VOLUME 2
ISSUE 5

September
2010

OFFICIAL NEWSLETTER OF THE SCHOOL OF EARTH AND SPACE EXPLORATION

SESE Source

this issue

Editors Note

Welcome to another school year and another issue of the *SESE Source*! This semester two new writers will be joining the newsletter staff: interns Matthew Button and Delia Miranda. Both have already shown a strong aptitude for science writing and I hope that our readers enjoy the fruits of their labors over the course of the semester.

Nikki (Staab) Cassis

MATTHEW BUTTON

Freshman, majoring in Linguistics with hopes of double majoring in Journalism. Matthew's writing talent stems from his experience working as an editor with his high school newspaper.

DELIA MIRANDA

Senior, majoring in English (Literature). Delia plans to pursue a career as an editor, maybe even a publisher. She made the Dean's list for Spring 2010.

From life in pools to life on planets?

By Matthew C. Button

Yellowstone National Park embodies the picture of serenity, a fortress of natural resources, and a refuge for rare wildlife such as the gray wolf, grizzly bear, Canadian minx…and ASU astrobiologists? Indeed, this summer, concealed from the public, far beyond the beaten path, ASU astrobiologists like Amisha Poret-Peterson and other researchers formed teams who delved deep into the forests of Yellowstone to analyze signs of life that exist in the park's unique hot springs.

The two-week trip involved camping in areas of the park only adventurous hikers endeavor to reach. Students and researchers took part in a range of experiments examining how factors such as temperature, nutrient availability, and water flow regimes of the springs affect the sediments and microbial life residing in sediments. By observing life in the hot springs, scientists can learn how organisms thrive in extreme environments. Hot springs may be similar in temperature and conditions to potential life-harboring environments on other planets, so understanding microbial communities that inhabit hot springs could inform strategies to discover extra-terrestrial life.

This last trip to Yellowstone was Poret-Peterson's second visit to the park as a part of a research initiative sponsored by NASA's Astrobiology Institute. ASU is home to one of 14 research teams from across the country that comprise the NAI which explores the origin, evolution, distribution, and future of life on Earth and in the universe. This time she focused on one-carbon compound utilization; however, other scientists such as Associate Professor Hilairy Hartnett and graduate student Steve Romaniello focused on N-Cycle processes in the springs, contributing to the dynamic analysis of the springs.

These hot springs can be configured in many ways, however, one particular Yellowstone spring has a high temperature source pool (about 93C), which can flow into channels that become progressively cooler as the water and moves away from the hot source. This natural spring water forced upward by intense heat below surfaces at around boiling up from the ground through networks of cracks and crevasses. These high temperatures actually make taking samples a hazardous task for the scientists. Long ladle-like instruments and, shorter spatula-type tools allow for careful scooping of sediment and spring water into containers for analysis back at ASU.

Another curious and more noticeable feature of hot springs is the rainbow of colors that appear at different temperatures. Microbes with differently pigmented chlorophyll molecules thrive along the gradient of temperature. ASU science teams sampled hot springs along temperature gradients to compare how microbial communities function at "really hot" and "not so hot" temperatures. Other samples are taken from what is called the "photosynthetic fringe" – (though not temperature defined, this

Perhaps extreme environments on Earth **contain evolutionary remnants of life that we call alien.**

Habitable Worlds

As a result of the new B.A. in Earth and Environmental Studies, the school is offering five new courses, one of them being the new lab course Habitable Worlds (GLG 106), which explores the possibility of extra-terrestrial life and how Earth supports life.

Are we alone in the Universe? If so, why? If not, where are our cosmic cousins?

Such questions, once the domain of science fiction, are on the verge of being answered with science facts. Astronomers are discovering planets around others stars. Planetary scientists are exploring the worlds in our solar system. Biologists are unlocking the secrets of metabolism and evolution. Geoscientists are determining how the Earth supports life. And as we struggle to build a sustainable future for ourselves, all of us are finding out how technologically advanced civilizations rise… and how they might fall.

Learn the latest, and the basics, about these and other topics in Habitable Worlds, a science course for everyone.

regime occurs around temperatures between 50 and 72° C in the Yellowstone hot springs) where it has been observed that photosynthesis becomes possible and where scientists find the first signs of life that harnesses the energy of sunlight.

Poret-Peterson and others can determine how microbes use different elements, like nitrogen and carbon, by incubating hot spring water and sediment in an enclosed bottle with what is called a "tracer compound." If utilized these tracers, such as 13C, are enriched within the microbial biomass sampled or in the gases released into the bottle. Determining if the compound is processed by microorganisms can be determined analytically.

The analysis requires a complex process encompassing three laboratories: ASU's Molecular Biology and Proteins Lab, Media Laboratory, and Cultured Chemostat Lab. First, samples in tiny vials must be transported back to ASU for analysis. Then in a second lab DNA is extracted from the samples. Once Poret-Peterson has this pool of DNA sequences she can use a process called Polmerase Chain Reaction (PCR) to amplify certain genes for study. By breaking the double strands of DNA apart in segments around the gene in question and applying replicating these bits scientists have more DNA to work with. Fortunately the organisms found in the hotsprings, specifically Thermus aquaticus, have a thermostable DNA polymerase, allowing for the use of PCR. With DNA data Poret-Peterson can gather information about the organism in these pools and channels and compare them with online databases and create a picture of the diversity in the hotsprings.

"Specifically what I'm looking for are genes encoding specific enzymes that function in carbon or nitrogen processing and relate to how the microbes use these compounds," explains Poret-Peterson. Poret-Peterson and others are interested in genes involved in one-carbon metabolism while other groups of scientists focused on denitrification.

"We know a lot about N-Cycle in oceans and on land, but there isn't much known about how these processes in hot springs," Poret-Peterson says.

The complete process of examining this living world of hot springs is a lengthy one; Poret-Peterson does not expect to see results until next year, and even these will be mere preliminary observations. After all of the labor of collecting and processing samples, Poret-Peterson will have just enough to start forming a hypothesis about life in extreme conditions.

"The hardest part for me is the anticipation, you know, just what am I going to find?" Poret-Peterson explains, "But the trip itself, working in the field, being around your friends, balances out all of that."

But what does all of this have to with space? Where has the "astro" in astrobiology gone? Poret-Peterson intends to find certain signs and signatures of life, not just existing life, but evidence of past life. Yellowstone's bacteria represent one of the closest possible forms of life that is speculated to occur in extreme space environments.

Poret-Peterson's research works to elucidate the mysteries of possible extraterrestrial life, by examining the protected diversity of life within the Yellowstone hot springs. Studying the functioning microorganisms at Yellowstone can provide insight into what we should look for as evidence of life on other planets. Perhaps Yellowstone is not only a sanctuary for endangered trout, and threatened fern, but perhaps it also contains some, partial, basic evolutionary reminisce of life that we call alien.

Scientific horizons to broaden with DAWN mission

By Matthew C. Button

Since its launch on Sept. 27, 2007, the DAWN robotic spacecraft has traveled roughly 220 million miles from earth, yet it still has not reached its destination. The spacecraft's DSI Xenon Ion Thrusters power it through space at nearly 9,800 mph toward the main asteroid belt (between Mars and Jupiter), where two massive asteroids – Vesta and Ceres – await their turns to be analyzed. David A. Williams, a faculty research associate in SESE and a participating scientist on the DAWN mission, eagerly awaits the spacecraft's arrival and the new knowledge that is sure to follow.

Dawn carries a suite of sophisticated instruments to image the surface, measure reflected and emitted radiation, and measure the gravity field of each of these large asteroids. By investigating the physical and geological properties of Ceres and Vesta, the two most massive bodies in the main asteroid belt, we will learn about the nature of the early solar system and the processes occurring as the solar system formed and evolved. However, since the spacecraft is not scheduled to arrive at Vesta until 2011 and Ceres until 2015, NASA has only just begun to seek out participating scientists for the future data analysis; Williams was one of several scientists competitively reviewed and specially selected in response to NASA's Announcement of Opportunity this summer.

Williams is a planetary volcanologist and has had previous experience with NASA's Magellan and Galileo probes imaging Venus and Jupiter.

Sometime during 2011, when DAWN makes a pass abreast Vesta and takes pictures of the asteroid's surface, Williams will begin examining these images. The German Max Planck Institute for Solar System Research designed a special framing camera to take these high resolution pictures from miles above the asteroid.

"The camera actually has two closely aligned lenses, so we can superpose images to examine differences, measure shadows, and clearly distinguish geologic attributes of Vesta," Williams explains.

First discovered in 1807, Vesta was the fourth asteroid formally discovered. The Institute of Applied Astronomy within the Russian Academy of Sciences estimates that Vesta contains nearly 9% of the asteroid belt's mass, so despite being smaller than Earth, it still remains one of the most substantial bodies of the asteroid belt.

"During the formation of the solar system, it's theorized that Vesta might have been a larger body ravaged by these massive gravitational tides between giant Jupiter and Mars," says Williams. This reasoning would explain the asteroid field as a sort of residual debris remaining after the formation of the solar system.

There is some controversy about the composition of Vesta, and its progression as a protoplanet. Earth based observations of the asteroid reveal that the planet may have an exterior of basalt, the same substance as the Earth's mantle. Mathematic models such as the Wilson and Kiel's offer mechanisms for predicting its geological progression, but if Williams finds evidence of certain volatile volcanic substances this may disprove aspects of that model. Williams is also looking for evidence of igneous deposits that would mean past volcanic activity on Vesta. Cones, volcanoes, impact craters, surface volcanoes and innumerable other surface features of the asteroid can all provide insight into the age and composition, and even the geological evolution of the heavenly body.

One method Williams plans to employ involves looking at the frequency of impact craters in a certain areas to determine the ages of the surfaces. "We know an area is older because more impact craters have formed compared to other areas," he says.

Williams intends to carefully record each geological formation and create maps that can be used to "enhance understanding of the geological history of this differentiated asteroid, and of the nature and diversity of planetary volcanism in the Solar System, particularly how volcanism operated on a small body."

Though Williams may interpret these images to explain aspects of planetary evolution, the DAWN Mission is especially interested in the role of size and water on Vesta's progression. According to Williams, water might have caused more explosive magma flows, a characteristic that could be observable from surface scarring on Vesta.

Another important aspect of the DAWN mission that will depend on Williams' careful inspection of Vesta images is the 2015 pass by Ceres. Ceres is the largest asteroid of the belt. It is often classified as a dwarf planet, and was considered for half a century to have been the eighth planet. Ceres is believed to be wetter than Vesta, and contains a partially oxygen based atmosphere; it also may have active hydrological processes like seasons.

Vesta and Ceres are two examples of forming planets that were stunted, disrupted in their baby state by the formation of Jupiter. Both offer unique glimpses into the early development of planets in the solar system. What's intriguing is what caused these two protoplanets to evolve so differently.

"Comparing planets' and asteroids' surface alterations and debris can tell us about earth today, as well as earth in the past," says Williams.

Objects like Vesta and Ceres are relics, primitive states of planets that never had the chance to grow, and understanding them provides valuable information about the beginnings of our own planet. The pair also has the potential to provide a valuable link between the terrestrial and gaseous planets.

But it will not be until November that Williams begins the process of integrating his computers and procedures with that of NASA's finest, and it will be a year till DAWN actually reaches Vesta to take pictures and send them home. Until then DAWN will peddle onward, purposed with illuminating those deep truths about the genesis of our planet, and of our solar system.

ALUMNI PROFILE
SIAN PROCTOR

Geology Faculty,
South Mountain Community College

Persistence pays off
SESE alumni takes geology skills to the silver screen

By Delia Miranda

As an ASU alumni, Sian Proctor has made quite a name for herself. She is currently one of the geology faculty members at South Mountain Community College and a TV “rock” star.

Proctor received her B.S. in Environmental Science/Earth Science from Edinboro University in1992. In 1998 she obtained her M.S. in Geology from ASU, and a Ph.D. in Curriculum and Instruction: Science Education from ASU in 2006. While studying for Ph.D., she worked under Professor Steve Reynolds on a project called Volcano Island: A Multimedia Simulation of Field Geology, which she claimed was one of her favorite projects.

According to Proctor, when she first started the program she questioned whether or not she belonged there and if it was something she really wanted to do. But as time went on she fell in love with being a teaching assistant and right then and there she knew that she wanted to teach. She says that the most important piece of knowledge that she walked away with was that persistence pays off in the end – that persistence enabled her to get a full-time job teaching geology at South Mountain Community College.

Proctor has not only made a name for herself in the world of academia but in the entertainment world as well. Currently, she has a role on the television series The Colony, which airs every Tuesday at 10PM ET/PT on the Discovery Channel.

“I was contacted by a casting agent for The Colony and when I met the producers they liked me,” says Proctor. “I was actually surprised that they picked me because I know a lot of people tried out for the show.”

Working on the show has been a major learning experience for Proctor. She stated that being on The Colony allowed her to experience a world-wide catastrophic situation under controlled experimental conditions. Her hope is that it never happens in the real world – although her background in geology has really helped her along the way. While teaching geology, she taught students about water resources and how to purify water. Proctor herself now uses these same skills to purify The Colony’s water supply.

While there were some aspects of the show that she found memorable, there were other aspects that were a little less than pleasant. Proctor found that the best part about being on The Colony is all the people that she met. She said that the cast and crew were amazing and that she had made some really good friends. However, the worst part about being on the show was the struggle of day-to-day survival. Proctor’s role on the show has left a distinct impression on her but she said that being on the show has not changed her life in anyway. It did, however, provide her with a new perspective on her ability to survive a catastrophe.

Remembering Ravi

Losing someone close to you feels as if your heart has been ripped from your chest and then stomped on. It’s the single most devastating event that you could ever imagine.

For SESE students and faculty, it’s an experience they know all too well. On August 1, alumni Ravi DeFilippo was killed in a mining accident near Mount Toromocho in Peru. He was one of SESE’s brightest and most promising alumni.

DeFilippo had just celebrated his 24th birthday and was looking forward to returning to the US in a few weeks. A native Tucsonan, he graduated cum laude from ASU in December 2009. He was a gifted geologist who loved field work and because of his curiosity, intelligence and positive attitude he was a favorite among fellow students and professors. One of his professors, Tom Sharp, said DeFilippo was a great student to have in his classes because he was so eager to learn about geology and always had a positive attitude toward his education.

His death is truly a tragedy amongst us all. He was an individual who made an impact in the lives of those around him whether it was his professors, his peers or his family and yet he will be sorely missed.

In honor of DeFilippo’s commitment towards field geology, a memorial scholarship has been created in his name. Donations can be made online at www.asufoundation.org/RaviDeFilipposcholarship or by check. Make checks payable to the ASU Foundation, and mailed to the School of Earth and Space Exploration at PO Box 871404, ASU, Tempe, AZ 85287-1404.

A foreign prospective

BY DELIA MIRANDA

Since 1951, Nobel laureates in chemistry, physics, and physiology/medicine convene annually in Lindau, Germany. They come together to engage in open and informal meetings with students and young researchers; each year about thirty outstanding graduate students are chosen to attend this prestigious, week-long event.

This year Cody Raskin, a graduate student in SESE, was selected to participate. Raskin helped develop and implement a new observational approach to determine the types of stars that result in Type 1a supernovae, a method that has already been incorporated into the science plans of several upcoming large projects and space missions. He also carried out a series of massively parallel computations that identified a completely new mechanism for forming Type 1a supernovae through the collision of two white dwarf stars.

He is currently working toward his doctoral degree in astrophysics. In 2008, he received his master's degree in physics from ASU. In addition to interactions between the Nobel laureates, Raskin enjoyed the picturesque island of Lindau, which is located at the eastern end of Lake Constance, just north of the Swiss Alps.

I sat down with Cody for an exclusive interview to get his take on his experience in Lindau, Germany and his conversations with the Nobel laureates.

DELIA: What was it like traveling to another country?

CODY: It wasn't all that bad; I had been to a foreign country before so I wasn't nervous at all.

DELIA: What was your favorite part?

CODY: There was this one day where I took a boat ride in Minae where I talked with several students.

DELIA: How did it feel meeting with these Nobel Laureates?

CODY: It was fine, I didn't feel intimidated or nervous about meeting them; I just saw them as any regular person like you see here on campus.

DELIA: Who were you most excited to meet and why?

CODY: That would be Snoot because he's a cosmologist.

DELIA: What did you learn?

CODY: I learned that the German scientists have no political influence and that they have a different approach on world views. I feel like I learned from the students who were there more than the Nobel laureates in the sense that they have different world views than us.

DELIA: Did you have anytime to do non-science activities?

CODY: Well, before the convention I went to an auto show and then after it I went to an engineering museum in Munich.

DELIA: How will this experience help you later on in your career?

CODY: I don't know if this experience will help me, but I do know that a liberal arts experience is important.

From my interview with Cody I ascertained that it can be beneficial for students from different parts of the world to discuss projects they are currently working on. You learn more just by stepping outside your comfort zone because as a student you spend four or more years developing similar relationships through similar interactions with similar people. The different environment that foreign study provides can offer important venues for personal and intellectual growth.

Trail of Time

By Matthew C. Button

The shear and sublime peaks of the Grand Canyon have for millions of years been eroded, cut and crushed, and gently worn down, layer by layer, to create the vast crevasse millions come to visit and to understand.

From Oct 13 to 15 visitors will not only to able to enjoy those colorful layers of sediment for their aesthetic value, but for their relevance in a geological timeline, transforming a casual pass through the canyon into an illustrative journey through time, a "Trail of Time".

Steve Semken, an associate professor of geoscience education and geological sciences in SESE, has been working to place bronze markers and explanatory signs almost since the project's conception in 1995.

The trail looks to utilize the natural awe of the canyon to produce a "teachable moment". Visitors can walk through geological eras, meander by notable rock formations, and complete the trail with a broader knowledge of the magnitude of geological time. The path looks to be one of the first and most monumental models to capture the scope of geologic time in a format graspable by the public.

This innovative exhibition is sponsored by the American Geological Institute with the goal of promoting newer and more effective approaches in the interpretation and education of geosciences. Even the immensity of the canyon looks to be dwarfed by the geological rulers the "Trail of Time" looks to provide.

Earth and Space Exploration Day

This year's annual Earth and Space Exploration Day will be held on Saturday, November 6 from 9 a.m. - 3 p.m. Many interactive activities will be available for kids to explore the various research areas of SESE. Each year a special guest lecturer is invited to kick off the event; this year's special speaker will be Jim Bell (Cornell University) giving a presentation titled "Postcards from Mars."

ASTRONOMY OPEN HOUSE

This month's Astronomy Open House will be held on Sept. 24 from 8-10 p.m. Join the graduate students of SESE for telescope viewing, experiments and more!

Students become the teachers

By Delia Miranda

During the 2009-10 school year, three SESE students participated in the GK-12 in ASU's Down to Earth program. The program supports fellowships and training for graduate students in science, technology, engineering, and mathematics (STEM). As fellows, Erin DiMaggio, Matthew Rossi and Jon Oiler took their first-hand science knowledge to the classrooms of Phoenix, enriching STEM content through their interactions with students and partnering teachers.

GK-12, a NSF-funded program, aims to get scientists into the classrooms and involves fellows with the local education system. Fellows attend classes and workshops to learn how to integrate inquiry-based education (a method designed to mimic how scientists really do research that has students learn science by exploring topics and labs themselves) into a classroom setting and then teach alongside an assigned teacher for two full days per week. In addition to improving communication and teaching skills, fellows learn what types of educational outreach is actually effective in the classroom as they begin to write research grants that include an outreach component.

DiMaggio, Rossi, and Oiler created lesson plans based on their own research at SESE and implemented it in the classrooms. DiMaggio's lessons focused on the rock cycle for seventh graders, while Rossi's was aimed at plate tectonics, and Oiler's focused on astrobiology and engineering.

Rossi had previous experience working with K-12 students and was not particularly overwhelmed or nervous from the get-go. Partnering with Paseo Hills School in Deer Valley, Rossi developed lesson plans for earth science and physics experiments that included dropping items on the floor to figure out the density of each object. Another activity had students building models of the Grand Canyon to analyze fossils from different time periods. Other lesson plans included looking at images from Mars and turn into a guessing game to draw the students' attention.

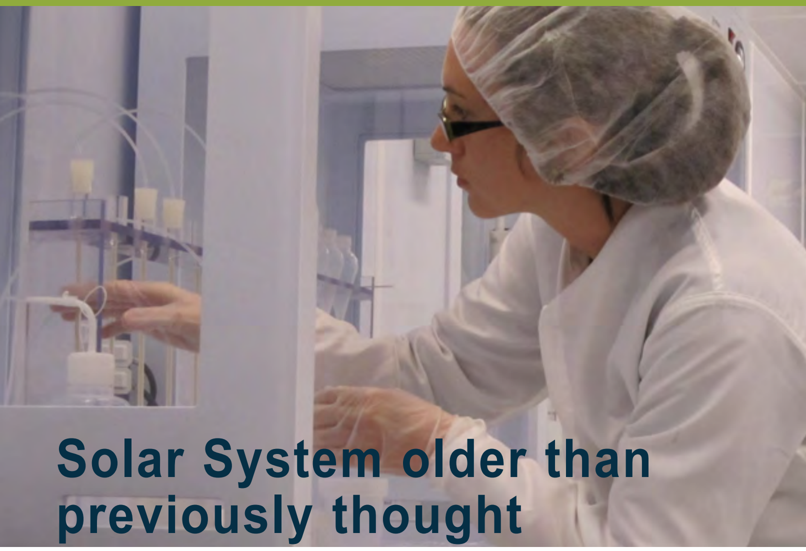
While Rossi's experience working in the GK-12 program was a positive one, DiMaggio's started out a little different. She said at first her experience working with seventh grade students at Willis Jr. High School in Chandler was chaotic but then as time went on things settled down.

Her best memory is of the day she used Google earth to show the children the different volcanoes around the world. When she pulled up Arizona and showed the students the volcanoes in the area the look of astonishment and surprise was immediately evident on their faces. They could not believe that volcanoes existed in Arizona. "I really do hope that I have contributed in some way in the sense that I've taught them that not all scientists are old and wear lab coats and look scary but that there is diversity in science," says DiMaggio.

While Oiler was teaching at Payne Junior High School in Queen Creek he first noticed that the students were not interested in science. With the first few labs of the semester, there were a lot of sighs and groans and even more, "Why don't you just tell me the answer?" However, as the semester progressed he quickly learned that it wasn't a lack of interest, but rather, a motivational problem. Oiler stated that most subjects are taught where the teacher tells the students "facts" and the students write them down and memorize them for a test later on. He and the teachers tried to instead offer exploratory inquiry-based labs. They did not tell the students what to expect; sometimes Oiler and his co-teacher didn't even tell them how to conduct the experiment. They really wanted the students to explore the natural world and learn how to setup the experiments themselves to test variables.

"It's a lot of work and the SESE students and their advisors should understand that participating in the program means that the student will have a diminished research workload; however, the experiences, relationships, and skills that the students will gain are immensely more important," Oiler says.

Students studying majors such as mechanical, aerospace, chemical and materials engineering, are encouraged to apply for the program. Benefits include: a $30,000 annual stipend, mileage classroom experience with K-12 students and teachers, a three-credit course on inquiry based science teaching and learning, a two-week summer workshop with ASU faculty and K-12 teachers as well as other opportunities for professional development.



Solar System older than previously thought

Timescales of early Solar System processes rely on precise, accurate and consistent ages obtained with radiometric dating. However, recent advances in instrumentation now allow scientists to make more precise measurements, some of which are revealing inconsistencies in the ages of samples. Seeking better constraints on the age of the Solar System, SESE researchers Audrey Bouvier and Meenakshi Wadhwa analyzed meteorite Northwest Africa (NWA) 2364 and found that the age of the Solar System predates previous estimates by up to 1.9 million years.

By using a dating technique known as lead-lead dating, Bouvier and Wadhwa were able to calculate the age of a calcium-aluminum-rich inclusion (CAI) contained within the Northwest Africa 2364 chondritic meteorite. These CAIs are thought to be the first solids to condense from the cooling protoplanetary disk during the birth of the Solar System.

The study's findings, published Aug. 22 in Nature Geoscience, fix the age of the Solar System at 4.5682 billion years old, between 0.3 and 1.9 million years older than previous estimates. This relatively small revision to the currently accepted age of about 4.56 billion years is significant since some of the most important events that shaped the Solar System occurred within the first ~10 million years of its formation.

"This relatively small age adjustment means that there was as much as twice the amount of iron-60 ... in the early Solar System than previously determined. This higher initial abundance of this isotope in the Solar System can only be explained by supernova injection," says Bouvier, a faculty research associate in SESE. "This supernova event, and possibly others, could have triggered the formation of the Solar System."

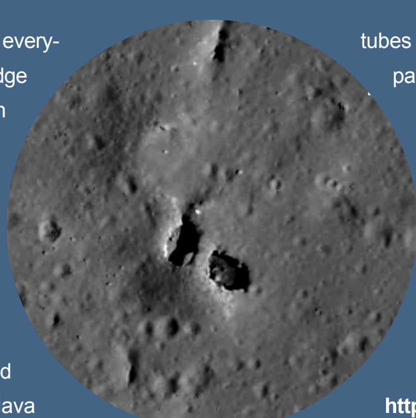
According to Wadhwa, "This work also helps to resolve some long-standing inconsistencies in early Solar System time scales as obtained by different high-resolution chronometers. However, there is certainly room for future studies. In particular, it will be important to conduct high precision chronologic investigations of CAIs from other pristine meteorites. We also need to understand the reasons for why the CAIs measured previously from two other chondritic meteorites, Allende and Efremovka, have yielded younger ages."

This is the first published lead-lead isotopic investigation that takes into account the possible variation of the uranium isotope composition. Earlier work conducted in Wadhwa's laboratory, has shown that the uranium isotope composition of CAIs, long assumed to be constant, can in fact be highly variable and this has important implications for the calculation of the precise lead-lead ages of these objects. Bouvier and Wadhwa inferred a uranium isotope composition for the CAI for which they reported the lead-lead age.

Natural bridge on the Moon

Just when you think you have seen everything, LROC reveals a natural bridge on the Moon. Natural bridges on the Earth are typically the result of wind and water erosion – not a likely scenario on the Moon.

So how did this natural bridge form? The most likely answer is dual collapse into a lava tube. From Apollo era, Selene, and LROC images we know that lava tubes did form in the Moon's ancient past. Selene and LROC images have raised the tantalizing prospects that lava tubes remain intact to this day. However, the bridge did not form in mare (basalt), but rather in impact melt from King crater. More astonishingly the same NAC image revealed two natural bridges – not just one.



http://lroc.sese.asu.edu/news/

Another BIG one coming soon?

Earthquakes have rocked the powerful San Andreas fault that splits California far more often than previously thought, according to UC Irvine and Arizona State University researchers who have charted temblors there stretching back 700 years.

The findings, published in the Sept. 1 issue of Geology, conclude that large ruptures have occurred on the Carrizo Plain portion of the fault – about 100 miles northwest of Los Angeles – as often as every 45 to 144 years. But the last big quake was in 1857, more than 150 years ago.

Researchers said that while it's possible the fault is experiencing a natural lull, they think it's more likely a major quake could happen soon.

"We've learned that earthquake recurrence along the San Andreas fault is complex," says co-author Ramon Arrowsmith, a geology professor SESE. "While earthquakes may be more frequent, they may also be smaller. That's a bit of good news to offset the bad."