

*Chairman Lamar Smith holding fragment of Chelyabinsk meteorite, provided by LPL's Dante Lauretta*

## Talking Asteroids in Washington, D.C.

by Dante S. Lauretta

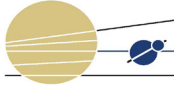
On Monday, March 25th, I had the honor to give two briefings on the OSIRIS-REx Asteroid Sample Return Mission to policy makers in Washington DC. OSIRIS-REx will visit asteroid 1999 RQ36, a carbon- and water-rich object that is also one of the most potentially hazardous near Earth asteroids. This visit was scheduled in conjunction with the OSIRIS-REx Independent Assessment Review (IAR) on March 26th. The IAR is the last of a mission Preliminary Design Reviews and focuses on the credibility of the management, cost, and schedule plans.

My first stop of the day was at the White House Office of Science and Technology Policy (OSTP), where I was scheduled to give a Brown Bag lunchtime seminar on OSIRIS-REx. Jim Green, Director of NASA's Planetary Science Division, Ed Beshore, OSIRIS-REx Deputy PI, and Shay Stautz, UA Vice President for Federal Relations joined me. We had a full house and several notable attendees including John Holdren, Director of OSTP, Philip Rubin, Principal Assistant Director for Science, and Tammy Dickinson, Senior Policy Analyst and our host. LPL alum Celinda Marsh (M.S., 2007), who now works at the Office of Management and Budget, was also able to join us. The meeting started out on a high note since I was able to pass around several fragments of the Chelyabinsk chondritic meteorite, which had exploded over Russia just one month prior to this presentation. Jim Green provided a nice overview of near-Earth objects and NASA's wide-ranging efforts to study these bodies. I followed with a detailed overview of OSIRIS-REx, highlighting the exciting science and feed-forward technologies for the agency. Afterwards, Tammy let me know that everyone at OSTP was still talking about both the mission and the sample of Chelyabinsk that I left behind. It had several visitors that afternoon.

Later that afternoon, Shay and I traveled to Capitol Hill to provide a similar briefing for staff members of the House Science, Space, and Technology Committee. UA worked with both full committee staff director Chris Shank as well as with Arizona Representative David Schweikert to arrange that discussion. Our host for this briefing was J.T. Jezierski, Director of Coalitions and Member Services for the Science, Space, and Technology Committee. Staff representing six Committee Members attended. Again, the samples of Chelyabinsk provided an excellent introduction to the scientific value of studying asteroids and meteorites. This venue provided for a more intimate setting, with Shay and I sitting around a conference table with the staff members. I presented a general overview of asteroid science and discussed the OSIRIS-REx mission. The conversation was dynamic and covered a wide range of topics from Solar System to formation to asteroid impact hazards, and resources of near-Earth space.

I also left behind a sample of Chelyabinsk for J.T. to pass on the Chairman Lamar Smith. The Chairman used the asteroid fragment to highlight the Chelyabinsk airburst event and kick-off the Full Committee Hearing - Threats from Space: A Review of Private Sector efforts to Track and Mitigate Asteroids, Part II (see photo).

Overall, the visits to OSTP and Capitol Hill were very successful. Asteroid research and exploration is emerging as a top priority for the United States. This avenue of research is critical to understanding Solar System origins, assessing the asteroid impact threat, and pursuing resource development in near-Earth space.



## Welcome from the Director

As usual, we've got a variety of news from the people around the lab, and links to stories talking about some of the great science the lab has been doing. But I wanted to highlight three things:

First, I'm delighted that we're able to mention honors received by a couple of people who led LPL during the tumultuous years following the establishment of academic side, the Department of Planetary Sciences. **Bill Hubbard**, who was the director of LPL from 1977 to 1981, and has been on the faculty ever since, won the Blitzer Award for teaching, while **Laurel Wilkening**, who succeeded Bill as department head from 1981 to 1983, was honored by having an asteroid named after her. Those two were among the key figures in steering the transition from Gerard Kuiper's planetary astronomy laboratory into a full-fledged academic department and a laboratory that specializes in just about everything.

Second, at the other end of the career scale, we have reports on awards and honors that our graduate students have won. Most notably, **Kathryn Volk** won the College of Science's award for the outstanding scholar in the college (out of nominees from nearly 20 departments), a notable accomplishment. Even better, it's the second year in a row that a woman from LPL has won the award, (**Nikole Lewis** won the award in 2012).

And finally, in our ongoing effort to keep LPL as the premier university-based planetary sciences organization in the world, we have formed an advisory board of committed community, industry and academic leaders (some of them with LPL backgrounds). You can find them introduced in this newsletter, and we hope to be hearing about some of the initiatives they help us plan in the near future, as we build for the coming decades.



**Timothy D. Swindle, Ph.D.**  
Department Head and Laboratory Director

## Faculty



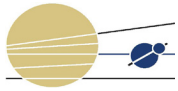
**Retirement for Peter Smith.** Professor Peter Smith has announced his retirement from The University of Arizona and LPL. Peter began his career at LPL in 1978 as a research assistant/postdoc; he was named Professor in 2009. Peter's career is rich with highlights and milestones, including: role as PI for the Imager for Mars Pathfinder (IMP) Science Team; design and construction of the IMP lander camera (1993-1997); service on several science teams and instrument design projects, including the MRO HiRISE camera; role as PI for the PHOENIX mission (2003-2008). We will miss Peter as a colleague at LPL, but wish him all the best as he pursues new adventures and opportunities!



**Blitzer Award to Bill Hubbard.** Professor William Hubbard was named the recipient of the Eighth Annual Professor Leon and Pauline Blitzer Award for Excellence in the Teaching of Physics and Related Sciences. Charles Blitzer presented the award at a special afternoon program held on February 28. Professor Hubbard's award lecture was titled "Why Do We Have a Space Program?" A reception followed Kuiper Space Sciences atrium. The Blitzer Award is funded through the Blitzer Teaching Award Fund, and commemorates Professor Leon Blitzer and his wife, Pauline Meyer Blitzer.



**Promotion for Shane Byrne.** Dr. Shane Byrne has been notified by the UA Provost of his promotion to Associate Professor with Tenure beginning with the 2013-2014 academic year. Shane earned his Ph.D. from CalTech in 2003 and joined LPL as an Assistant Professor in 2007. His research interests are surface processes on planetary bodies throughout the solar system, especially those processes which affect, or are driven by, planetary ices. He is a deputy-PI on HiSCI and a co-I on HiRISE. Shane teaches a core course in the department curriculum (PTYS 554), as well as a required undergraduate minor course (PTYS 411), and leads the fieldtrip course each semester (PTYS 594A).



## LPL Board of Advisors

The LPL Board of Advisors, the external group chartered with helping LPL and its director improve interactions with the world beyond campus and NASA, has been reformulated after a several year absence. The group will have its initial meeting in June to set goals and begin work. The Board members range from LPL alumni to Tucson community leaders who have not been part of the LPL family before. You'll be hearing more from the Board as time progresses. Board members are:

**David Acklam** is a retired engineer who has been very active in astronomical outreach in the Tucson area. As well as being the chair of LPL's Kuiper Circle Community Outreach committee, he is also an OSIRIS-REx Ambassador, a volunteer telescope operator at Flandrau Science Center, a Friend and docent at the Planetary Science Institute, and a volunteer Project ASTRO astronomer partner. Acklam is also a member of the Tucson Amateur Astronomy Association and the Planetary Society. He received his BSEE and MS from the University of Arizona and was a career Air Force officer, before moving to Texas Instruments and then Raytheon Missile Systems.

**Dan Cavanagh** is a 1974 Communications graduate of the University of Arizona. His varied background includes being President of the American Chamber of Commerce Government Relations Council and being a leading contributor to radio networks and wire services though out North America. He has spent 40 years in Southern Arizona developing/serving on successful efforts impacting public policy, taxation, the arts and education. Cavanagh's most recent position was Southern Arizona Manager of Government Affairs for the world's largest publicly traded copper company, Freeport McMoRan.

**Chris Lewicki** is the President and Chief Engineer of Planetary Resources, the asteroid mining company. He received his bachelor's and master's degrees in Aerospace Engineering from UA, and worked at LPL with Professor Bill Boynton's group. He was then intimately involved with the lifecycle of NASA's Mars Exploration Rovers and the Phoenix Mars Lander. Lewicki performed system engineering development and participated in assembly, test and launch operations for both Mars missions. He was Flight Director for the rovers Spirit and Opportunity, and the Surface Mission Manager for Phoenix. The recipient of two NASA Exceptional Achievement Medals, Lewicki has an asteroid named in his honor, 13609 Lewicki.

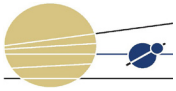
**Laura McGill** is Engineering Deputy of Raytheon Missile Systems, the largest private employer in southern Arizona. A principal engineering fellow, McGill was formerly deputy director for Advanced Medium Range Air-to-Air Missiles and Special Programs. She holds a bachelor's degree in aeronautical and astronautical engineering from the University of Washington and a master's degree in aerospace systems through a General Dynamics engineering development program. She is a lifetime fellow of the American Institute for Aeronautics and Astronautics (AIAA) and a member of its board of directors.

**Jani Radebaugh**, who obtained her PhD in planetary science from LPL in 2005, is an associate professor of geological sciences at Brigham Young University. She specializes in landform geomorphology in the solar system. As an associate member of the Cassini RADAR Team, she studies dunes, mountains, cryovolcanoes, rivers and lakes on Saturn's moon Titan, and she studies volcanoes and mountains on Jupiter's moon Io from Galileo, Cassini, and Voyager observations. Radebaugh has done field work in the Egyptian Sahara, the Ethiopian Afar Rift Valley, Hawaii, the desert southwestern US, and Antarctica.

**Timothy Reckart** is a Tucson attorney whose commercial and corporate practice focuses on intellectual property transactions and the representation of emerging-growth, technology-based companies. Reckart's broad experience includes 22 years as General Counsel for technology-based enterprises, 19 of them with Research Corporation Technologies in Tucson. He holds a law degree and an MBA from Stanford University, a master's degree in nuclear engineering from the University of California at Berkeley and a bachelor's degree in nuclear engineering from the Massachusetts Institute of Technology.

**Kjell Stakkestad** is the President of Northstar, a wholly-owned subsidiary of KinetX Aerospace in Tempe, Arizona. He received both his bachelor and master degrees in mathematics from the University of California at Davis, and then accepted a position as a staff orbit analyst at Lockheed Missiles and Space Company (LMSC). In 1993, Stakkestad left LMSC to help found KinetX Aerospace and serve as its first President and Chief Financial Officer. As the orbit dynamics lead for the development of the IRIDIUM satellite ground control system, he developed the initial orbital dynamics requirements for the ground system. He also led a variety of KinetX software, hardware, and system engineering projects for the IRIDIUM project. KinetX is a partner with LPL in the OSIRIS-REx mission.





## Department

# LPL Fieldtrip Fall 2013: Circum-Tucson

by Shane Byrne

Despite our tendency to crisscross the whole southwestern U.S. on these trips, there is an incredibly interesting geologic story sitting on our doorstep here in the Tucson area. There has been growing interest among the fieldtrip group in understanding more about the processes that have fashioned the local landscape around Tucson and that was finally satisfied this semester.

From a geological point of view, we're fortunate here in the Southwest to be so close to the edge of North America. Our geologic story is largely shaped by our proximity to this active plate boundary over the past hundred million years or so. Prior to that, southern Arizona had a mix of dry periods and marine incursions. One of these marine periods led to the formation of limestone rocks, which would likely have remained obscure were it not for the fabulous caves that formed within them. We had the chance to visit one of these caves at Kartchner Caverns, discovered less than 40 years ago by Gary Tenen and Randy Tufts (an LPL alum). Other sedimentary rocks that predate the main volcanic and tectonic stories recorded at Tucson can be seen east of the Tucson Mountains too. However, most of the geologic story we followed started in the late Cretaceous – just before the disappearance of the dinosaurs.

Despite all the buildings, agriculture and people around Tucson there's still a lot of geology to see. This trip has certainly provided us with an appreciation of the local story and how it fits into the broader forces at work as Earth's tectonic plates (and perhaps those of some extrasolar planets) jostle past each other over geologic time.



*Photo: Christa Van Laerhoven*



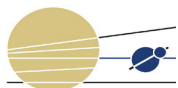
*Photo: Ali Bramson*



*Photo: James Keane*



*Photo: Melissa Dykhuis*



## Outreach

# Tucson Festival of Books

The UA Campus played host again this spring to the annual Tucson Festival of Books. This year's event, the fifth annual festival, was held March 9-10, 2013; the event was a huge success despite some wild spring weather at the start.

LPL faculty, staff, and graduate students participated in the festival as part of the UA ScienceCity, located on the UA mall directly in front of the Kuiper Space Sciences building. Highlights of the LPL events included OSIRIS-REx staff and ambassadors describing the mission and talking about meteorites and impact cratering. Also featured was Assistant Professor Tamara Rogers, who presented an informal talk on "Mysteries of the Sun: What We Know and What We're Learning." This opportunity for outreach was greatly facilitated with volunteer staffing from the College of Science community volunteers.

The Tucson Festival of Books is free and open to the public. It has become one of the most anticipated and well attended book fairs in the U.S., attracting approximately 100,00 attendees, 450 authors, and 300 exhibitors.



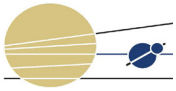
*Dolores Hill, Catherine Elder and Anna Spitz at the meteorite table.  
Photo: Melody Farmer*



*Maria Schuchardt demonstrates impact cratering.*



*OREx Ambassador Jonna Alley and a young scientist.*



## News

### Scientists Peer Into a Brown Dwarf, Find Stormy Atmosphere

By Daniel Stolte/UANews and Whitney Clavin/JPL, January 8, 2013

A University of Arizona-led team of astronomers for the first time has used NASA's Spitzer and Hubble space telescopes simultaneously to peer into the stormy atmosphere of a brown dwarf, creating the most detailed "weather map" yet for this class of strange, not-quite-star-and-not-quite-planet objects. The forecast shows wind-driven, planet-sized clouds enshrouding these strange worlds.

Brown dwarfs form out of condensing gas like stars but fail to accrue enough mass to ignite the nuclear fusion process necessary to turn them into a star. Instead, they pass their lives as dimly glowing, constantly cooling gas balls similar to gas planets with their complex, varied atmospheres. The new research is a stepping stone toward better understanding not only brown dwarfs but also the atmospheres of planets beyond our solar system.

"With Hubble and Spitzer, we were able to look at the layers of a brown dwarf, similar to the way doctors use medical imaging techniques to study the different tissues in your body," said Daniel Apai, the principal investigator of the research from the UA, who presented the results at the American Astronomical Society meeting in Long Beach, Calif. Apai is an assistant professor with joint appointments in LPL and the department of astronomy.

A study describing the results, led by Esther Buenzli, a postdoctoral researcher in the department of astronomy, and also including LPL theorist Adam Showman and LPL graduate student Davin Fplateau as co-authors, is published in the *Astrophysical Journal Letters*.

The researchers turned Hubble and Spitzer simultaneously toward a brown dwarf called 2MASSJ22282889-431026.



They found that its light varied in time, brightening and dimming as the body rotated around every 1.4 hours. But more surprising, the team also found that the timing of this brightening changed depending on whether they looked at it with Spitzer or Hubble using different wavelengths of infrared light (Hubble sees shorter-wavelength infrared light than Spitzer).

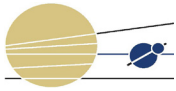
These variations are the result of different layers, or patches, of material swirling around the brown dwarf in windy storms as large as Earth itself. Spitzer and Hubble see different atmosphere layers because certain infrared wavelengths are blocked by vapors of water and methane high up, while other infrared wavelengths emerge from much deeper.

"What we see here is evidence for massive, organized cloud systems, perhaps akin to giant versions of the Great Red Spot on Jupiter or large-scale storm systems on Earth," said Showman.

"We were expecting the phases of the light variations to be in sync between the two telescopes, so we were really surprised that they were offset," said Buenzli. "This is the first time that we can probe variability at several different altitudes at the same time in the atmosphere of a brown dwarf."

"The deeper layers appear to lag behind the higher layers," Apai explained. "This tells us that the same or similar cloud distribution is present in the different layers, but the deeper you look, the later you will see the same clouds turning into view."



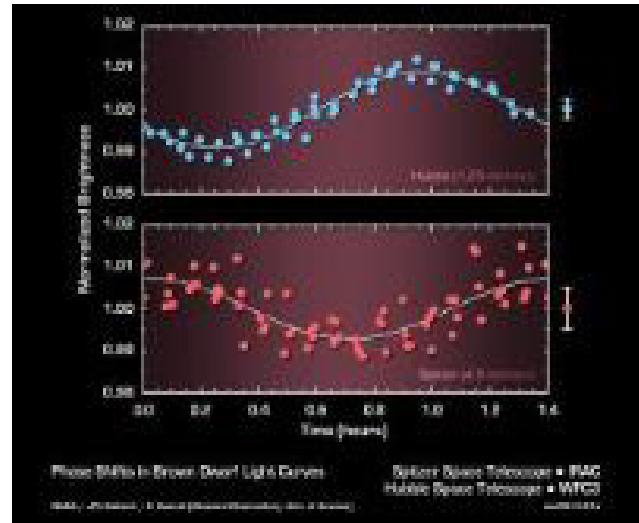
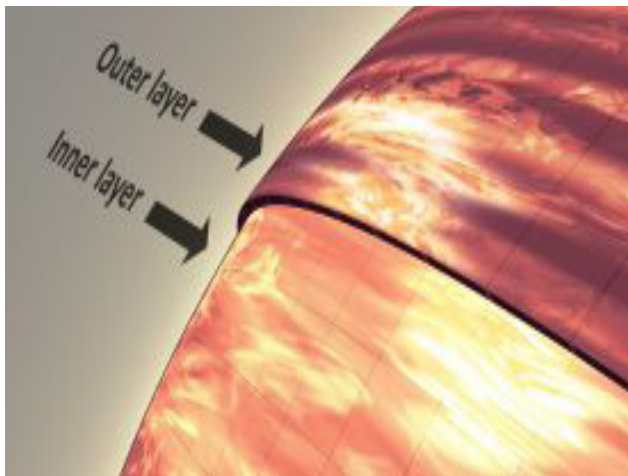


## News cont..

“We were very surprised to see such a big lag. Our best guess is this has to do with the brown dwarf’s atmospheric circulation. The bigger picture here is that we see a very large-scale atmospheric structure in this brown dwarf.”

“These out-of-sync light variations provide a fingerprint of how the brown dwarf’s weather systems stack up vertically,” added Showman. “The data suggest that regions on the brown dwarf where the weather is moist and cloudy deep in the atmosphere coincide with balmy, drier conditions at higher altitudes – and vice versa.”

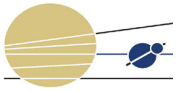
Ranging in size between Jupiter and the smallest stars and commonly weighing in at 30-40 Jupiter masses, brown dwarfs are cool relative to other stars but quite hot by our Earthly standards. This particular object is about 600 to 700 degrees Celsius (1,100 to 1,300 degrees Fahrenheit). Being quite warm, they emit strongly in the infrared, wavelengths picked up by Spitzer and Hubble.



At the cooler, outer layers of the star, gas condenses into smoke-sized particles, including sand and iron, which fall down into the interior as a sandy and iron rain. Just like on Earth, the iron and sand “raindrops” heat up as they enter the deeper warmer layer and eventually evaporate, triggering a rain cycle.

Although the group would like to study this type of process on exoplanets, Apai noted that, “Currently, we can’t get this type of data on exoplanets because their bright host stars blind our vision. Brown dwarfs are the perfect laboratories for studying the exotic science of worlds beyond our own.”

Apai is the principal investigator of the project Extrasolar Storms, which uses the Spitzer and Hubble space telescope together to follow the evolution of gigantic storms in the atmospheres of brown dwarfs over 1.5 years. Storms is one of the largest projects ever approved for the Spitzer Space Telescope, equaling two months of continuous observations with this \$1 billion telescope. Launched in 2003, Spitzer has long exceeded its nominal lifetime.



## Department

# LPL Fieldtrip Spring 2013 – Mojave Desert Remote Sensing by Shane Byrne

We packed our bags for the Mojave Desert, but not before doing some analysis of remotely sensed data from a variety of instruments on both aircraft and spacecraft. In this way we aim to test our ability (or the data's ability) to determine something of the surface properties in advance.

At Kelso dunes we set out to explain the appearance of the dunes in Synthetic Aperture Radar (SAR) datasets. These data show the dunes are dark in the shorter wavelength bands (such as the 5cm C-band) and brighter in the longer wavelength bands (such as the 25cm L-band and 80cm P-band). Some digging revealed a possible cause – the upper sand is dry quartz grains (with a low dielectric constant that doesn't scatter radar waves well); however, about 20-30 centimeters (8-12 inches) below the surface a wet layer was found. The longer wavelength radar waves may be sensing this higher dielectric constant layer and scattering more.

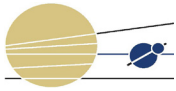
We stopped at a rock outcrop that we had identified as 'interesting' in some hyperspectral imaging data then pressed onward to Soda Lake (a playa). SAR data show the playa surface to behave very differently in C, L and P bands and to have large variations from place to place.

At the Cima volcanic field we stopped to look at roughness differences between volcanic flows of different ages and how they manifested themselves in the radar data. Many of the Cima cinder cones also show spectral differences between their summits and lower flanks in our hyperspectral datasets. Close inspection from hiking to the top and back (which proved to be more involved than expected) of one cone suggested weathering differences of the cinders led to the spectral differences. Finally at Cima we checked out a lava tube cave. Recent high-resolution planetary cameras have resulted in the discovery of several such caves on Mars and the Moon.

At the Pisgah lava flow and cone, we investigated obvious brightness and depolarization contacts in the radar data of the lava field that correlated with dramatic changes in surface roughness. We also had the chance to explore Glove cave, another lava tube, and our final stop for this day was the Amboy lava field and cinder cone. In visible-band orbital imagery the Amboy cone has a dark streak emanating from it to the southeast. Examination of C-band radar data suggests the streak also scatters more radar energy. Rick Greenberg joined the trip in his plane and flew to Amboy to help us characterize the streak from the air. At Broadwell lake (another playa), which (in contrast to Soda Lake) is homogeneously dark at all radar wavelengths, the surface is smooth packed silt and bone dry as far down as we could dig.

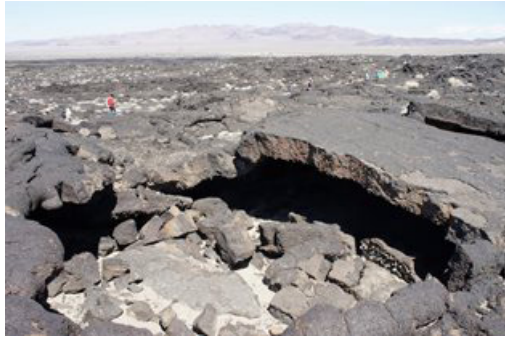
A trip to the Mojave is always fun from a geological perspective. This time however we also gained a little remote sensing intuition.





## Department

*Spring 2013 Fieldtrip  
Photo: James Keane*



*Spring 2013 Fieldtrip  
Photo: Ali Bramson*

*Spring 2013 Fieldtrip  
Photo: Catherine Elder*



*Spring 2013 Fieldtrip  
Photo: Ali Bramson*

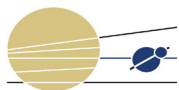
## Outreach

### OSIRIS-REx Celebrates Women in STEM

In celebration of Women's History Month 2013 (Women Inspiring Innovation Through Imagination: Celebrating Women in Science, Technology, Engineering and Mathematics), the OSIRIS-REx team developed some online resources for promoting celebrating women in STEM careers. Several current and former LPL faculty, staff, and students are featured, including Nadine Barlow, Veronica Bray, Kat Crombie, Renu Malhotra, Elisabetta Pierazzo, and Elizabeth Roemer.

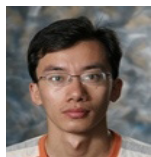
Check out the videos, booklists, PowerPoint shows, and biographies online at:

<http://www.lpl.arizona.edu/~dubois/womenshistory.html>



## Graduate

### Fan Guo and Kathryn Volk named as recipients of the 2013 Gerard P. Kuiper Award



**Fan Guo** defended his dissertation titled “Effects of Turbulent Magnetic Fields on the Transport and Acceleration of Energetic Charged Particles: Numerical Simulations with Applications to Heliospheric Physics” on August 22, 2012. Professor Joe Giacalone was Fan’s dissertation advisor. Fan is currently a post-doc with the Los Alamos National Laboratory.



**Kat Volk** defended her dissertation titled “Dynamical Studies of the Kuiper Belt and the Centaurs” on April 1; she begins her post-doc at the University of British Columbia Vancouver in the summer of 2013. During her time as a graduate student, Kat also earned the Graduate Teaching Excellence Award (Fall 2006) as well as the department award for Service and Outreach (2010). She was a two-time recipient of a College of Science Galileo Scholarship (2009 and 2011). This spring, Kat was named as recipient of the College of Science Scholarship award, an honor given to the single most outstanding graduate researcher in the entire college. Professor Renu Malhotra was Kat’s dissertation advisor.

The Kuiper award is presented to planetary science students who best exemplify the goals and standards established by Gerard P. Kuiper, founder of the Lunar and Planetary Laboratory and the Department of Planetary Sciences. The Kuiper award has been presented annually since 1985.

### Fall 2012 GTA Award



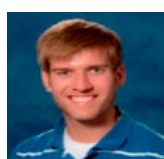
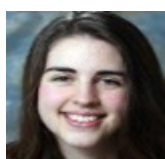
**Patricio Becerra** is the recipient of the Outstanding Graduate Teaching Assistant Award for Fall 2012. Patricio earned the award for his work as a GTA for Professor Tamara Rogers’ PTYS 170B1 course during the Spring 2012 semester. Recipients of the Outstanding GTA Award receive funds of up to \$1,000 to support travel to a professional meeting of their choice.

### Ali Bramson receives NSF GRFP



**Ali Bramson** has been named the recipient of a NSF Graduate Research Fellowship, which comes with three years of funding and tuition support. Ali is a first-year student working with Shane Byrne. She is a graduate of the University of Wisconsin (B.S. in Physics and Astronomy). LPL is proud to count three other current NSF Graduate Research Fellows among our student ranks: **Davin Flateau, Melissa Dykhuis, and Ethan Schaefer.**

### 6th Annual College of Science Graduate Student Awards

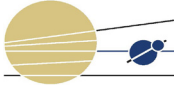


LPL was pleased to name the following students as recipients of the 2013 College of Science Graduate Student Awards:

Outstanding Scholarship: **Kathryn Volk**

Outstanding Service and Outreach: **Meghan Cassidy and Rob Zellem**

Outstanding Teaching: **Rob Zellem**



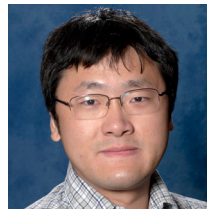
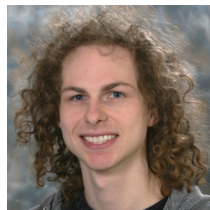
## Invest in LPL

### 2013 Shandel Travel Award



**Catherine Elder** has been announced as the recipient of the 2013 Shandel Travel Scholarship. Catherine plans to use the funds for summer travel to Zurich, Switzerland. While there, she will collaborate with Professor Paul Tackley (ETH Zurich) on studies of Io. Tune in to the LPL Fall Newsletter for a report on Catherine's summer travel and research accomplishments!

### 2013 Galileo Circle Scholarships



**Congratulations** to LPL's 2013 Galileo Circle Scholarship recipients:

**Corwin Atwood-Stone, Sky Beard, Davin Flateau, Sarah Morrison, Tom Schad, Peng Sun, and Michelle Thompson.** Galileo Circle Scholarships are awarded to the University of Arizona's finest science students and represent the tremendous breadth of research interests in the College of Science.

Galileo Circle Scholars receive \$1,000 each; these awards are supported through the generous donations of Galileo Circle members. The Galileo Scholars were honored at an early evening reception held on April 18, 2013.

Congratulations to all our 2013 Galileo Scholars!

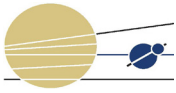
## Graduate

### LPI Career Development Award to Catherine Elder



**Catherine Elder** was awarded a 2013 Lunar and Planetary Institute (LPI) Career Development Award in February. The award is given to graduate students who submitted a first-author abstract to the 44th Lunar and Planetary Science Conference (LPSC). Recipients received a \$1,000 travel stipend to help cover LPSC conference expenses.





## LPL in the News

Links to the news stories below are available at: [http://www.lpl.arizona.edu/newsletter/spring\\_2013/](http://www.lpl.arizona.edu/newsletter/spring_2013/)

**“ROCK” Star: Dante Lauretta** - TO INFINITY AND BEYOND! Buzz Lightyear’s famous rallying cry may be hyperbole, but the mission of the NASA- funded project headed up by UA’s Dante S. Lauretta, Ph.D., is certainly meant to go well beyond anywhere Man has gone before.

**9-Year-Old Names Target Asteroid of UA-led NASA Mission** - Inspired by the spacecraft’s “heron-like” appearance, a 9-year-old submitted the winning entry for a more memorable name of asteroid 1999 RQ36, from which the UA-led NASA mission OSIRIS-REx will scoop up a sample and return it to Earth in 2023.

**Voyager 1 thought to be along the magnetic highway at edge of solar system** - Faculty and graduate students at the UA’s Lunar and Planetary Lab spent a recent lunch hour discussing the conflicting signals being sent by Voyager 1, which may become the first spacecraft to ever leave our solar system.

**UA & NASA Partner to Inspire Love of Science** - A new exhibit at University of Arizona’s Flandrau Science Center — OSIRIS-REx Presents Great Balls of Fire! — opens with a video animation showing Earth ringed by a swarm of asteroids. They number just more than 9,000, including several in red to indicate which orbits cross ours.

**Scientists Peer into a Brown Dwarf, Find Stormy Atmosphere** - Pointing the Spitzer and Hubble space telescopes simultaneously at a brown dwarf, a UA-led team of astronomers has obtained detailed images of the stormy atmosphere that enshrouds these strange objects, which are not quite planets and not quite stars. Their forecast shows planet-sized clouds and showers of sandy and iron rain.

**Just Coming Through: Asteroid Toutatis** - UA astrophotographer Adam Block caught asteroid Toutatis with the Schulman Telescope at the UA Mt. Lemmon SkyCenter as it zipped by the Earth on Dec. 11.

**Improving Software for Asteroid Detection** - Alon Efrat and Jonathan Myers of the UA computer science department are working under a new grant to help improve methods for discovering asteroids on paths toward Earth.

**Earth’s Date with an Asteroid** - The UA has held a long-standing love for asteroids, from pioneering the search for potentially hazardous space rocks before NASA did to sending a spacecraft to one to scoop up a sample.

**TEDx Tucson Explores OSIRIS-REx Mission, Russian Meteor Crash**

**Mars vs. comet in 2014: Scientists prepare for red planet sky show** - A close encounter between Mars and Comet C/2013 A1 (Siding Spring) in 2014 is creating both opportunity and anxiety in scientific circles.

**Used Parachute on Mars Flaps in the Wind** - Photos from NASA’s Mars Reconnaissance Orbiter show how the parachute that helped NASA’s Curiosity rover land on Mars last summer has subsequently changed its shape on the ground.

**UA Helps Lead U.S. Exploration of Asteroids** - UA asteroid experts welcome President Barack Obama’s NASA budget proposal with its strong push to study, sample and eventually visit, space rocks.

**Did UA Mars Camera Find Lost Spacecraft?** - Hardware from a Soviet spacecraft that went silent only seconds after making the first successful soft landing on Mars in 1971 might appear in images taken by the HiRISE camera aboard NASA’s Mars Reconnaissance Orbiter.

**OSIRIS-REx Mission: Are We Stardust?** - Making bold discoveries about the origins of life on Earth