ARES

Astromaterials Research and Exploration Science Directorate

Newsletter – December 2010

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.
Send your Newsletter inputs and feedback to Greg Byrne.

In the News

Carbon Dioxide Study Reveals Martian Surprises

Although the Mars Phoenix mission operations officially ended earlier this year, the success stories and surprises from analyses of the lander's data keep on coming. An example are the results of the paper "Stable Isotope Measurements of Martian Atmospheric CO_2 at the Phoenix Landing Site," published in the September 10, 2010 issue of *Science* by **Paul Niles** as first author and **Doug Ming** as co-author, both members of the Phoenix Science Team. The paper describes the findings from the most precise measurements ever taken of carbon dioxide in the Martian atmosphere, recorded by Phoenix's Thermal and Evolved Gas Analyzer (TEGA) instrument.

The results gleaned from the TEGA data indicate that Mars has been geologically active and that liquid water has been present within its relatively recent past. How was this gleaned? Well, the key is actually in TEGA's measurements of the ratios of stable isotopes of carbon and oxygen in the CO_2. In Paul's words, *"Isotopes can be used as a chemical signature that can tell us where something came from, and what kinds of events it has experienced."* Furthermore, *"Atmospheric carbon dioxide is like a chemical spy. It infiltrates every part of the surface of Mars and can indicate the presence of water and its history."* The carbon and oxygen isotopic signatures in the TEGA data were found to be surprisingly similar to those on Earth, indicating Earth-like processes – that Mars has replenished its atmospheric CO_2 relatively recently through geologic activity, and that liquid water has been present to react with the CO_2.

The Martian CO_2 study by Niles et al. *"may be the most profound result to come out of the Phoenix mission"* – Bruce Jakosky, University of Colorado.

Thin Films of Liquid Water on Mars

And there's more from our Phoenix Science Team members – Following up on their publication in *Science* last July on the discovery of high concentrations of perchlorate salts in Martian soil, the paper "Concentrated perchlorate at the Mars Phoenix landing site: Evidence for thin film liquid water on Mars" was published in the November 20, 2010 issue of *Geophysical*

Research Letters, with coauthors **Dick Morris** and **Doug Ming**. The paper reports that thin films of liquid water appear to be responsible for depositing the perchlorate onto small patches of subsurface soil uncovered by the Phoenix lander. A commentary on the paper was published as "News of the Week" in *Science* (http://www.sciencemag.org/content/330/6004/571.1.full

Asteroid Itokawa Samples Coming to ARES

For the first time since the return of the Stardust mission in 2006, a new extraterrestrial sample collection will be coming to ARES, thanks to the success of the Japan Aerospace Exploration Agency's (JAXA) Hayabusa mission. Hayabusa, the first spacecraft to make physical contact with an asteroid and return to Earth, collected samples from the surface of the asteroid Itokawa and landed safely back on Earth in June 2010. With assistance from Hayabusa Science Team member **Mike Zolensky**, a preliminary analysis of the samples in Japan has begun, following the basic protocols developed by ARES most recently for the Genesis and Stardust mission samples and previously for the Apollo lunar samples.

Mike Z (second from right) and JAXA colleagues examine Itokawa samples via Scanning Electron Microscope in JAXA's Hayabusa Curation Lab.

With a recent announcement by JAXA, the analysis has confirmed that the collected Hayabusa samples, estimated at more than 10,000 dust-sized particles, are indeed from Itokawa. ARES will receive 10 percent of the Itokawa samples and is responsible for their curation and distribution to investigators for detailed analyses. Mike will be the ARES Curator for the Hayabusa collection and **Scott Messenger** will serve as Chairperson for the Hayabusa Sample Subcommittee of the Curation and Analysis Planning Team for Extraterrestrial Materials.

Who Knew? Cratons Are Dry

Despite the fact that the Earth's crust has been constantly recycled into the planet's interior by plate tectonic dynamics, we still find crustal rocks that are over four billion years old, almost as old as the Earth itself. How have these ancient rocks survived? The research of **Anne Peslier** and colleagues may have found the answer, as published in the paper "Olivine water contents in the continental lithosphere and the longevity of cratons," in the September 2, 2010 issue of *Nature*, with Anne as first author.

The key to survival for the ancient crust may be simply that it is dry; the rock is virtually void

> *"Our results provide a solution to a puzzling mystery of plate tectonics, namely why the oldest continents have resisted recycling into the interior of our tectonically dynamic planet"* – Anne Peslier

of water. Specifically, Anne and her colleagues investigated specimens of olivine, the most abundant mineral in the Earth's mantle, which originated from the bases of cratons. Cratons are the ancient cores of the continents where the oldest rocks on Earth are found. Unlike your ordinary hydrated olivine that is softened by the presence of water in its crystal structure, Anne, et al., found that the olivine from the bases of cratons are really, really dry, and consequently hard, strong, and resistant to change. This may explain the longevity of the cratons. Science Daily has a nice layman's description of this great research – http://www.sciencedaily.com/releases/2010/09/100902131742.htm

Dawn Picks Duck

David "Duck" Mittlefehldt has been selected as a Participating Scientist on NASA's Dawn mission to the asteroid Vesta, the second largest body in the main asteroid belt between Mars and Jupiter. The Dawn spacecraft launched in September 2007 and is scheduled to rendezvous with Vesta in July 2011, where it will circle in close proximity for about a year, mapping and measuring Vesta in great detail. The spacecraft will then head for Ceres, a dwarf planet and the largest body in the asteroid belt, arriving in 2015. Duck has joined the Gamma-Ray and Neutron Detector (GRaND) instrument team, which will be mapping the composition of the surface of Vesta. He is also on working groups that are responsible for producing geological and mineralogical maps of its surface.

Vesta is thought to be the parent asteroid of a large suite of basaltic achondrite meteorites that have been recovered from all over the Earth. The ARES **Meteorite Curation Facility** houses a couple hundred of those meteorites collected from Antarctica. **Kevin Righter** is compiling detailed summaries of the recovery, condition, and analysis results for some of the more influential of the Vesta meteorites; an important and timely reference for the Dawn investigators.

Spotlights on Andrea

Andrea Mosie was one of only a handful of JSC members selected to participate in the City of Houston's 174th birthday celebration, during which the NASA workforce was honored by the City with the *Spirit of Houston Award* for 2010. The award honors Houstonians who have motivated their fellow citizens with their everyday acts of leadership. The people of JSC were cited for their "iconic contributions" throughout the history of NASA and for their "reach beyond the boundaries of the Johnson Space Center campus that makes Houston a better community at large." There was no better choice to represent JSC for this honor than Andrea.

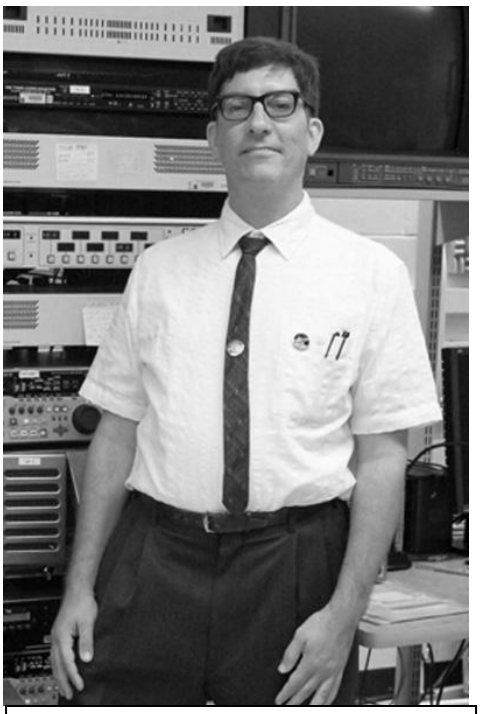
Andrea has also been recently featured in the *Time* photo gallery "The Labor of Space Exploration." She was photographed inside her domain, the Lunar Sample Laboratory Facility. See more at: http://www.time.com/time/photogallery/0,29307,2014843,00.html#ixzz15U7JQvNG

ARES Goes Hollywood

*by **Tracy Calhoun**, local Hollywood-Beat reporter*

When you take in the movie *Transformers: Dark Side of the Moon* next summer be sure to keep a lookout on the big screen for actors you might know. No, not Shia LaBeouf or John Malkovich. But you might feel like one of the Apollo flight controllers looks a little like **Kevin Beaulieu**…but with a retro haircut? And that intimidating SWAT guy may remind you of **Marco Lozano**. You are not imagining things; Kevin and Marco along with **Rob Scharf** and **David Bretz,** all of the **Image Science and Analysis Lab** responded to a call for extras when the Transformers filmed at JSC. Kevin and Marco were lucky enough to make it onto film. Rob and David were also put through wardrobe, makeup and hair, but didn't make it into a scene.

Rob reflected on the behind-the-scenes process, "*It was a lot of hurry up and wait. Reminded me of my military days."* When people compliment his haircut, Rob says it's courtesy of Paramount Pictures. "*Besides five folks cutting the extra's hair, there were two makeup chairs and one guy focused on sideburns.*" Rob and David suited up and stood by during filming in the historic Apollo flight control room, and they rooted for their coworker, Kevin, who portrayed an Apollo-era flight controller. Due to a non-disclosure agreement and his consummate professionalism as an actor, Kevin is unable to give additional details. However, he can share that the opportunity to watch director Michael Bay (*Armageddon, The Rock, Pearl Harbor*) in action was a treat.



David Bretz, looking every bit the 60's engineer part.

Across the site at the large Building 32 vacuum chamber, Marco made his film debut as a member of a SWAT team. Due to non-disclosure legalities, we'll have to wait for the movie to see how a modern day SWAT team fits the 1960's setting of the movie. Time travel? Flashbacks?

David stayed in character coming into work on Monday in vintage clothing, providing Greg Byrne a bit of a childhood flashback, *"Holy cow, he looks like my Dad from his Apollo engineer days!*" and confirming that the movie got it right. So, should one of your ARES projects involve video production, keep ISAL acting services in mind to add that special, realistic touch.

Congratulations are in Order

More President's Awards

At the annual ESCG awards/holiday banquet, each of the seven teammate companies of ESCG presented a "President's Award" to their most outstanding employee for 2010. Our ARES folks did very well again this year – we won four of the seven awards! This is out of about 1800 employees from all of ESCG. And the winners are: **Tom Prior** – President's Award

from Hamilton, **Jim Hyde** – President's Award from Barrios, **Andrea Mosie** – President's Award from GeoControls, and **Simon Clemett** – President's Award from ERC. In addition, **Anne Peslier** won first place for outstanding science or technical paper for her Nature article on cratons and **Charlie Galindo** won second place for Community Service.

More Silver Snoopys

The Silver Snoopy is the Astronaut Office's personal achievement award for those who enhance space flight safety and mission success. Joining the growing list of ARES Snoopy honorees are **Jim Hyde** and **Marco Lozano**.

Jim was recognized for his years of service in assessing the risks of micrometeoroids and orbital debris to the Shuttle and ISS, resulting in operational and vehicle design changes that have measurably improved crew safety. Marco was recognized for his high-speed camera expertise in critical Shuttle tests performed at the Southwest Research Institute and at the Stennis Space Center. The NASA test director at Stennis had this to say about Marco's work: *"Your staff here (Marco) has demonstrated exceptional commitment and technical competencies in image acquisition and analysis that has been the cornerstone of this project's success."*

More Antarctic Service Medals

In the last Newsletter, we reported on the awarding of Antarctic Service Medals to **Scott Messenger** and **Keiko Nakamura** for their service on the ice as members of the Antarctic Search for Meteorites (ANSMET) field teams. Update – also receiving medals were **Carl Allen** (Scott's tent mate during the 2002-03 ANSMET field season) and **Mary Sue Bell** for her participation in 2005-06 ANSMET field season.

STEM Aerospace Award

John Gruener received the Outstanding STEM Aerospace Award from the Federal Laboratory Consortium for Technology Transfer, Mid-Continent Region. John was cited for his outstanding contributions to the High School Aerospace Scholars Program and is now a candidate for the Outstanding STEM Aerospace Award at the national level. The STEM Award recognizes the efforts of a federal laboratory employee that has demonstrated outstanding work in support of science, technology, engineering, and mathematics (STEM) education.

Wall of Fame Honoree

Larry Nyquist was honored by his high school alma mater as one of its alumni who merited inclusion on its "Wall of Fame." The event took place as part of a celebration of American Education Week. The objective in honoring its alumni is to provide inspiration for students of this rural Minnesota school district. Larry is the first scientist to be so honored by the school. Former recipients have included accomplished people from all walks of life, including noted musicians and a General.

Group Achievement Award

Over the past few Shuttle missions, NASA's Hypersonic Thermodynamic Infrared Measurements (HYTHIRM) project has successfully acquired calibrated thermal infrared

imagery of the Shuttle as it reenters the Earth's atmosphere. The project goal is to improve the Agency's capability for designing more effective spacecraft thermal protection systems. The HYTHIRM Team has now been awarded a Group Achievement Award from the NASA Engineering and Safety Center, and award recipients include **Tracy Calhoun** and **Dan Smith** of the Image Science and Analysis Group.

Comings and Goings

We thank **David Fuller** for his past two years of service as the ARES Safety Representative and wish him well in his new systems engineering position at the NASA/Glenn Research Center. David was recently recognized with an award from the JSC Safety Action Team for his work in ARES, including his incorporation of the concept of "human factors" in his approach to safety awareness. David emphasized to all Directorate personnel the importance of how everyday decision-making ultimately affects our health and safety.

Vince Abrignani joins ARES as our new Safety Representative and brings a wealth of experience, professionally and academically. Vince holds Masters degrees in both Occupational Health and System Safety and has worked for over 20 years at DoD sites that included radar operations at Kwajalein island, analytical chemistry, pyrotechnics, vacuum systems, and even a visit to McMurdo Station in Antarctica. He has worked at four NASA facilities in the last 10 years in a variety of lab and space flight testing environments.

Robert McCandless has joined the ARES Astromaterials Curation Office where he will be concentrating on Curation laboratory maintenance and support with thin sections. Robert has worked as an independent contractor for the past five years and plans to enroll at the University of Houston Clear Lake to further his career in Environmental Management.