ARES

Astromaterials Research and Exploration Science Directorate

Newsletter – June 3, 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

Sending astronauts to an asteroid is not just an idea of Hollywood fancy; it is, in fact, being seriously considered by the Constellation Program as a future use of its new Crew Exploration Vehicle (CEV). **Paul Abell** co-led a study on the feasibility of sending a manned CEV to Near-Earth Objects (NEOs), asteroids whose orbits come close to Earth's orbit, and found that the concept is technically sound within the current development of the CEV for lunar exploration.

A manned NEO mission would have all the makings of a blockbuster hit for Constellation, and it would write another compelling NASA chapter in the history of human exploration. As for its scientific merit, according to the study, returned NEO samples "*may provide the same kind of breakthrough in understanding these primitive bodies as the Apollo samples have done for understanding the Moon and its formation history.*" The National Research Council has also endorsed exploration of NEOs using astronauts as an "*intriguing and exciting potential future use of the Constellation System.*" Encouraged by the findings of the initial study, Constellation has asked Paul's team to expand upon their script to further develop the concept.

Look for CEV astronauts at a NEO near you sometime in the 2020s.

The "Earth Observatory" is NASA's popular public website for the Earth Sciences, managed out of GSFC. To commemorate its 10th anniversary, the website held a "Vote for Your Favorite Image of the Earth" contest. Of the thousands of great satellite images of the Earth published on the website over the years, the 1st place winner is… a photo of Saturn. Actually, in this amazing image taken by the Cassini spacecraft, our planet is barely visible as a tiny dot in space, an afterthought a billion miles away, set against a most beautiful Saturn and its rings in the foreground. The voting public chose well.

Several photos taken by astronauts from the vantage of the International Space Station were also finalists in the contest, and taking the 3rd place ribbon was an intriguing photo of Atafu Atoll in the Pacific Ocean. The photo and its caption were courtesy of the ISS Expedition 18 crew and **Will Stefanov** of the ARES **Crew Earth Observations** group, respectively. View the top ten images at http://earthobservatory.nasa.gov/Features/10thAnniversary/top10.php.

When the Genesis spacecraft crashed to Earth in 2004 from a parachute failure, it was feared that the precious solar wind samples it had collected over 28 months in space were lost. Many of us in ARES had gathered in our conference room for live video of Genesis' return, watching in disbelief as it plunged into the desert floor of Utah. Our hearts sank. The impact had severely breached the science canister and shattered the solar wind collectors into thousands of fragments. Fortunately, the coveted samples were securely implanted at depth within the collector material, while the dirt contamination was largely on the collector surfaces. Remarkably, after meticulous decontamination by the ARES **Genesis Laboratory**, the solar wind samples are being extracted and the mission science research objectives are being met.

In addition to providing elemental abundances of the Sun, the Genesis payload affords a unique opportunity to directly measure the effects of space weathering; the physical and chemical alteration of materials from exposure to the space environment. **Michael Callaway**, **Lindsay Keller**, and **Eileen Stansbery** published their research on Genesis space weathering by solar wind irradiation in the April 15th edition of Nuclear Instruments and Methods in Physics Research B. Their measurements show how materials such as silicon are changed over time when exposed to solar wind irradiation, which may help improve future designs of spacecraft components such as solar arrays. Their analysis also has implications for interpreting the surface conditions of extraterrestrial materials exposed to the solar wind.

Also contributing were **Roy Christoffersen, Judy Allton, Melissa Rodriguez** and NASA intern **Grace Asanaenyi**.

Out and About

As a result of recent events in space that have highlighted the growing menace of space debris, **Nick Johnson**, Chief Scientist for the **Orbital Debris Program**, appeared before a Congressional Hearing on the topic of Space Debris. Nick eloquently set the stage for his testimony before the House of Representatives Subcommittee on Space and Aeronautics in his opening remarks:

"While the adage 'what goes up, must come down' still applies in the space age, most satellites take a very long time to fall back to Earth. In many cases, this descent can last hundreds, even thousands, of years. Consequently, after more than 4,600 space missions conducted world-wide since Sputnik 1, a large number of human-made objects have steadily accumulated in Earth orbit."

You may recall the Beagle 2 spacecraft, Britain's ill-fated Mars lander which was lost without a trace in December 2003 just days before its scheduled entry into the Martian atmosphere. Now taking aim at a closer target, the Moon, Beagle 2 investigators have completed a concept study on redesigning the Beagle 2 instrument package for a Moon landing to investigate ice at the lunar poles. Collaborating on the study are ARES Yanks **Everett Gibson** as Co-PI and lead author, **Dave McKay** as science advisor, and team member **Dan Garrison**.

Everett was recently in the UK where he presented a New Zealand flag, flown on the Space Shuttle, to one of the Beagle 2 The Moon team members, Lester Waugh, a Kiwi working in the UK. He has made numerous outstanding engineering contributions to the concept study. Lester was completely surprised and emotionally moved by the flag presentation.

Comings and Goings

Chris Stokely has left the Orbital Debris group to take a career opportunity closer to family in the Atlanta area. Chris led the radar team for many years and provided critical data assessments that have helped improve our knowledge of the orbital debris environment. We wish Chris well in his career endeavors and thank him for his service.

Dave Draper makes his glorious return to ARES as the new KR Office Manager. Dave has spent the past seven years at the University of New Mexico, managing the High-Pressure Experimental Lab and researching planetary interiors, a continuation of similar work he had done with ARES before departing for UNM in 2002. Please welcome Dave back into the fold when he reports for duty at JSC on June 8th.

Congratulations are in Order

Jim Hyde received the Space Flight Awareness Award for his work on flight risk assessments from micro-meteoroid and orbital debris impacts. By providing mission planners with orbiter orientations with the lowest risk, Jim has helped reduce this flight risk for almost every shuttle mission since STS-40. Jim also leads the meticulous Shuttle post-flight inspections for impact damage.

Also receiving the Space Flight Awareness Award was **Nancy Todd** for her creative work in developing databases and web tools for the Astromaterials Curation group. Nancy continues to develop innovative approaches to integrating historically significant data and knowledge resources and presenting them for easy access by the science community.

Linda Watts received the ESCG Star Award for her career-long work with the Apollo Lunar sample collection, meticulously maintaining the scientific integrity of the collection and preparing thousands of lunar samples for shipment to researchers around the world. She was also recognized for her contributions in developing the comprehensive lunar sample database and the transfer of thousands of sample records from the heritage system into the new database.

Jim, Nancy, and Linda were honored at a reception at KSC for their awards and enjoyed VIP viewing of the STS-125 launch of Atlantis on its mission to the Hubble Space Telescope.

Group Achievement Awards were presented to the following teams -

- The Robert M. Walker Laboratory for Space Science Team, including ARES members **Keiko Nakamura-Messenger, Scott Messenger, Mike Zolensky, Lindsay Keller, John Jones,** and **Simon Clement**, "*In recognition of the discovery of a new mineral (Brownleeite) in material from a comet.*"
- The JSC Science Operations for the Phoenix Mission Team - **Doug Ming, Dick Morris, Paul Niles, Vern Lauer, Brad Sutter,** and **Rick Socki** – "*In recognition of successful science operations and interpretation of measurements for the Mars Phoenix mission.*"
- The International Mars Architecture for the Return of Samples (iMARS) team, including our own **Carl Allen**, for producing an international plan for the first-ever Mars sample return

mission. After only 10 months of tug-of-war among the team members, the citation notes; *"achieving multilateral consensus in such a short time was possible only because of the skill, dedication and tenacity of the iMARS team members."*

Special congratulations go to the ARES recipients of the prestigious Director's Commendation. **Kevin Righter** was recognized for "*outstanding leadership in the Antarctic Meteorite Laboratory and world-class research on extraterrestrial materials."* **Al Brandon** was recognized for "*exceptional scientific productivity and world-class research on extraterrestrial materials."* Also, a Director's Innovation Award went to former ARES employee **Lisa Fletcher** for "*outstanding leadership and technical innovations in the Astromaterials Research and Exploration Science (ARES) Directorate curation and research laboratories."*

And finally, the NASA Exceptional Achievement Medal goes to… **Nick Johnson**, who was honored *"For exemplary analysis and communication of risk associated with both a natural and kinetic intercept reentry of an uncontrollable National Reconnaissance Office Satellite."*

From the Archives

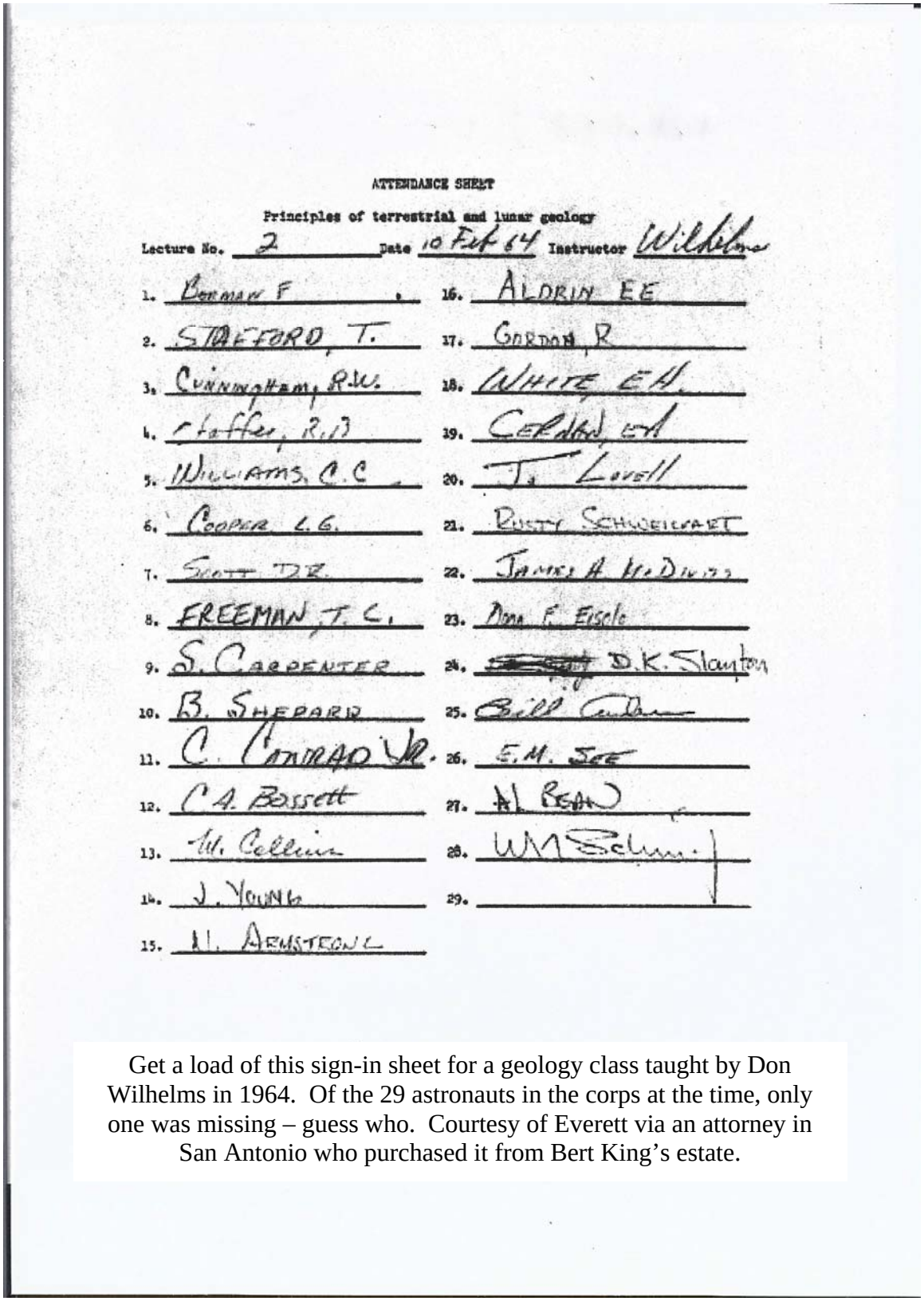
We're optimistic that this year's Astronaut Candidate (ASCAN) class will be the next generation of lunar explorers during the Constellation era. So, **Cindy Evans** has begun to develop an ASCAN training curriculum that may be useful to astronauts on the Moon, like Moon Fam 101 and Basic Geology. We also anticipate that much of this training will be done right here in our ARES facilities, just as it was done for the first generation of lunar explorers, the Apollo astronauts.

In the early days, the geology training for the first three classes of astronauts, 29 in all, began in 1964 jointly by our scientists at JSC (then known as the MSC) and staff of the USGS – there was somewhat of a power struggle between the two, but that's another story. The anecdotes from that era of training are fascinating and nostalgic, but they also guide us with lessons learned for our modern-day training.

The most basic lesson is in the spirit of the old training KISS rule, as inferred from an interview with Don Wilhelms of the USGS: *"We'd just pour this stuff on them* (the 1964 astronauts)*, all sorts of subjects in geology and geophysics, lunar geology and what have you, and give them books, and then equipment. All of this. They were great learners, and great forgetters. They would absorb it and talk to you in an animated way with great understanding, and then next week it would be gone. It took us a while to realize that. We gave them too much."*

A great read on the subject is the book "Moon Trip," by **Bert King**, our first Lunar Sample Curator who passed away in 1998. In his chapter on Astronaut Geology Training, Bert recounts that *"the crew were not really interested in general background; they wanted to get the information they needed for observing and collecting rocks on the lunar surface."* As such, Bert found that when it came to classroom study *"intensive instruction on field trips was more productive*." The field trips also made for the best anecdotal stories, like the "booze runs" into Mexico (see the book).

Here's another tip for our future instructors; have sign-in roll sheets for your classes and keep them as souvenirs, like Bert did (see below).



ATTENDANCE SHEET

Principles of terrestrial and lunar geology

Lecture No. 2 Date 10 Feb 64 Instructor Wilhelms

1. Borman F
2. STAFFORD, T.
3. Cunningham, R.W.
4. Shaffer, R.D
5. WILLIAMS, C.C
6. Cooper L.G.
7. Scott D.R.
8. FREEMAN, T. C.
9. S. CARPENTER
10. B. SHEPARD
11. C. CONRAD Jr.
12. C.A. Bassett
13. M. Collins
14. J. YOUNG
15. N. ARMSTRONG
16. ALDRIN EE
17. GORDON, R
18. WHITE, E.H.
19. CERNAN, E.A
20. J. Lovell
21. RUSTY SCHWEICKART
22. JAMES A McDIVITT
23. Don F. Eisele
24. D.K. Slayton
25. Bill Anders
26. E.M. Lee
27. A L Bean
28. WM Pogue
29.

Get a load of this sign-in sheet for a geology class taught by Don Wilhelms in 1964. Of the 29 astronauts in the corps at the time, only one was missing – guess who. Courtesy of Everett via an attorney in San Antonio who purchased it from Bert King's estate.