PSI is Major Sponsor of DPS Meeting in Tucson

The 46th Annual American Astronomical Society Division for Planetary Sciences conference was held in Tucson Nov. 9-14. PSI was an exhibitor and principal sponsor of the event. There were 876 people from around the globe at the conference, with 34 from PSI.

The conference took place at the JW Marriott Starr Pass, west of town in the Tucson Mountains. PSI Senior Scientist Joe Spitale was the Chair of the Local Organizing Committee and proposed the idea of bringing the conference to Tucson. Senior Scientist Faith Vilas was the Chair of the Scientific Organizing Committee.

Joe and Faith worked very closely with AAS meeting staff to create a world-class conference. Attendees had opportunities to hear about up-to-the-minute science developments such as Rosetta’s Philae probe landing on Comet 67/P on Nov. 12, and a talk by the discoverer of a ring around Chariklo, the small icy body between Saturn and Uranus, announced earlier this year.

On Nov. 11, PSI held an Open House at our headquarters. Hundreds attended the event that featured several food trucks and tours of our new building the PSI Conference Center and Planetary Geosciences Laboratory. Guests from DPS were invited to don virtual reality goggles and “walk through” a virtual exhibit of 3D shape models of Solar System bodies.

After-hours activities were interesting and locally accented including among others a field trip to Meteor Crater and an opening reception with a Day of the Dead theme.

PSI Senior Scientist Joe Spitale was the Chair of the Local Organizing Committee for the DPS meeting and was pivotal in bringing the meeting to Tucson as well as designing interesting after-hours activities with a regional flair.

Inside this issue:

- 40th Anniversary of PSI’s Lunar Origin Saga  2
- Our Annual Retreat 2014  3
- Rock ‘n’ Roll Scientist: David Grinspoon  4
- Getting to Know Sarah Andre  5
- Director’s Note  7
Forty years ago, in August 1974, we presented a talk at a symposium on planetary satellites at Cornell, sponsored by the International Astronomical Union. Bill had conceived the idea that if a giant impact blew rocky crustal-mantle material off the primordial Earth and into orbit, the Moon might have formed from that material. It might also explain why the Moon has a rocky composition with no substantial iron core.

Don, fresh from helping to bring Apollo 13 back from the Moon (see “Apollo 13: Forty Years Later” in PSI’s Summer 2010 Newsletter), was starting PSI’s pioneering computer models for how planets aggregated from asteroid-like “planetesimals” in the early Solar System. His models suggested that large bodies could have emerged with a chance of colliding with Earth, thus blowing the rocky material into orbit to form the Moon.

At the end of our talk, researcher Al Cameron rose to say that he and his student Bill Ward were working on a similar idea and had reached a similar conclusion. We published a paper in Icarus in 1975; Cameron and Ward published an LPSC abstract in 1976.

Around this time, it was discovered that oxygen isotopes in the Moon precisely matched the ratios of Earth’s oxygen isotope—but not those of any other known bodies in the Solar System. This seemed a powerful confirmation of the hypothesis that the Moon formed from terrestrial material. However, a challenge to this theory, referred to as the “isotope crisis” by impact expert and colleague Jay Melosh from the University of Arizona, arose in 2009 (see “Lunar Origin: A Crisis at ‘Downton Abbey’?” in the Winter 2013 Newsletter). The 2009-2013 “isotope crisis” implied that any impactor would have had very different isotopes, and the impactor would have contributed material to the Moon, so the Moon must have had different isotope ratios than Earth.

At the lunar origin conference last fall in the U.K., Bill presented a paper saying that if Earth had been hit by a local impactor, with Earth-like isotopes, most of the “crisis” would be resolved—and noted also that such objects must have existed, since enstatite chondrite meteorites have very Earth-like compositions.

In June 2014, a new paper appeared in Science, by Herwartz and colleagues, announcing that their new lunar rock oxygen isotope ratio measurements indicated that the impactor’s oxygen isotope ratio was slightly different from Earth’s, and that this supports the PSI hypothesis of a local giant impactor. They concluded that the impactor “formed from the same...reservoir as Earth, Mars [and] enstatite chondrites....”

Based on the 2014 evidence, we can say at a minimum that after 40 years, the PSI hypothesis of lunar origin is still alive and kicking. At the maximum, we can say on romantic, moonlit evenings that PSI research explained where the Moon came from!
PSI 2014 Retreat, August 20-22

The tenth annual PSI Retreat in August included 70 scientists and staff members who assembled at the Westward Look Resort in Tucson from all over the U.S. and Europe. The days were filled with science talks, lunches, and breakout sessions and the evenings with banquets, soirees and informal gatherings, all with the purpose of making connections and finding new areas of research. Pictured are some of our members giving their science presentations and enjoying the banquet at the Arizona Inn. The official group photograph is on page 8.

Director and CEO Mark V. Sykes gave a preview of what to expect when Dawn reaches Ceres in April 2015.

At the retreat, Faith Vilas challenged Mark Sykes to take the ALS Ice Bucket Challenge. (Eric Palmer is behind the bucket.) Bravo, Mark!

Associate Research Scientist Shawn Wright attended his first PSI retreat and described what fraction of the amorphous component of Martian soils and sedimentary rocks could be glasses resulting from impacts.

Andrea Jones has just joined PSI as an Education Specialist and gave her presentation about strategies for engaging the public in science education.

Meetings were held at PSI headquarters in the Conference Center on the last day of the retreat.

Research Scientist Maria Banks, at right (NY), another new member of PSI, talks with Sarah Mattson from UA/LPL at the banquet.

New to PSI, Senior Scientist Michelle Minitti came from Baltimore to attend her first retreat and updated us on MAHLI and MARDI data from Mars.

For 10 years of service at PSI, everyone receives a beautiful captain’s chair: l-r, Nalin Samarasinha, Lijie Han, Pasquale Tricarico and Beatrice Mueller received their anniversary chairs, engraved with their names and the year they joined the Institute. Other recipients not pictured: Matt Balme, Matt Staid, and Chuck Wood. Congratulations, scientists!

Getting together for the banquet at the Arizona Inn: l-r, Sarah Andre (DC), Eldar Noe Dobrea (CA), Julie Rathbun (CA) and Andrea Jones (DC).
Rock ‘n’ Roll Scientist: David Grinspoon  
*(in his own words)*

One of my earliest, vivid memories is from the fourth grade, watching the Apollo 11 landing and the first moonwalk. That entrancing experience launched me on this trajectory. As a kid, my two loves were science fiction and rock music: I played guitar in garage bands, devoured every sci-fi novel in my grade school library, and eagerly followed the planetary missions of the 60s and 70s, hoping to one day join in the adventure.

In high school, I audited a space engineering class at MIT, and when my pals and I discovered that one of our heroes, Dr. Gerard O’Neil from Princeton, was on sabbatical at MIT, we found his address, biked over, and knocked on his door. He was extremely nice to us, even serving us lemonade. My junior high school band was *Liquid Earth*, and my high school band was *Hyperdrive*.

As an undergraduate at Brown, I took planetary geology courses with Tim Mutch and Jim Head and had summer jobs working for them on Viking and Pioneer Venus data. But it was a summer job working with the Voyager Imaging Team at JPL during the Voyager 2 Jupiter encounter that hooked me for good. At Brown I played in a band called *The Geeks*.

For graduate school, I migrated far from my New England home to the seemingly mythical land of Arizona, which felt at first like an arid, sparsely populated, rarely habitable, exoplanet. After seven years in Tucson, working at LPL, I fell in love with the place. At LPL, I worked with John Lewis on origin and evolution of planetary atmospheres, which has been my research focus ever since. The Alvarez Hypothesis, the impact origin of the Moon, and the Martian origin of the SNC meteorites were all controversial, new, and exciting, contributing to a growing sense that impacts were important in the history of terrestrial planets.

My dissertation was on large impact events and atmospheric evolution on the terrestrial planets. I also studied creative writing at the UA, published my first popular science magazine articles, composed music for the dance department, and performed with several Arizona reggae bands including *Neon Prophet* and *Shagnatty* and an indie rock band called *HMMAH*. At NASA/Ames I had a post-doctoral position with the late, great Jim Pollack, who taught me radiative transfer theory and cloud modeling. Using NIMS data from the Galileo Venus fly-by, I constructed an improved model of the Venusian clouds and, inspired by the new Magellan radar images of Venus, began working on an evolutionary climate model incorporating surface/atmosphere feedbacks. I then joined the planetary science faculty at the University of Colorado, Boulder, and began a long-time collaboration with my student Mark Bullock on further developing the evolutionary climate model. I taught large introductory astronomy classes and small graduate seminars in planetary geology and atmospheres, and created one of the first university courses in astrobiology, a long-term interest of mine. I also wrote planetarium shows and published my first two books.

At Southwest Research Institute, I became a full-time researcher and, and encouraged by the growing NASA support for astrobiology, extended my research into constraining the limits of habitable environments in a wide range of planetary contexts, and became more involved in new planetary missions. I helped write the proposal for the RAD experiment that was selected for the Curiosity Rover. I played in a band called *Mom’s Instant Hot*, which won a “Best of Denver” award in the World Beat category, played with a funk group called *Venus Envy*, and continued to pursue outreach activities in various media and planetarium shows. There, I published another book and began writing regularly for newspapers and magazines.

In 2006, I became Curator of Astrobiology at the Denver Museum of Nature & Science, where my job was 50/50 research and outreach. I became a Co-I of the NASA Astrobiology Institute, modeling the chemistry and atmosphere of Titan, and became Interdisciplinary Scientist on the Venus Express mission, while also working on exhibits, planetarium shows, public events, volunteer and teacher training, and more. I did some experiments combining live music with interactive immersive data visualizations in the planetarium dome in Denver with a group of musicians and technologists who eventually became the *House Band of the Universe*. We created a musical/scientific/visual journey through cosmic evolution called *Life Out There*.

In 2013, I became the inaugural NASA/Baruch S. Blumberg Chair of Astrobiology at the Library of Congress in Washington, D.C., where I worked for 18 months, researching and writing about the Anthropocene Era from an astrobiology perspective.

And now I am thrilled to be joining the Planetary Science Institute, to renew my connection to Tucson (where I went to graduate school with PSI Director Mark Sykes and several other PSI folks), and join such an active and welcoming group of scientists and staff. I also really value the creative flexibility of the organization, as for now I will be half-time as a grant-supported researcher at PSI, and remain as a Distinguished Visiting Scholar at the Library of Congress in Washington where I’m finishing a book about the planetary/astrobiological dimensions of the Anthropocene. And I’m continuing to play with *The House Band of the Universe*. The NAI gave us some funding for a tour of *Life Out There* and we played shows in Jackson Hole, Washington and Chicago. Maybe someday soon we’ll come to a planetarium near you!
Getting to Know Sarah Andre

Sarah Andre joined PSI in August of 2011 as a Research Scientist and has since been promoted to Senior Scientist. Growing up in Helena, Montana, gave her an appreciation of mountains and nature which influenced her decision to pursue geology. This interest was evident early in her childhood when on hikes with her mother she was constantly picking up rocks and filling her pockets with them!

Sarah attended the University of Rochester in Rochester, N.Y., for her undergraduate education, studying geological sciences and biology and earning her Bachelor of Science in 1997. She went on to graduate school at Northwestern University in Evanston, Illinois, where she started out studying seismology and seismic anisotropy. She switched to planetary science after working on several research projects with Dr. Mark Robinson, who later became her Ph.D. advisor.

She earned her Master of Science in 1999 and her Ph.D. in 2004. While at Northwestern, Sarah worked with the Near Earth Asteroid Rendezvous mission, looking at the connection between ordinary chondrite meteorites and Eros, an S-type asteroid. Her primary thesis topic was an investigation of the densities and porosities of meteorites and how these physical properties relate to asteroid structure. Sarah also became interested in stereogrammetry and image processing techniques.

Currently, Sarah’s projects include the study of the structure and tectonics of heavily degraded impact basins on Mercury, using MERcury Surface, Space ENVironment, GEOchemistry, and Ranging (MESSENGER) MDIS (Mercury Dual Imaging System) image and topography data. She is examining the tectonic history of these basins to better understand how subsequent uplift and tectonic deformation has occurred, which will help reveal more about the evolution and modification of Mercury’s surface.

Sarah lives in Washington, D.C., with her husband and two sons. Besides planetary science, Sarah enjoys reading, gardening, and working on restoring and renovating her historic house.

It has been a pleasure getting to know Sarah and now to offer her a long overdue welcome!

Staff News

Balistreri Marries

Tucson-based PSI Controller Maurizio Balistreri and his bride Tina Wagner were married in sartorial splendor in their hometown of Milwaukee on June 14, 2014.

Best wishes to Mr. & Mrs. Balistreri from everyone at PSI!

Jones has a baby girl

Lydia Aster Jones was born on May 17, 2014, to PSI Education Specialist Andrea Philippoff Jones and her husband Kevin Jones. Lydia is a planetary explorer already as her uncle took her searching for meteorites when she was only one week old.

Congratulations on the birth of your little planetary explorer, Andrea and Kevin!
The Planetary Science Institute wishes to acknowledge our new and renewing Friends of PSI for supporting planetary exploration as well as our educational programs here on Earth.

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• Check out the online store on our PSI website. The store offers a wide variety of PSI logo items such as t-shirts, water bottles, field bags, baby bibs, and much more.

PSI Social Hour

Friends of PSI and PSI staff mingled during the July 25th Social Hour at Bodega Restaurant. A good time was had by all! Please join us for the monthly get-together on the last Friday of the month held in a different location each time. Look for your email invitation!

Pierazzo International Student Travel Award

The second 2014 Pierazzo International Student Travel Award, in honor of our esteemed colleague Betty Pierazzo (d. 2011), was given to Jakob Deller, University of Kent, Max Planck Institute, by PSI Director Mark Sykes, at the AAS DPS meeting this Nov. in Tucson. The first award was presented to Jacob Richardson last spring in Vienna. Congratulations, Jakob!
**Director’s Note**

With nearly 100 Ph.D. scientists, PSI is becoming one of the largest private employers of planetary scientists in the world. We are constantly working to preserve our culture of mutual support to maximize our competitiveness and encourage collaboration. PSI was recently ranked 20th in the nation among American corporations for workplace efficiency and flexibility to increase employee success and grow its business, according to the Families and Work Institute and Society for Human Resource Management.

As we continue to grow so do our ambitions, driven by our scientists and educators. Our research has expanded to include funding from every NASA planetary research program. We are participating in 15 active missions (including some under development) by NASA, the European Space Agency and the Canadian Space Agency.

In the past year, our scientists have proposed to build flight instruments for the future Mars 2020 and Europa missions, and many of us are deeply involved in proposals for the next Discovery mission. We are also discussing building our first laboratories. Today, our vision is to be a leading institution at all levels of Solar System exploration. There is always more to do!

Of course, our success depends upon the continuing availability of funding from NASA and the health of its planetary program. It is a testimony to the quality of our scientists and educators that despite the 20 percent cut to the NASA planetary budget in 2013, our revenues have continued to grow. But that cut needs to be restored in order for there to be any stability to our nation’s Solar System exploration program.

We are also deeply grateful to our supporters whose generous donations have provided funds we use and reuse to support our mission work and other contractual research. The amount of science leveraged by these donations is truly remarkable. Needless to say, as we continue to grow, so do our needs! This covers our discoveries of ice in the polar regions of Mercury and the Moon, the study of ancient streambeds on Mars, the eruption of curtains of water into space from the subsurface ocean of Enceladus at Saturn, and our approach to the dwarf planet Ceres that may reveal clues not just to life in our Solar System, but the universe.

We are explorers. We do not know what we will discover next and what precious ideas and theories will have to be tossed. The one certainty is that we will be confronted with beauty. As we close out another calendar year and look to an exciting year ahead, I hope you will join us in this adventure!

*Mark V. Sykes*
*December 2014*

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**PSI Scientists Reddy and Le Corre Named Early Career Fellows by NASA**

On Oct. 23, NASA named PSI Research Scientists Lucille Le Corre and Vishnu Reddy as Planetary Science Early Career Fellows for being outstanding scientists in separate work they successfully proposed to NASA’s Planetary Mission Data Analysis Program. This work also earned them permanent positions on the science staff of the Planetary Science Institute.

Le Corre’s proposal, “Restoring Dawn Framing Camera Multi-Band Data of Vesta to Full Spatial and Photometric Accuracy,” is critical to the interpretation of the history and evolution of the heavily battered and complex surface of the first target of NASA’s ongoing Dawn mission. “I am thankful to NASA for giving me the opportunity to help our community leverage great science from this mission,” Le Corre said. PSI was awarded $795,000 for her to pursue her work.

Reddy’s proposal, “Mineralogical Mapping of Asteroid Itokawa Using Hayabusa AMICA Camera Multispectral and NIRS Spectrometer Data,” will calibrate data from the Japanese Hayabusa mission that returned the first samples from a near-Earth asteroid, Itokawa. He will generate important maps of the asteroid’s composition while creating products that will allow deeper research into the nature of this object. “The Hayabusa data is a gold mine that is yet to be fully analyzed. We are fortunate to have the opportunity to enable planetary scientists to do high quality science with the data products we intend to generate,” Reddy said. PSI was awarded $674,000 for Reddy to pursue his work.

With their new permanent positions at PSI, Le Corre and Reddy are now each eligible to apply for $100,000 in start up funds from NASA. The start-up package is intended to aid Fellows in establishing a research group, program or laboratory in their new positions.

“This program is important to help talented scientists, early in their careers, build a foundation to sustain their future success,” said Mark Sykes, PSI CEO and Director. “Lucille and Vishnu are worthy recipients of this award, and will continue to make important contributions to our science in the years to come.”