Planetary Science Institute

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FALL/WINTER 2016 NEWSLETTER Vol. 17, No. 3

The Annual Retreat

PSI members at the retreat. 1st row: (l-r) Kelly Yoder, John Weirich, Xiaoduan Zou, Mark Sykes, Caoimhe (7) and Mary Bourke, Dan Berman, Elisabeth Adams, Vicki Hansen, Alex Pontefract, Gil Esquerdo. **2nd row**: Kathi Gardner, Melissa Lane, Karen Stockstill- Cahill, Eldar Noe Dobrea, Darby Dyar, Beatrice Mueller, Victoria Klocko, Thea Cañizo. **3rd row**: Jeff Morgenthaler, Amara Graps, Lynnae Quick, Yuki Yamashita, Al Anzaldua, Jesse Stone, Emily Joseph. **4th row**: Tom Prettyman, Amanda Hendrix, Julie Rathbun, Henry Hsieh, Bruce Barnett, Carol Neese. **5th row**: Bryan Travis, Joe Spitale, Pasquale Tricarico, Maria Banks, David Grinspoon, Elaine Owens, Luke Sollitt, Shawn Wright. **6th row**: Stu Weidenschilling, Jules Goldspiel, Alan Fischer, Nalin Samarasinha, Terrill Yuhas, Isaac Smith, Maui Balistreri, Bill Feldman, Michelle Greer, Sarah Sonnett, Michael Wendell. **Back row**: Ed Tedesco, Bob Nelson, Eric Palmer, Gavin Nelson, Larry Lebofsky, Jim Richardson, Roger Clark, Thomas Platz, and Than Putzig.

Photograph by Gil Esquerdo

Inside this issue:

In August PSI scientists and administrative staff from 16 U.S. states, Canada, France, Germany, Ireland, and Latvia gathered at the Westward Look Resort in Tucson for our annual retreat. The yearly meeting features three days of science presentations by new members and guest speakers and breakout sessions balanced by convivial evening functions and a science-related field trip. This winning combination has made the retreat a cornerstone of the Institute for 12 years in a row.

Continued on next page

PSI Retreat 2016 Photo Gallery

On this page are scientists new to the Institute who made their first presentation at a PSI retreat this year. Also pictured below are guest presenters from SpaceX, World View Enterprises, and the Large Synoptic Survey Telescope (LSST). *All photos by Alan Fischer.*

From the new PSI Denver West office, PSI Senior Scientist Than Putzig (left), and Postdoctoral Research Scientist Isaac Smith.

PSI Associate Research Scientist Jorden Steckloff is from Whitmore Lake, MI.

PSI Senior Scientist Vicki Hansen lives in Duluth, MN.

Guest speaker Taber MacCallum, Chief Technology Officer with World View Enterprises. PSI attendees toured the future home for the high-altitude ballooning and human spaceflight company. *(See page 3)*

Guest Paul Wooster, from SpaceX, gave a presentation about the unmanned Red Dragon capsule intended for future Mars missions.

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NEWSLETTER
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Chris Holmberg, Editor and Writer
Alan Fischer, Writer and Photographer
Special thanks to Gil Esquerdo, Dianne Janis, Emily Joseph, Carol Neese, and Elaine Owens

PSI Research Scientist Lynnae Quick traveled from her home in Greensboro, NC.

PSI Senior Scientist Jim Richardson is from South Bend, IN.

PSI Research Scientist Sarah Sonnett is from Huntington Beach, CA.

PSI Senior Research Associate Thomas Platz came to retreat from his home in Potsdam, Germany.

The final day of the retreat at PSI headquarters featured a presentation about the Large Synoptic Survey Telescope (LSST) given by Project Scientist Željko Ivezić (UW). LSST will produce an unprecedented wide-field astronomical survey of our universe using an 8.4-meter ground-based telescope.

FRONT PAGE BANNER: Mt. Etna, Sicily, Italy, is Europe's most active volcano. This image from May 2016 shows lava fountaining, ash clouds, and lava flows. Three of the four summit craters were active, with lava flows descending into the Valle del Bove to the east, and (unusually) a flow to the west. In this nighttime thermal infrared image from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) instrument on NASA's Terra spacecraft, the more recent western flow is displayed in yellow, superposed on an older daytime image, with vegetation in red. The thermal data were acquired May 26, 2016, cover an area of 19 by 19 miles (30 by 36 kilometers), and are located at 37.7 degrees north, 15 degrees east. Credit: NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team.

Retreat 2016: *After hours*

PSI members unwind at the first evening's soireé atop the Westward Look Resort, the retreat banquet at the Arizona Inn, and a field trip to World View Enterprises, Inc. *Photos by Alan Fischer.*

Jules Goldspiel and Jeff Morgenthaler (both PSI) at the Westward Look Resort.

Karen Stockstill-Cahill, Henry Hsieh, and Luke Sollitt (all PSI) at the Arizona Inn.

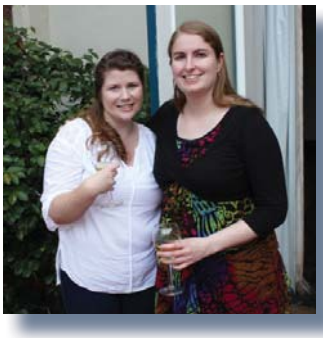
Marilyn Guengerich and Anna Don at the banquet.

Eileen Goldspiel and Karen Stockstill-Cahill (PSI) at the rooftop soireé.

L-r, Bob Nelson, Don Davis, Roger Clark, Mark Sykes, Paul Weissman (all PSI), Peggy Renner (hidden by Paul), and Maureen Weissman.

Mark Sykes (center) presented 10-year PSI anniversary chairs to PSI Senior Scientists Bill Feldman (left) and Eldar Noe Dobrea (right) at the Arizona Inn banquet. Senior Scientists Bob Gaskell and Alexis Rodriguez (not pictured) also received chairs.

From left, Claud Smith (a *Friend of PSI*), Gil Esquerdo, Frank Chuang (PSI) and Victoria Klocko (PSI) enjoy the night air on the roof of the Westward Look Resort.



Desi Berman and Emily Joseph (PSI) enjoy the patio at the Arizona Inn before the banquet.

At the Arizona Inn: l-r, David Grinspoon, Joe Spitale, Maria Banks (all PSI), and Sarah Sutton (UA).

Pointing to Space: PSI retreat attendees on a field trip to the World View Enterprises facility under construction. The company is planning high-altitude ballooning and human spaceflight from their location in Tucson. In the center, PSI CEO and Director Mark Sykes (in green) next to World View Enterprises CEO Jane Poynter (in white). *Photo courtesy of World View Enterprises, Inc..*

Getting to know Yuki Yamashita

Naoyuki "Yuki" Yamashita joined PSI in 2011 as a post doc to PSI Senior Scientist Tom Prettyman, and was himself promoted to Senior Scientist in 2016. He came to PSI from Institut de Recherche en Astrophysique et Planétologie (IRAP), Toulouse, France, where he spent two years on various international space missions while enjoying fine wines, delicious food, and beautiful scenery. He currently resides in Albuquerque, NM.

Yuki's science is all about measuring what planetary bodies are made of and inferring their origin and evolution history based on observations and modeling. For this purpose, he uses the knowledge of nuclear and radiation physics and measures radiation called gamma rays and neutrons. They carry information about chemical elements (H, Al, Si, Fe, etc.) that form rocks and sands on the surface of stellar bodies such as planets, moons, and asteroids.

Yuki was born in Tokyo and grew up in the city of Yokohama, Japan, famous for its port where U.S. Commodore Matthew Perry arrived with a fleet of warships, demanding commerce and supplies for American whalers in the early 1850's.

His family moved to the San Francisco bay area when he was in middle school. After graduating from high school there, he went back to Japan and acquired his Ph.D. at Waseda University, Tokyo, in 2006. He took several teaching/research jobs at Waseda and other colleges while he was involved in the Japanese mission to the Moon, SELENE (a.k.a. Kaguya) as a Co-Investigator on its Gamma-Ray Spectrometer team. When French colleagues of the team asked him to recommend a young researcher who would be willing to apply for a post doc position at their Institute in southern France, he asked them to hunt for applicants no more, because he would apply for it. And he got that job.

His interest in space science began as a child excited by the approach of Halley's comet. He posed many questions about the comet and space to his science teachers at the beginning of every school year, and each year he was told "You will learn it next year." He finally realized that "next year" was never going to come, so he pursued it by himself and ended up becoming a scientist.

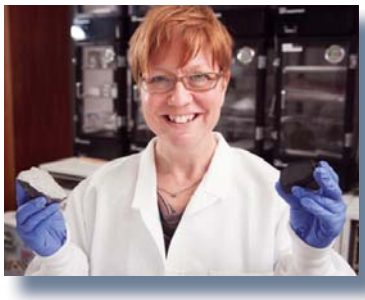
Currently Yuki is working on retrieving elemental information of the dwarf planet Ceres. He processes and analyzes data obtained by Gamma Ray and Neutron Detector on NASA's Dawn spacecraft. While the presence of vast amounts of water and/or hydrogen on Ceres excites him and confuses him at the same time, he thinks it is a privilege to be one of the first to analyze the data and discuss it with his distinguished and supportive colleagues. He also leads a project to archive high resolution gamma ray data obtained on the Moon and make it available to the entire planetary science community.

If he has any spare time he engages in the everlasting battle to childproof his home against his two-year-old son, who loves to undo all of his efforts. He also enjoys cycling, motorcycling, swimming, diving, and visiting national parks and monuments in the Southwest.

We are so glad you joined PSI, Yuki!

Linda Welzenbach, A Recent Arrival

Officially Linda Welzenbach joined PSI in July 2015, yet she was actually invited to join in November 2014 as part of a proposal to provide sample handling, education and access with Astromaterials Curation at the Johnson Space Center. In her position as Senior Research Associate she is working on providing a PSI sample handling policy and assisting PSI scientists with planetary sample issues. She came to us from the Smithsonian Institution's National Museum of Natural History, where she was the manager of the U.S. National Meteorite Collection and Antarctic meteorite collections for the last 15 years.



Linda's scientific work involves meteorite petrology and geochemistry, asteroid impact processing, meteorite curation, and curation for sample return missions. During her tenure at the museum, she classified over 10,000 meteorites collected from Antarctica, participated in two field expeditions to collect meteorites in Antarctica, and built a Class 10,000 clean room to house the Antarctic meteorite collection repository at the Natural History Museum Support Center.

She acquired her Bachelor of Science degree at the University of Maryland (UM) in 1988, College Park, and her Master's degree at Bowling Green State University (BGSU) in 1992. Linda was greatly influenced by her uncle, an amateur mineral collector who mined Herkimer diamonds in New York. He gave her a fluorite octahedron–her first mineral–when she was 7 years old.

Her interest in space science really did begin as a child watching *Star Trek* on television. She was, after all, a child of the 1970's and *space* was really interesting and worth striving for. She took geology and astronomy in high school and watched Carl Sagan faithfully. There was one planetary geology course at UM (primarily looking at geomorphologic features using Magellan imagery) but no encouragement to go into the field as there was no real confidence that we would go back to Mars.

Linda took a job with a "beltway bandit" (i.e., a federal government contractor) right out of school to pay her tuition, but decided to go back to graduate school since petroleum industry data analysis was a dead-end, horrible job. She was awarded a teaching assistantship (covering full tuition and providing a stipend) at BGSU and graduated in 2 years.

Continued on page 6

Director's Note

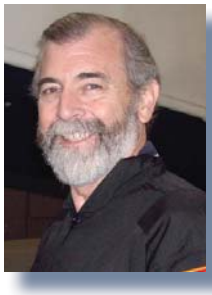
Our annual retreat is always a fun and hectic event. For it to run smoothly I am always grateful to our great administrative staff!

At the last two retreats we have been exploring opportunties beyond NASA. We have had presentations by the National Science Foundation (NSF), Defense Advanced Research Projects Agency (DARPA), and private industry. This year included presentations and discussions with World View Enterprises, Inc., here in Tucson, which plans to launch tourists and scientific packages on balloons deployed to more than 100,000 ft, where you can see the curvature of the Earth. Founders Taber MacCallum and Jane Poynter were generous with their time, showing remarkable footage of test launches and a tour of their current and future facilities (the latter of which is under construction near the Tucson airport. See photo pg. 3). Discussions among our scientists quickly moved to how these balloons might be used, what kind of experiments and observations might be made, and where to seek funding for them.

The other inspiring visit was from SpaceX, talking about the Red Dragon capsule they plan to land on Mars in the very near future (possibly beating NASA's Mars 2020 to the surface). The thought of a private company going to Mars is very exciting. Even more exciting were the discussions among our scientists about instruments they contemplated building to send to Mars at significant time and cost savings compared to a normal NASA mission! If SpaceX is successful in realizing its vision, I see a private sector initiative pressuring a government agency to embrace efficiency and practical risk assessment (this is my own message, not anything advanced by SpaceX). SpaceX founder Elon Musk is redefining ambition in our business–and PSI has the native guides!

With our last retreat also came the delivery of spectroscopy laboratory equipment donated to PSI by the U.S. Geological Survey (Denver). This lab was actually put together over decades by PSI Senior Scientist Roger Clark, who recently joined PSI and arranged for this donation. It is now being set up at our Tucson offices and more equipment is being promised by others. There is much to do but the end result will be a facility that our scientists can use both for funded work and for project development, free of charge other than consummables. It will be capable of making measurements from the ultra violet to the thermal infrared. We will also be looking for work, not necessarily scientific, to provide ongoing support for the lab.

One of our goals over the next few years is to continue expanding the scientific infrastructure available to our scientists. Building instruments, perhaps microsatellites, more powerful computational facilities, a visualization lab, the list goes on!



PSI is also expanding its presence by opening a new office in Colorado, which will be featured in our next Newsletter!

Mark V. Sykes
November 2016

PSI Staff News

Darby Dyar Receives GSA's G.K. Gilbert Award

In September, PSI Senior Scientist Darby Dyar received the Geological Society of America's prestigious G.K. Gilbert Award at the GSA Annual Meeting in Denver.

"I am humbled to receive this award, and grateful to be recognized for doing the fundamental research I love," Darby said. "Much of planetary science rests on a foundation of understanding mineralogy through spectroscopy, so as a laboratory scientist studying those data, it is a special honor to receive this award."

Darby is a mineralogist and spectroscopist interested in a wide range of problems relating to the evolution of the Solar System. She uses Mössbauer, Raman, LIBS, X-ray absorption, FTIR, and optical spectroscopies to understand the relationships between mineral structures and spectral/geochemical signatures. Her research focuses on the signatures of hydrogen and oxygen throughout our Solar System, particularly in terrestrial bodies such as the Earth, the Moon, Mars, and the parent bodies of meteorites. She studies rocks from diverse localities on Earth, from the deep oceans to Antarctica, as well as lunar rocks and meteorite samples.

Darby has written more than 225 papers in scientific journals and has been awarded more than $5 million in over 35 diverse grants from NASA and the National Science Foundation. These include support for her participation on the Mars Science Laboratory science team. She also serves on three of the eight NASA Solar System Exploration Virtual Institutes. In her current work, she is pioneering development of novel machine learning techniques for interpretation of spectroscopic data. She is a Fellow of the Mineralogical Society of America and has served as Associate Editor of *The American Mineralogist* for the past 20 years.

The award is named for G.K. Gilbert, who 100 years ago clearly recognized the importance of a planetary perspective in solving terrestrial geologic problems. The G.K. Gilbert Award is presented annually for outstanding contributions to the solution of fundamental problems in planetary geology in the broadest sense, which includes geochemistry, mineralogy, petrology, geophysics, geologic mapping, and remote sensing. Such contributions may consist either of a single outstanding publication or a series of publications that has had great influence in the field.

Congratulations, Darby!

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Linda Welzenbach, A Recent Arrival (Cont'd from page 4)

In her final year at BGSU, Linda saw an advertisement in *Geotimes* magazine to work as research support for the new Geology, Gems and Minerals Hall at the Smithsonian Institution's National Museum of Natural History. Here was her dream job, but the application deadline was in less than 48 hours! This was 1992 (no real email yet), and the U.S. government required paper submission with original signatures. She thought she was too late, but she took a chance and cold-called the contact person.

After a long and enthusiastic conversation (on both ends), she was told to fax her application and materials by the next day and was assured it would be submitted. She later learned the person walked quite a distance to the main Human Resources office to make the deadline. After three months of nail-biting, she finally heard from the Smithsonian: She got the job!

As a Museum Public Programs technician from 1992-98, she worked on all aspects of developing and installing a permanent exhibit at the Natural History Museum, then applied for and was selected as the Meteorite Collection Manager in 1999, though she knew virtually nothing about meteorites or planetary science. Everything she knows today was acquired through immersion, learning about all the meteorite types, their origins, the history of planetary science, and then conducting research using the collections.

Working with scientists to provide appropriate materials for research, conservation and curation of planetary materials with regard to new directions in planetary science (e.g., astrobiology), participating with international partners to identify materials needed for science and sample return missions, watching students grow into successful research scientists, and sharing new findings in planetary science with students, VIPs and the world, was a fabulous career.

Currently Linda is working with scientists on developing data management and sample curation plans for planetary analog investigations.

Linda and Marc Fries (her husband and PSI Alumnus) on a summit above þórsmörk Valley–just NW of Eyjafjallajökull eruption–in Iceland.

She has many varied interests: photography, managing ~300 orchids in an Arduino controlled greenhouse, judging orchids as an accredited judge for the American Orchid Society, mounting herbarium sheets for the Smithsonian's Department of Botany, volunteering with Galveston Bay as a Master Naturalist, and travelling whenever and wherever she can to geologically interesting places. She just returned from 2 weeks in Iceland where she attended the Mars' Polar Science and exploration conference.

We are very pleased to welcome Linda to PSI!