Astromaterials Research and Exploration Science Directorate

Newsletter – August 20, 2009

The ARES Newsletter is a snapshot of current events within the Directorate. Each newsletter highlights a small sample of the remarkable breadth and variety of the research activity and facilities in ARES and the people who do the work.

> You have a story to tell, we want to hear it. Send your Newsletter inputs, images and comments to Greg Byrne.

What's New

The Phoenix Mars Lander launched two years ago, touched down on Mars in May '08, and operated successfully for more than 5 months before succumbing to the approaching darkness of the Martian winter. Now, the first peer-reviewed publications of the scientific results from Phoenix have appeared in the July 3rd issue of *Science*. Co-authors on three of the papers include ARES members of the Phoenix science team, **Doug Ming, Dick Morris, Paul Niles,** and **Brad Sutter**. Together, the papers tell a compelling scientific story for the possibility of liquid water on Mars.

First, Phoenix confirmed the presence of layers of water ice on Mars, uncovered by the lander's robotic arm at a depth of only a few centimeters below loose surface soils. Secondly, evidence of past liquid water on Mars, or that the present ice sometimes melts, comes from the lander's finding of calcium carbonate in the Martian soil – carbonates are generally products of liquid water processes. And finally, with the lander's unique onboard wet chemistry lab, the salty chemical perchlorate was detected in the soil in relatively high concentrations. This is an intriguing discovery because, even in the extreme cold of Mars, the perchlorate could lower the melting point of the water ice to temperatures commonly found on summer days at the Phoenix landing site. So, it all fits – with an affinity for water like a sponge, the perchlorate could at times turn the ice into a briny liquid solution which, by the way, could also provide a nice habitat for little Martian critters. The critters, however, have yet to be found.

The ARES **Orbital Debris Program Office** (ODPO) is internationally known for its world-class modeling of the Earth's orbital debris environment. When the rare opportunity arises to cross-check their models with actual data collected in situ, the staff of the ODPO jumps on it. And so it is with the return to Earth of a piece of the Hubble Space Telescope, the Wide Field Planetary Camera 2 (WFPC2) retrieved by the STS-125 astronauts during the latest Hubble Servicing Mission. Since WFPC2's deployment on Hubble in 1993, its outer radiator surface endured a peppering of impacts by micrometeoroids and orbital debris (MMOD). Now safely

back home at Goddard, the WFPC2 radiator serves as a unique witness plate for the MMOD environment over the past 16 years.

In a joint effort between the **ODPO**, the **Hypervelocity Impact Technology** group, and Curation's **Space Exposed Hardware Lab**, an ARES team (**Phillip Anz-Meador, Bill Davidson, Troy Hedman, Jason Herrin, Jim Hyde, J.-C. Liou, Karen McNamara,** and **John Opiela)** travelled to Goddard for an initial inspection of the radiator. A low-resolution survey of the radiator surface using a laser scanner was completed, as were detailed measurements of about 250 impact craters using an advanced digital microscope. Using tape pulls, impact residues from the 50 largest craters were collected to determine the types of impactors. The team will return to Goddard for more measurements of the impact craters, incredibly expected to number over 1000.

The ARES **Earth Observations Group** has made the news again, this time by providing an outstanding set of images of the Sarychev Volcano eruption in Russia as viewed by the ISS Expedition 20 crew. The orbit of the ISS fortuitously took it directly over the picturesque eruption in its early stages, prompting the attention of volcanologists and the media around the world. Some of the Sarychev images and other recent images from the ISS were featured by the Boston Globe in its "Big Picture" feature online:
http://www.boston.com/bigpicture/2009/06/recent_scenes_from_the_iss.html
Note some of the eruption phenomena – the main plume of brown ash with pileus clouds formed on top and a pyroclastic flow down the side of the volcano. The eruption also appears to have cleared out a circle in the overhead stratus cloud deck. Also worth checking out is a very cool little movie put together by the GSFC:
http://earthobservatory.nasa.gov/images/imagerecords/38000/38985/sarychev_oblique_final_H264.mov

Astromaterials research often deals with extremes; the very old, the very small, the very rare… Units with giga- or nano- prefixes are typical. For the ARES **Experimental Petrology Laboratory**, the realm of extreme is in high pressures and temperatures. With multi-anvil presses that can achieve pressures of up to 25 GPa, the lab recreates the conditions found deep within terrestrial-sized planets to study planetary interior formation and evolution. For you non-petrologists, or "surface dwellers" as **Lisa Danielson** puts it, 25 GPa is equivalent to the pressure at several hundred km below the Earth's surface and much deeper than that for Mars.

Working together, Lisa and **Kevin Righter** also at times use the facilities at Argonne National Lab for their research. They recently traveled there to conduct high pressure melting experiments of chondritic and terrestrial planet mantle materials using presses similar to those in their ARES lab. But the experiments at Argonne make use of the high energy X-rays generated by the Advanced Photon Source facility, a synchrotron which boasts *"the brightest x-ray beams in the Western Hemisphere."* The resulting X-ray diffraction patterns from their samples are the first attempt "to increase both the accuracy and precision of determining the silicate high pressure phase diagram for terrestrial planet mantle." Ask Lisa or Kevin what that means.

Comings and Goings

Trevor Graff has returned from active duty with the United States Army this month. Captain Graff was deployed to Iraq a little over a year ago and has safely returned to pick up his work in ARES. Trevor will be working on mineralogy instrument development for the Mars Science Lab mission and on-going Mars research. We're proud of Trevor's service to our country and glad to have him back.

Angela Green-Garcia joins ARES Curation as the new lunar sample processor. She holds an MS in Geology from LSU, and before accepting her position here Angela was an Adjunct Geology Professor at the University of Houston-Downtown teaching Physical and Historical Geology. She's no stranger to ARES – she has previously collaborated with our education team in developing and coordinating ARES outreach activities.

Congratulations are in Order

The **Image Science and Analysis Group** was recognized for their role in the success of the STS-127 mission. The group is a major contributor to the Shuttle's Imagery and Debris Analysis Team, cited with a team award for *"outstanding imagery and debris analysis of the STS-127 external tank which resulted in a safe return of the STS-127 Crew and Endeavour*."

Dick Morris was officially invited to join the faculty of Washington University as an Adjunct Professor of Earth and Planetary Sciences. More than simply an honorary position, Dick's appointment will facilitate his ARES research through interactions with other staff within Wash U's outstanding research program in the planetary sciences.

And now for something completely different… After 9 years of training, **Merrell Skipper** has certified as a Federally Permitted Wildlife Rehabilitator, which grants her the authority to care for any wild creature, injured or orphaned, except for endangered species and eagles. Merrell is also one of the local JSC wildlife reps; it's not unusual to find some kind of baby rodent in her office. She has just finished caring for three baby screech owls, now released back into the wild. Merrell, we thank you for your service to our furred and feathered friends.

Out and About

You may have noticed that the 40th anniversary of Apollo 11 was the subject of much media attention. As the caretakers of the Apollo Moon rocks, ARES staff naturally participated in a number of the media events. Here are a few:

Gary Lofgren, Andrea Mosie, and **Linda Watts** did live TV interviews from inside the Lunar Lab describing the Apollo rock collection and its importance. The planning and setup for these interviews was complex, and according to our Public Affairs rep, "the *client list for the day constitutes one of the largest audiences I have ever seen us reach in a day of live satellite interviews.*" Check out one of the interviews at: http://www.foxnews.com/search-results/m/24118747/lunar-look.htm

Gary also coordinated the loan of one of the Apollo 11 Moon rocks for a ride back into space! The little rock traveled up to the ISS on the Shuttle mission STS-119 in time for an Apollo 11 anniversary celebration onboard the ISS. Here's one link to this interesting story: http://www.collectspace.com/news/news-072009a.html

The Australian Science Centers celebrated the 40th anniversary of Apollo 11 with a special televised program for secondary level students, broadcast throughout Australia. **Everett Gibson** participated in the video celebrations along with Professor Ross Taylor who performed the very first analyst on the returned Apollo 11 samples in the Lunar Receiving Laboratory.

Even the magazine *GQ* got into the act with an entertaining feature article titled *The Next Giant Leap* that included **Carl Allen**. The quote of the month belongs to Carl – while giving the *GQ* author a tour of the ARES Curation facilities, Carl handed him a meteorite that was 4.5 billion years old, saying, "*That is the oldest thing you will ever touch*."