can alter natural microbial communities and thus impact the biogeochemical cycling of Mn in these environments.

The team of scientists and numerous students went spelunking in eastern Tennessee and sampled a pristine, uncontaminated cave (e.g., Daniel Boone Cavern where the photos are taken) as well as cave greatly impacted by agricultural runoff and sewage release. Samples for a variety of microbiological, molecular biological, geochemical, and mineralogical analyses were collected. Stay tuned for results!
One of the museum’s newest temporary exhibit, The Evolving Universe, opened to the public on October 21, 2011. The exhibit, located on the second floor of the museum behind the Gem Store, is highlighted by specimens from the Museum’s meteorite collection and full-color photographs that capture the beauty of the cosmos. Through these images, sent back from high-powered terrestrial and orbiting telescopes, visitors will journey through time and space to learn how Smithsonian researchers study the evolution of the universe. The exhibit is a collaborative project of the National Museum of Natural History (NMNH) and the Smithsonian Astrophysical Observatory at Harvard University (SAO). With guidance by NMNH geologist Glenn Macpherson and SAO physicists Jonathan McDowell and Scott Kenyon, this exhibit explores how the stars, galaxies and universe undergo the same stages as life on Earth: from birth, to maturity and, eventually, to death. Throughout the exhibit’s run (until July 7, 2013), staff will participate in “Meet the Scientist” programs, coordinated through the Office of Education and Outreach.
The Stardust case which is normally located near the entrance of the Meteorite Gallery of the Janet Annenberg Hooker Hall of Geology, Gems and Minerals, is temporarily being displayed in the new Evolving Universe exhibit. The stardust actually consists of microscopic grains of diamonds that were extracted from the Allende meteorite, which fell to earth near Chihuahua, Mexico in 1969. The Allende meteorite came from the Asteroid belt between Mars and Jupiter, some 17.5-27.5 light-minutes away from Earth. The interstellar diamonds were formed during an explosion in a dying star and were later mixed into the cloud that gave birth to our Solar System 4.6 billion years ago.

Awards & Grants

❖ At the Mineralogical Society of the District of Columbia’s annual Christmas party held on December 7th, Museum Specialist Cathleen Brown accepted a $1000.00 check donated by the club to the Department of Mineralogy. The money will be used by the Division of Petrology, Rock and Ore collection to fund several projects throughout the year.

❖ Paul Pohwat was honored for 30 years of service to the Smithsonian at the 2011 Career Service Awards Ceremony held in Baird Auditorium on December 13, 2011.

❖ Congratulations to Nicole Lunning whose stellar work on the Department’s meteorite collection earned her one of the 2011 NMNH Peer Recognition Awards.

Nicole Lunning receives her NMNH Peer Recognition Award from Tracy Cones and Museum Director Cristián Samper. Photo by Michael Wise.
During the last quarter, Science Direct has ranked a paper by Sorena Sorensen and Liz Catlos as #16 on their “hottest paper list” for the Journal of Structural Geology. The paper heavily relies on Cathodoluminescence (CL) and Scanning Electron Microscopy (SEM) data of granites. It’s a new approach to evaluating subtle effects of deformation versus wholesale mylonitization. Images were collected by Liz and her students here in DMS with Sorena’s guidance and assistance in interpreting the microstructures. The citation for the paper is Catlos, E.J., Baker, C.B., Sorensen, S.S., Jacob, L., and Cemen, I. (2011) Linking microcracks and mineral zoning of detachment exhumed granites to their tectonomagmatic history: evidence from the Salihli and Turgutlu plutons in Western Turkey (Menderes Massif). Journal of Structural Geology 33, 951-969.


Meetings & Abstracts

**AGU Fall Meeting**
*(San Francisco, CA)*

A different view of Kilauea’s Past 2500 years *(Invited).* Donald Swanson, **Timothy R. Rose,** Adonara E. Mucek, Michael O. Garcia, **Richard S. Fiske** & Larry G. Mastin

Controls on banded pumice and enclave formation during magma mixing. **Benjamin J. Andrews** & Michael Manga

Diatreme-like eruption at Kilauea: the Kulanaokuaiki-3 Tephra (~900 CE). **Richard S. Fiske, Timothy R. Rose** & Donald Swanson

Digital management and curation of the National Rock and Ore Collections at NMNH, Smithsonian *(Invited).* **Elizabeth Cottrell,** **Benjamin Andrews,** Sorena S. Sorensen & Leslie J. Hale

Dynamics of pyroclastic density currents studied using scaled laboratory experiments *(Invited).* Michael Manga & **Benjamin Andrews**

Electrical and thermal conductivity of iron and iron-silicon alloy at high pressures *(Invited).* **Christopher T. Seagle,** Elizabeth Cottrell, Yingwei Fei, Daniel R. Hummer & Vitali Prakapenka


High-MgO vitric ash in Upper Kulanaokuaiki tephra, Kilauea volcano, Hawai‘i: a preliminary description. **Timothy R. Rose,** **Richard S. Fiske** & Donald Swanson

How were oxidation state heterogeneities formed in the Martian interior? Marie E. Schmidt, Christian M. Schrader & **Timothy J. McCoy**

Importance of oxygen fugacity for temperatures and melting regimes beneath ridges, arcs, and hot spots *(Invited).* Katherine A. Kelley & **Elizabeth Cottrell**


Physical and chemical processing of eclogite: protolith and pre-subduction inheritance versus subduction-related deformation and alteration of oceanic crust. Fraukje M. Brouwer, Sorena S. Sorensen & Pascal Philippot

Quantitative textural analysis of phenocryst zoning patterns. Elizabeth Niespolo & **Benjamin J. Andrews**

Reaction rind formation in mélangé in the Catalina Schist, California. Sarah C. Penniston-Dorland, Gray E. Bebout, Sorena S. Sorensen, Philip M. Piccoli & Richard J. Walker

The magmatic evolution of the Kulanaokuaiki-3 Tephra at Kilauea: parallels to Hawaiian lava lakes. **Stephen J. Lynton,** **Timothy R. Rose** & **Richard S. Fiske**

Thermal equation of state of Fe(III) and Al-bearing magnesium silicate perovskite. Daniel R. Hummer, Yingwei Fei & **Christopher T. Seagle**

**Tim McCoy** was an invited speaker at the 50th anniversary celebration for the Center for Meteorite Studies at Arizona State University in Tempe. Tim’s first talk was “The future of meteoritics: Where will we be in 2061?” Designed to look ahead 50 years, the talk centered on a top 10 list of major innovations in the field, ranging from the recovery of newly-fallen meteorites using satellite technology to the landing of humans on an asteroid to subatomic particles becoming the new frontier of meteorite studies, replacing the focus on elements and isotopes that have dominated the past 50 years. He also presented a public lecture on the results from the Dawn mission to asteroid 4Vesta, on which he is a participating scientist.
New Acquisitions

Smithsonian Gemstone Collectors Group Gift to NMNH

In 2010, the Smithsonian Institution’s National Museum of Natural History founded the Smithsonian Gemstone Collectors Group (SGC). This informal advisory group will financially support the acquisition of major gemstones, gem-quality crystals and minerals for the National Gem and Mineral Collection. Funds contributed by the group will also be used to fund selected projects of the Department of Mineral Sciences. The philanthropic support of the group’s members will insure the continued growth of the National Gem and Mineral Collections.

On October 18, 2011, the SGC donated a spectacular demantoid gemstone to NMNH. Demantoid is the green gem variety of the mineral andradite (a member of the garnet group). Demantoid is arguably the rarest and most valuable garnet gem and gets its green color from the substitution of chromium for iron in the garnet crystal structure. Demantoid was first discovered in Russia’s Ural Mountains in 1851 and was used by the finest jewelers, often seen in Carl Fabergé’s jewelry and precious objects made for the Czars. Demantoid has been found in Italy, Iran, and more recently Namibia, but the Russian material continues to be the standard by which the gem is judged. Gems larger than a few carats are extremely rare.

The Museum’s newly acquired demantoid was recently discovered in the central Ural Mountains, near Ekaterinburg, Russia. The beautiful cushion-cut gemstone weighs in at 11.24 carats and displays the very rare and highly prized intense emerald green color. This new addition to the collection is one of the largest and finest demantoids in existence.

Morganite, or pink beryl, gets its delicate hue from trace quantities of manganese incorporated into the crystal structure of the mineral beryl. Morganite ranges in color from pink or rose to peach to light violet. This magnificent 448.64 carats gem from Minas Gerais, Brazil was a recent gift from Tricia and Michael Berns (members of the Smithsonian Gemstone Collectors) and is the finest and largest morganite in the National Gem Collection to date. Photo by Ken Larsen.

New acquisitions to the Petrology Collection include 9 boxes of xenoliths from Salt Lake Crater, Oahu, Hawaii and a specimen of silicified serpentinite (Liskavite) from Liska River, Siberia, Russia.