Astromaterials Research and Exploration Science Directorate

Newsletter – January 15, 2009

As we start the new year, the 5th year of ARES as its own Directorate, we also kick-off the ARES Newsletter, a monthly 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.

Send your Newsletter inputs, images and comments to Greg Byrne

Breaking News

On January 9th, the lead center for NASA's Lunar Science Institute (NLSI at Ames Research Center) announced that a joint Lunar Planetary Institute-JSC ARES team was selected as one of the seven initial teams to comprise the NLSI. Our winning proposal, "Impact Processes in the Origin and Evolution of the Moon: New Sample-driven Perspectives," was one of seven selected out of 33 submitted from across the country. Several ARES researchers are team members. The proposal's science theme is driven by the highest-priority science concept (the bombardment history of the inner solar system as revealed on the Moon) and highest-priority goal (to test the lunar cataclysm hypothesis) as identified by the NRC in 2007. This research will center on the Apollo sample collection, which provides the highest-fidelity view of the lunar surface.

Our NLSI research will also help revitalize the lunar community's interest in and expertise with the Apollo collection. It will create a pipeline of young talent, mentored by our resident depth of Apollo expertise, to support a growing lunar science and exploration program. Through our strong ties to the Constellation Program, we will pass along the science lessons learned and provide leadership in requirements development and review, enhancing the integration of science and exploration within Constellation.

Congratulations to the ARES NLSI team members on this important selection.

In the Labs

Mark Cintala is a co-investigator on another selected NLSI proposal, "Colorado Center for Lunar Dust and Atmospheric Studies" led by the University of Colorado. As part of that proposal, Mark and **Frank Cardenas** are gearing up the **Experimental Impact Facility**, the "Gun Lab", for some experiments to help characterize the lunar dust environment by impacting lunar surface simulants with hypervelocity particles and analyzing the fine grain dust that is generated and mobilized. The dust is electrically charged, creating a sort of dusty plasma environment near the surface. These experiments are some of the most challenging for the Gun Lab to date, with lower pressures and more sensitive instrumentation needed to record the weak electromagnetic signatures than in past experiments. Mark has graciously invited an ARES manager to christen the experiment by firing the first shot, and the manager hopes to not misfire.

John Jones with **Loan Le, Lisa Danielson,** and **Elicia Hay are** attempting to cook up something for the first time in a laboratory setting; Tetrataenite, an iron-nickel mineral commonly found within iron meteorites. Their metallic mixture has been baking in a kiln at 350°C in the **Experimental Petrology Lab** since July in a study of Tetrataenite's formation in nature. If **Transmission Electron Microscope** (TEM) analysis of the sample reveals any trace of this cosmic mineral, it is guaranteed top billing in a future newsletter. The experiment will benefit from the installation of **Lindsay Keller's** new **Focused Ion Beam (FIB) lab**, which should be up and running in the near future; the FIB instrument is used to prepare the ultra-thin samples needed for the TEM analysis.

In case you missed it, not only are ARES researchers attempting to recreate meteoritic minerals in the lab, they are also discovering previously unknown cosmic minerals in nature. **Keiko Nakamura-Messenger** and **Scott Messenger** were recently honored with Space Flight Awareness awards for their leading roles in the discovery of a new mineral, hence named Brownleeite. Through **Transmission Electron Microscope** analysis, microscopic grains of the mineral were found within an interplanetary dust particle, most likely originated from a comet and captured by an ER-2 aircraft in the stratosphere.

Influencing the decision makers on the development of the Orion spacecraft is a pretty big deal, and that's exactly what members of the **Image Science and Analysis Laboratory** (ISAL) are doing. Led by test coordinators **Tracy Calhoun** and **Mario Runco**, the ISAL is performing a series of lab tests on the optical qualities of proposed materials for the Orion spacecraft windows. Initial test results by lead analyst **David Bretz** show that polycarbonate (Lexan) pressure panes are not suitable for photography using long focal length lenses. Based upon the ISAL findings and Dave's recommendations, Orion Project managers have eliminated Lexan as a candidate window material. The tests continue for other proposed materials.

The case for extensive liquid water once upon a time on Mars was made stronger with the research publication "A Case for Ancient Springs in Arabia Terra, Mars", by **Carl Allen** and **Dorothy Oehler** in the journal *Astrobiology*. Based on high resolution imagery from the Mars Reconnaissance Orbiter (MRO) along with interpretations from terrestrial analogs, the research indicates that several structures observed in Vernal Crater are relic springs several kilometers in scale. Given the Agency's "follow the water" theme for Mars exploration, features of the sort identified in this paper may be strong candidates for future landing sites.

Collaborating on the research was the ISAL's **Orrin Thomas,** who used photogrammetric analysis of MRO image stereo pairs to provide 3-D views and 3-D measurements of the topography of the structures. Orrin also used MOLA data to define control points in the stereo models for accurate scaling.

During the STS-126 mission, one of Shuttle Endeavour's cockpit windows was impacted by a relatively large micrometeoroid or piece of orbital debris. MM/OD impacts to the Orbiters are a common occurrence; an average of four windows need replacing after each mission due to impact damage. However, the STS-126 impact resulted in the largest Shuttle window impact crater on record, measuring over 1 cm in diameter. **Dana Lear** of the **Hypervelocity Impact Technology Facility** (HITF) has led the effort to assess the damage and to characterize the impactor. The HITF's **Jim Hyde** inspected the window post-mission at KSC along with **Jason**

Herrin to take damage measurements, digital microscope photos, and dental-mold impressions of the damage. In addition to providing crater topography, the dental molds also frequently retain impactor residue.

As another example of collaboration between the ARES labs, Jason and **Georg-Ann Robinson** are analyzing the dental mold for impactor residue using a **Scanning Electron Microscope** and **Raman Spectroscopy** to attempt to determine if the impactor was a micro-meteoroid or an orbital debris particle.

Out and About

Former ARES Director, **Steve Hawley**, is teaching a class at Kansas University this spring semester entitled, "The Quest for Extraterrestrial Life". Steve has invited our own **Everett Gibson** for a guest lecture on ALH 84001, the meteorite made famous in 1996 by the announcement that it contained evidence for fossilized Martian bacteria. Everett was on that research team. Steve also reports that he enjoys teaching at KU, but laments that his beloved Jayhawks, normally basketball powerhouses, will be lucky to even make the March Madness tournament this year.

David "Duck" Mittlefehldt is still in Antarctica "on the ice" for another week or so as part of the 2008-09 Antarctic Search for Meteorites (ANSMET) team. Through the ANSMET blog, Duck reports that while the search team's efforts have been hampered by high winds and cold temperatures (it is Antarctica, after all), with any luck they will break the 500 meteorite barrier for the season. That's quite a haul that will add to the ANSMET total from the past 30 years of more than 16,000 meteorites. All of the collected specimens will be transported back to JSC for processing in the ARES **Meteorite Curation Facility**.

The dedication of Duck and the ANSMET team to their frigid task is summed up in their haiku from the ice:

Cold little space rock
Hiding among the Earth rocks
We'll get you sucka!

In the arena of "exploration science" it doesn't get much better than this: **Gary Lofgren** and **Fred Hörz** are on the team field testing JSC's Small Pressurized Rover (SPR), a concept for the new generation of rover for lunar exploration. The SPR is also the same NASA rover that will be in the upcoming presidential inaugural parade. Gary and Fred recently took part in SPR exercises out in the Arizona desert, planning the science objectives and logistics of the rover traverses and astronaut EVAs. The exercises are intended to maximize the scientific gain for future lunar exploration traverses, reduce risk, and sharpen the skills and interactions of astronauts and the ground science teams.

Talk about legacy - Gary and Fred were involved in exactly the same type of science planning and astronaut field tests for the Apollo lunar EVAs.

The strength of ARES Education Outreach was on display recently in Brownsville, Texas. **Jackie Allen, Paige Graff, Charlie Galindo** and **Carl Allen** took part in the 6th annual NASA Space Day, reaching out to over 700 students and educators from the Rio Grande Valley area. According to the Brownsville Herald, "The daylong series of imaginative science activities has become one of the most treasured educational events in the region". The best customer feedback on the outreach value of this event came from a 5th grader who simply stated "After this, I want to be a scientist". Mission Accomplished.

Comings and Goings

Welcome to **Tracy Calhoun** as an ARES employee. She had been on a year-long rotation to KX from the Mission Operations Directorate. She apparently likes us; her permanent reassignment as the lead for the Image Science and Analysis Lab was complete as of the end of November.

We wish **Alexis Davis** well as she starts her rotation to the LI/Institutional Resources Management Office. Alexis will initially train under the expert tutelage of **Kate Suratt** on all things financial within ARES.

Welcome back to ARES for **Cindy Evans**. Her rotation from KX to the ISS Program Payloads Office ended recently. There's no place like home, especially after a year in the Land of ISS. Cindy rejoins ARES in KT.

We wish **Lisa Fletcher** well in her new position as a Branch Chief with the JA/Center Operations Directorate. Lisa has been on the cutting edge of facilities development within ARES for several years, so her expertise and energy will be tough to replace. Fortunately for us, her knowledge of ARES facilities will continue to be put to good use – her areas of responsibilities for JA include Building 31.

Congratulations are in Order

We congratulate the following winners of the 2008 Annual ESCG awards:

Outstanding Mentor Award - **Donn Liddle**, Image Science and Analysis
Continuous Task Improvement Award - **Kevin Crosby**, Image Science and Analysis
President's Award (Barrios) - **David Bretz**, Image Science and Analysis
President's Award (Geo Control Systems) - **Melissa Rodriguez**, Genesis Curation Laboratory
President's Award (Hamilton Sundstrand) - **Eleanor Cizek**, Orbital Debris Program

Considering that the ARES ESCG workforce makes up less than 10 percent of the total ESCG pool considered for these awards, 50 percent of the President's Awards going to ARES personnel isn't too shabby. Nice work everyone.

From the Archives

There aren't many people who have had their full names broadcast from the Moon (trivia question - anybody know how many?). But there is someone right here in ARES whose name was spoken twice, by two different moonwalkers!

During an Apollo 16 EVA, while collecting a particularly interesting-looking lunar sample Charlie Duke remarked, "It looks like all those shocked rocks that **Fred Hörz** was telling us about". Later in the EVA, John Young described another specimen saying, "It's got a spectacular little zap pit in it. It's lined and it's all silvery and glassy. **Fred Hörz** will appreciate this rock." Very cool.

Find Fred. The others are Ed Mitchell, John Young, and Charles Duke, 1971.