Earth and Planetary Sciences at UC Santa Cruz

Fall 2015

Last day of summer field, Panum Crater

https://eps.ucsc.edu

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Fall 2015

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Chair's Welcome

Dear Alumni and Friends,

With a very positive 2015 coming towards its end, the Earth and Planetary Sciences Department has undergone a few changes in faces, its denizens have collected their share of accolades, and a couple of new pedagogic initiatives have either been initiated, or are on their way to fruition.

The awards garnered by our faculty continue to give us opportunities to reflect on the outstanding research conducted in our Department: this year, our local lunar expert, Ian Garrick-Bethell, was AGU's Planetary Sciences Greeley Early Career Award winner; emeritus Léo Laporte was awarded the 2015 Mary C. Rabbitt History of Geology Award from the GSA (presented by alum Steve Rowland) for his work on guiding paleontological light George Gaylord Simpson; and, in late breaking news, Jim Zachos was awarded the 2016 Milutin Milanković Medal (named, of course, after the guru of orbitally-driven climate cycles) from the European Geosciences Union for his extensive contributions to our understanding of Earth's past climates.

As ever, we've had regretted departures and eagerly-awaited arrivals: Lisa Sloan retired this past academic year---we wish her well, and her many contributions to our Department and the campus are much appreciated! On the arrival side, Xi Zhang (our new planetary atmospheres expert) arrived from his post-doc at Arizona, and has hit the ground running. And, we were very pleased to hire Nicole Feldl, a climate dynamicist, who got her Ph.D. from U. Washington and will finish up her NSF Post-Doctoral Fellowship at CalTech before arriving at UCSC this coming summer.

On the teaching front, Susan Schwartz, with a brace of colleagues from UCD and UCSD, launched our Department's first on-line class "Geology of the National Parks." It's part of a UC initiative spanning multiple disciplines to establish UC-caliber on-line, mostly lower division instruction that's broadly accessible and can be pursued at one's own rate. Check it out at geoparksonline.wordpress.com! Otherwise, a prospective undergraduate Environmental Sciences major, developed by Patrick Chuang with Raphe Kudela from Ocean Sciences, is in the resource-availability vetting process at the moment, and we are optimistic that it will be launched when a couple more faculty are hired, as the sausage-making of a new UC degree program has begun!

It was great seeing many alums back here in May for our 50th anniversary Departmental alumni event, and we hope to have other such events in the future. And now comes my request for your support: we have information on pp. 31-35 describing current EPS Development Priorities, which are focused on providing more and better opportunities for our students; and, The Earth and Planetary Sciences Fund provides discretionary support for a variety of Departmental projects, including support for our alumni activities. We'd truly appreciate any support you can give to maintain and enhance the educational experiences of our students…this is much appreciated by both our students and us!!

And now the party invitation: our annual (and 15th!) AGU Alumni Gathering will take place at the Thirsty Bear Organic Brewery, on Tuesday, December 15th, 6-8:30, 661 Howard Street, San Francisco. We hope to see you all at this great chance to see old friends, meet new ones, eat snacks, and drink fermented beverages!

Quentin Williams, Chair

Department News

Paul Koch

Ian Garrick-Bethell

Aradhna Tripati

Jim Zachos received the Milutin Milankovic medal of the European Geoscience Union

Paul Koch was elected a Fellow of the American Association for the Advancement of Science (AAAS).

Ian Garrick-Bethell received the Ron Greeley Early Career Award in Planetary Sciences from the American Geophysical Union (AGU).

Adina Paytan received the Paleoceanography and Paleoclimatology Dansgaard Award of the American Geophysical Union (AGU).

Lèo Laporte won the Mary C. Rabbitt History of Geology Award from GSA

Alumni Awards

Priya Ganguli (PhD 2013) won the Doris M. Curtis Outstanding Woman in Science Award at GSA.

Priya Ganguli with Russ Flegal

Yingcai Zheng (PhD 2007) received the Clarence Karcher early career award from the Society of Exploration Geophysicists (SEG).

Doug Hemingway (PhD 2015) was awarded a Miller Postdoctoral Fellowship at Berkeley

Don Penman (PhD 2015) was awarded a Flint Postdoctoral Fellowship at Yale

Kathy Sullivan (BS 1973) received the Linda Duttenhaver Distinguished Alumni Award from the UC Education Abroad Program (UCEAP)

Aradhna Tripati (PhD 2002) was featured in "Spotlight" on the Earth Sciences

Arrivals/Departures

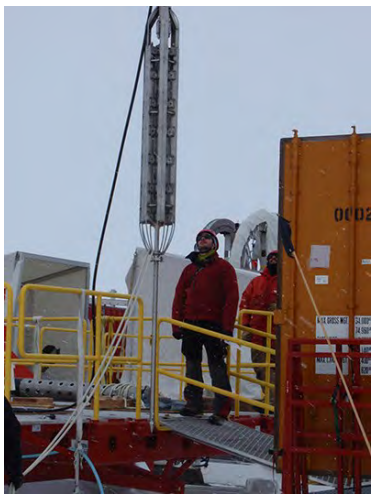
Nicole Feldl was appointed as a new faculty member in Atmospheric Sciences

Lisa Sloan and **Steven Ward** have retired

Slug Web Corner

We are now on Facebook! Like us at **www.facebook.com/UcscEPS**

Slug Science Round-up

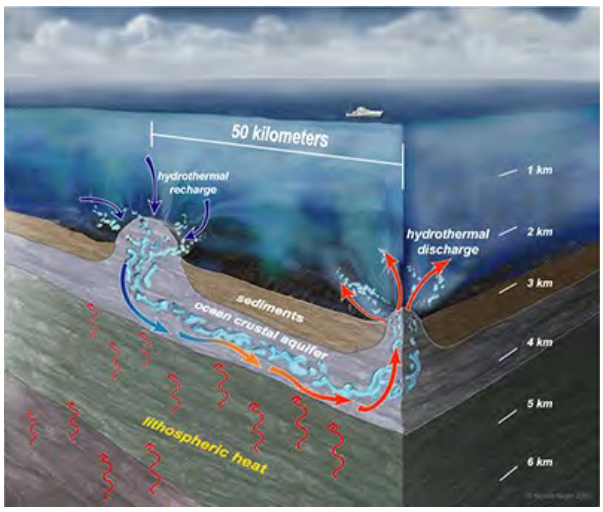


Study finds high heating beneath West Antarctic Ice sheet

The amount of heat flowing toward the base of the West Antarctic ice sheet from geothermal sources is surprisingly high, according to a new study led by **Andy Fisher, Ken Mankoff**, and **Slawek Tulaczyk**. The results, published July 10 in *Science Advances*, will help researchers trying to predict the fate of the ice sheet, which has experienced rapid melting over the past decade.

A "hydrothermal siphon" drives seafloor water circulation

Vast quantities of ocean water circulate through the seafloor, flowing through the volcanic rock of the upper oceanic crust. A new study by **Andy Fisher** and grad student **Dustin Winslow**, published June 26 in *Nature Communications*, explains what drives this global process and how the flow is sustained.



Lake water supplies methane in a warming Arctic

Methane is a potent greenhouse gas, and Arctic lakes are a potentially important source of methane. A new study by **Adina Paytan** and colleagues published in *PNAS* measured how much methane production is associated with Arctic lakes, and predicts how the production will increase as the area undergoes warming.

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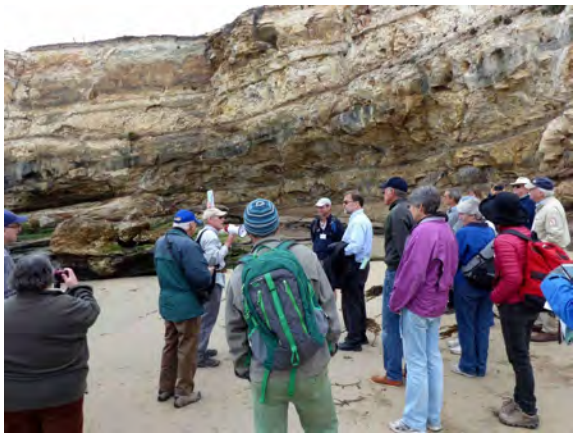
Alumni Reunion Weekend (May 8-10th 2015)

Jerry Weber and participants in a field trip to examine coastal geology and active tectonics, as part of a field trip during the EPS 2015 Reunion

Kathy Sullivan with Chancellor George Blumenthal, sampling red wine during UCSC 50th Anniversary



Casey Moore and Bob Garrison explain the origins natural hydrofractures associated with tar sands north of Santa Cruz, with an attentive group of former students and guests, as part of the EPS 2015 Reunion

Casey Moore explaining local geology, with help from Maya Wildgoose

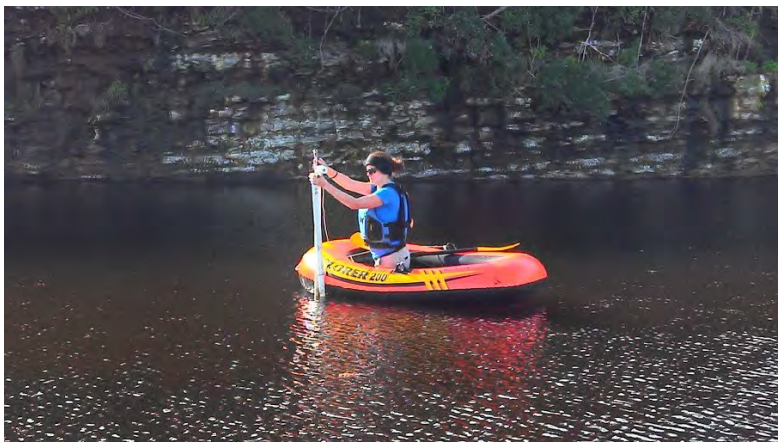
EPS Alumni Reunion Posters

Some of the featured speakers from Saturday 5/9 at the 2015 EPS reunion. From left to right: Kevin Biddle, Mary Bannister, Slawek Tulaczyk.

Slugs in the Field

Invertebrate Paleontology Field-Trip, New York Canyon, Nevada

Jennifer Cossaboon and Rachel Hohn down-loading data



Rachel Hohn at Younger Lagoon

Patrick O'Connell and Sina Sadeghi at Younger Lagoon

EPS graduate students, Sarah Beganskas and Galen Gorski, and EPS major, Dominique van den Dries, collect water quality samples during infiltration testing in Summer 2015.

Slugs in the Field

Noah Finnegan, Jon Perkins and Allison Pfeiffer, McGee Mountain, E. Sierras

Grad student Kyle Broach sample collecting on the Yukatán Peninsula

In 2014-15, Jim Gill sailed on an IODP expedition to the Izu arc, co-authored the most thorough quantitative forward model ever of subduction zone basalt genesis, co-authored a linkage between hot subduction, enriched mantle components, and Earth geochemical evolution, and completed a 15 year-long study with MBARI of Juan de Fuca Ridge MORB.

EPS grad student Erin Todd on the HOBITSS recovery cruise, off New Zealand

Graduate Degrees, 2014-15

Bruce Daniels Fall 2014 (PhD)
"Hydrologic Response to Climate Change in California: Observational and Modeling Studies"

Don Penman Winter 2015 (PhD)
"The response of marine carbonate chemistry to rapid carbon injection during the Paleocene-Eocene Thermal Maximum"

Elizabeth Derse Crook Spring 2015 (PhD)
"Corals and ocean acidification: insights on reef community development and coral calcification in an acidified ocean"

Dustin Winslow Spring 2015 (PhD)
"Hydrogeology of ridge-flank hydrothermal systems"

Alanna Lecher Summer 2015 (PhD)
"From the Land to the Sea: Impacts of Submarine Groundwater Discharge on the Coastal Ocean of California and Alaska"

Doug Hemingway Summer 2015 (PhD)
"Icy satellite interiors inferred from their topography and gravity fields"

Lian Xue Summer 2015 (PhD)
"Investigations of fault zone behavior during earthquake cycles using hydrology and geodesy"

Naor Movshovitz Summer 2015 (PhD)
"Stardust to stardust: a new scaling law for catastrophic disruption of gravity-dominated bodies and implications for the outer solar system"

Lingling Ye Summer 2015 (PhD)
"Rupture characteristics of large earthquakes"

Rachael Klier Fall 2014 (MS)
"A field test of the influence of grain size in determining bedrock river channel slope"

Priscilla Vazquez Winter 2015 (MS)
"Comparative physiological selectivity of Pennsylvanian to Jurassic extinction in bony fish, sharks and invertebrates"

David Santaniello Spring 2015 (MS)
"Transient Response of Bedrock Channel Networks to Pleistocene Sea-Level Forcing in the Oregon Coast Range"

Bethany Nagid Summer 2015 (MS)
"Historical shoreline evolution as a response to dam placement on the Elwha River, Washington"

Fei Wu Summer 2015 (MS)
"Insight into climate variations of the early middle Eocene: High-resolution benthic stable isotope data from site 1408, Newfoundland Ridge"

Qingjun Meng, Summer 2015 (MS)
"The 3 May 2006 (Mw 8.0) and 19 March 2009 (Mw 7.6) Tonga earthquakes: Intraslab compressional faulting below the megathrust"

Graduate Awards

CAMPUS-WIDE OUTSTANDING TA:
Allison Pfeiffer

DEPARTMENTAL OUTSTANDING TA:
Qingjun Meng (Winner)

HONORABLE MENTION DEPT OUTSTANDING TA:
Allison Pfeiffer
Lesley Petrie
Dustin Harper
David Finn
Kerri Johnson
Tracey Conrad

WATERS' AWARD:
Sarah Beganskas
Grace Barcheck
Allison Pfeiffer

DISSERTATION QUARTER FELLOWSHIP:
Jon Perkins

ARCS FOUNDATION AWARD:
Allison Pfeiffer

Graduate Awards (cont'd)

J. CASEY MOORE FUND AWARD:
Sarah White

ZHEN AND REN WU MEMORIAL FUND AWARD IN GEOPHYSICS:
Esteban Chaves Sibaja

COTA-ROBLES FELLOWSHIP:
Elke Teo

PBSCI AWARD FOR BEST PRESENTATION AT GRADUATE RESEARCH SYMPOSIUM:
Claire Masteller

MILDRED E. MATHIAS RESEARCH GRANT:
Allison Pfeiffer

PALEONTOLOGICAL SOCIETY GRADUATE STUDENT RESEARCH GRANT:
Dan Killam

G. ARTHUR COOPER RESEARCH GRANT AWARD:
Marko Manojlovic

NCALM SEED PROPOSAL AWARD:
Allison Pfeiffer

STARS RE-ENTRY SCHOLARSHIP:
Heidi Stauffer

NATIONAL DEFENSE SCIENCE & ENGINEERING GRADUATE FELLOWSHIP:
Mikey Nayak

OUTSTANDING STUDENT PRESENTATION, GROUNDWATER RESOURCES ASSOCIATION OF CALIFORNIA'S OCTOBER, 2015 MEETING:
Sarah Beganskas

Undergraduate Degrees (BS/BA)

Erik Thomas Bagley
Edward Ballaron
Anthony Ian Banks
Alexandra Melania Belinsky
Emma Leah Blake
Patrick Thornton Boyden
Ethan Dewar Brown
Julian Robert Carroll
Mackenzie Rea Dennis
Megan Leigh Dill*
Anna Ingeborg Fairehrenreich
Matthew Steven Farrell
Michael Joseph Filice*
Angelo Crucena Genabe
Gabriel Gordon**
Xochiyotti Kujin Gutierrez
Lauryn Danielle Gutowski
Kais Hamidi
Ryan Matthew Herren
Neal Sanders Hetzel*
Cheyne Tsuyoshi Hirota**
Emily Marguerite Honn*
Jacqueline Ann Hyman
Suhwan Im
Kevin Infante Jauregui
Jessica Pu-Yu Jin
Robert Barrett Jones
Jonas Andreas Kintner
Sierra Keller**
Michael Stephen Kong*
Chelsey Marie Lindo
Karla Susana Lomeli
Robert Bowen Macarthur**
Alexander Mitchell**
Melina Marie Meseroll
Stephen Joseph Neroda
Nicholas Tyler Ogasa
Eric Joseph Oleynick
Diego Armando Osnaya
Jordan Allyn Partida
Brenden Stewart Schenk
Nikolas Jon Schram
Nicholas Alden Takahashi*
Brian Jonathan Takeda
Erik Peter Van Der Meulen
Katherine Louise Walton

Undergraduate Degrees (cont'd)

Matthew Jordan Wilbur*
Donald Andrew Woolf
Yanhong Ye

* Honors
** Highest Honors

Undergraduate Awards

HOLLY DAY BARNETT MEMORIAL GRANT:

Lauryn Gutowski

ASSOCIATION FOR WOMEN GEOSCIENTISTS OUTSTANDING STUDENT AWARD:
Sierra Keller

STARS RE-ENTRY SCHOLARSHIP:
Benjamin Dejarnatt

SANTA CRUZ GEM & MINERAL SOCIETY SCHOLARSHIP:
Marcus Silva

SANTA CLARA GEM & MINERAL SOCIETY SCHOLARSHIP:
Sierra Keller

LT. COL. PASCAL AWARD FOR VETERANS AT UCSC:
Benjamin Dejarnatt

Undergraduate Awards (cont'd)

CAROL FREEMAN LEADERSHIP AWARD:
Flynn Moore

KEELEY COASTAL SCHOLARS AWARD:
Linda Pineda

COWELL COLLEGE SERVICE AWARD:
Flynn Moore

NATIONAL ASSOCIATION OF GEOSCIENCE TEACHERS AWARD:
Sierra Keller

THOMAS WALSH SCHOLARSHIP:
Matthew Wilbur

WEBER-HOLT GRANTS:
Benjamin Dejarnatt
Priscila Diaz
Angelo Genabe
Gabriel Gordon
Hannah Hagemann
Seana Hood
Kevin Jauregui
Devin Minnich
Flynn Moore
Madeline Richards
Marcus Silva

Kingsley Odigie and Chris Morrow sampling water at Pescadero

My Story – Your Story: 2015 Earth and Planetary Sciences Commencement Address

Nancy Ann Budden (BS 1974)
Director, Special Operations Technology' Office of the Secretary of Defense

This past June I was asked to address the UCSC EPS Graduating Class of 2015 and their families. I began and closed by talking about their story, and told my story in between. I shared a few personal "Life Lessons" along the way. Here is a short summary.

Congratulations on completing your degree in Earth and Planetary Sciences from UCSC. A significant chapter of your story begins today. Your story is already unique. You are set apart because of your Earth Science degree. You see the world through "Earth Science-colored glasses." You are taught and trained to observe as observational scientists. This stays with you for life. In most settings you'll be the resident expert on anything scientific. It colors your story from this day forth!

When I graduated UCSC I honestly had no idea of my future beyond graduate school, but the future held some remarkable unplanned opportunities, leading to some different careers, or 'career-ettes' as I call them. Some opportunities are 'experience-driven.' For me, this included an invitation my junior year to join a summer research cruise off shore California, with the USGS. Bob Garrison and Eli Silver encouraged me to jump at the chance, and I did. That experience changed my life, and I pursued Marine Geology for the next decade.

At Gary Grigg's recommendation I attended Oregon State University Graduate School of Oceanography. I studied sedimentary processes and chemistry, spent time in the lab and at sea, enjoying the teamwork and adventure. My graduate degree in Marine Geology led unexpectedly to a great job at Union Oil Company of California as an Exploration Geologist. While at UNOCAL I earned an MBA at night, which led to an 'education-driven' opportunity--to my surprise I was asked by the Reagan Administration to work in Washington D.C. in long-range planning and funding for U.S. Science and Technology. It was not planned and I had to learn a whole new landscape of federal government budget processes, political subtleties, and the realities about how Washington works.

LIFE LESSON #1: Education creates Opportunity.

Continued education and advanced degrees open doors. Continue your education. Consider a degree outside of science or in another science -Business, Law, Art, Biochemistry, Economics, Computer Systems. You can't predict how it may expand your horizons and change your future!

While in Washington I worked with NSF and other federal science agencies -- NASA, NOAA, and USGS. I developed a strong desire to work with NASA. I took a job at NASA Johnson Space Center in Houston, in a completely different field, doing Science Planning for future exploration of the Moon and Mars.

LIFE LESSON #2: Be willing to try something completely different.

At NASA I used the same skills but enjoyed more mission-oriented focus, and a tight team culture. It was inspiring and motivating, a lot of work, and a whole lot of fun. For the next decade I worked with moonwalkers, Shuttle and International Space Station astronauts, scientists, engineers, as we planned future missions. Once again UCSC geology background was critical to considering advanced technologies that scientists would need to understand and characterize Lunar/Mars terrains, regolith formation, surface processes, crater-

ing, Mars warm/wet climate change, tectonics, and volcanism.

In 1998 my husband Terry (a geologist/geophysicist-businessman) was promoted to be President of UNOCAL's newest Exploration and Production corporate office in Dhaka, Bangladesh. Taking a deep breath, we took our 7-year old son and moved to Bangladesh. I created a job working again at UNOCAL, this time for Corporate Headquarters, to create an External Affairs department--hiring and training Bangladeshis in Press Affairs, Publications, and Community Projects. In remote villages of Bangladesh we built schools and libraries, clinics, conducted polio campaigns and flood remediation. We co-hosted President Clinton's first state visit to Dhaka, finding ourselves pulled into diplomatic and political roles —with no training. The Bangladesh experience was mostly about teaching and equipping disadvantaged people, with rampant disease, poverty, and limited resources, to learn to help themselves and their families. We learned one day at a time, in challenging situations. Not rocket science, but very satisfying.

LIFE LESSON #3: Sometimes you have to create your own Opportunity.
LIFE LESSON #4: Sometimes you have to Step out of your Comfort Zone.

The latest chapter of my story started as a result of 9/11, when I had the opportunity to apply my eclectic skill set to Department of Defense's security needs, in the Rapid Reaction Technology Office. As Director for Special Operations Technology, my job involves finding and facilitating funding for diverse advanced technologies for countering violent extremism. Once again I drew upon my UCSC Earth Science foundation in remote sensing, earth imaging, and geomorphology, to foster the advancement of technologies to understand physical environments and promote situational awareness. I have the honor of interfacing with our Nation's top defense leadership and military commands world-wide, collaborating side by side the men and women in uniform who keep us safe, working from Afghanistan to Africa to Asia, in arid deserts and undersea environments, from barren ridge tops of the Hindu Kush to the thickest jungles. Serving with these unsung heroes that sacrifice so much adds purpose to profession. It requires technical expertise, but also constant travel, leadership, and decision making, team building and communication skills acquired from all my previous jobs. It is certainly my greatest challenge so far--and the most satisfying….which leads to:

LIFE LESSON #5: Discover what motivates you.

Your story is already one of success. Discover what motivates you and employs your natural skills. What brings you passion and purpose? End up in a career where work doesn't feel like work! You will excel when driven by love of the job and the mission.

Take time today and in the years ahead to thank those family members and friends who helped you along the way and those professors who helped teach and inspire you. Tell them HOW they helped you. One day you will be asked by a student for help and advice, and you will realize you've become a mentor. A faculty member of UCSC EPS may even ask if you will talk to a graduating class! You will come to appreciate my most recent life lesson:

LIFE LESSION #6: None of your success really matters until you start to give back to others.
(or: "Leaning over to give someone a hand up, keeps your head out of the clouds.")

Your Earth Science background has given you a tremendous foundation. It will take you places you never dreamed. Your opportunities are limitless. Be prepared to be surprised, as you write your own story, and find your own passion and purpose. May God bless you as you step out boldly. Your story will be nothing less than extraordinary! **YOU are the hero of your story!**

Receiving OSD Medal

NAB in Afghanistan

Nancy Ann Budden, with NASA team,

Featured EPS Graduation speaker, Nancy Ann Budden . From left to right: Terry Budden, Jan Garrison, Quentin Williams, Bob Garrison, Nancy Ann Budden, Matthew Clapham, Andy Fisher, and Patrick Chuang

We hope to see you at the Thirsty Bear Brewing Company for our *15th Annual UCSC Earth & Planetary Sciences Alumni Event at Fall AGU!*

When? **Tuesday, December 15th, 2015**
from 6:00pm - 8:30pm

Where? **Thirsty Bear Brewing Company**
661 Howard Street, San Francisco, CA 94105
http://www.thirstybear.com/

Utilizing LiDAR as a tool for urban forestry management

Basia Marcks (Undergraduate)

This summer I worked as an intern at the Naval Postgraduate School in Monterey, CA. I joined the Remote Sensing Center in researching and implementing techniques to increase the accuracy of LiDAR for characterizing forest metrics in Point Lobos State Reserve.

In order to quantitatively determine the accuracy of airborne LiDAR my team worked together to collect measurements of tree height and diameter at breast height (DBH) as well as GPS location of more than 700 trees in the reserve. We then compared our measurements to LiDAR derived measurements in programs such as ArcMap, Trimble Business Center and RiScan Pro.

I ran into some problems while surveying as the dense canopy in some areas of the park prevented the GPS from reaching sub-meter accuracy. In order to correct for these errors I am continuing my research in New Monterey. I will be assessing urban forestry with the hope that less dense canopy will improve GPS measurements and allow the LiDAR system to penetrate deeper into the foliage. I will also compare multispectral LiDAR data with spectral data and assess their accuracy independently and combined. My new LiDAR dataset will be coming from Titan, a sensor with 3 beams with wavelengths of 532nm, 1064nm, and 1550nm. With three bands at my disposal, I expect to see much better spectral classification and I hope to find advantages in tree classification.

The overall goal of my research is to test the benefits of multispectral LiDAR in urban forestry management. Hopefully my results will benefit Monterey's forestry catalogues and provide a new method for city mapping and planting of vegetation that can be applied in many cities beyond Monterey.

Basia Marcks on the hunt for trees, posing with GPS rover and laser range finder in Whaler's Cove, Pt. Lobos State Reserve.

Mercury, From Land to Sea

Priya M. Ganguli (MSc 1998; PhD 2013)

I joined Russ Flegal's lab in 1995 as a master's student in the Earth Sciences Department at UC Santa Cruz. I explored a myriad of research possibilities, which involved San Francisco Bay sampling cruises with spectacular city vistas as well as a 5-week long voyage in the South Atlantic amid pods of dolphins and brilliant sunsets. Despite the call of the ocean, the geologist in me missed mountains and I set my boots on the somewhat less glamorous path of legacy mining impacts. While I was in full swing searching for a field site, I volunteered to join Jerry Weber's *Field Methods* class during their New Idria mapping exercise in the California Coast Ranges. On my drive to our campground I noticed an orange creek running along the road – I had unexpectedly stumbled upon what would become the cornerstone of my career. I spent the following two years measuring various forms of mercury in San Carlos Creek, which owes its color to acid mine drainage (AMD) from the New Idria Mercury Mine (Fig. 1). I was surprised when our results indicated that although AMD contributed plenty of metals to the creek, mine tailings were the primary source of mercury.

Figure 1. *Elena Ramirez (left, EPS undergrad) and me (right) measuring water quality in San Carolos Creek, New Idria, 1997.*

Since that fateful day, mercury has become the focus of my research. The two primary reasons mercury is an environmental concern are (1) it is a toxin that impacts the nervous system, especially in its organic form, monomethyl mercury (CH_3Hg^+), and (2) CH_3Hg^+ readily accumulates in food webs via a process called biomagnification, which can result in top level predators with mercury concentrations more than a million times higher than organisms at the base of the food web (Fig. 2). This bioaccumulative form of mercury is produced by certain anaerobic bacteria that convert inorganic mercury (Hg^{II}) into organic CH_3Hg^+. Anaerobic bacteria thrive in low oxygen and high nutrient environments. Therefore, the movement of water and sediment influence both the transport of mercury as well as its toxicity by altering nutrient and oxygen gradients. So while my area of specialization is aqueous geochemistry, I rely heavily on tools from the fields of hydrology, hydrogeology, geomorphology, microbiology, and ecology, and I typically collaborate with other scientists.

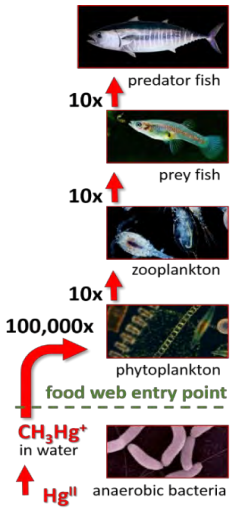


Figure 2. *Mercury biomagnification.*

Even my non-academic experience has involved mercury. After completing my MSc I was hired by the San Francisco Bay Water Board to help evaluate remediation efforts at an abandoned mercury mine in the Tomales Bay watershed. I also gained valuable skills working on a large-scale wetland remediation and groundwater cleanup projects. That position brought me full circle and I finally learned how contaminant impacts can be mitigated. However, I missed research and teaching and eventually decided to take a leap of faith and return to graduate school.

Russ welcomed me back to his lab group in 2008 as a PhD student and I started developing a project to study the effect of groundwater-surface water interaction on mercury cycling. Relative to surface water, groundwater is typically oxygen-depleted and contains high nutrient concentrations. Therefore, the porewater beneath streams, lakes, and coastlines – where groundwater and surface water interact – is often characterized dynamic oxygen and chemical gradients. I hypothesized that this interaction results in a zone of enhanced CH_3Hg^+ production by anaerobic bacteria. I was fortunate to establish collaborations with Peter Swarzenski (USGS) and Adina Paytan (UCSC Institute of Marine Sciences), who study nearshore nutrient cycling associated with the flux of water from the seabed to coastal waters. This hydrological process, referred to as submarine groundwater discharge (SGD), includes a mix of fresh groundwater discharged from the coastal aquifer as well as recirculated seawater (Fig. 2). I suppose the call of the ocean finally won and I spent a lot of time sampling seawater during my PhD! We investigated multiple sites along the shore of the North Pacific and determined that:

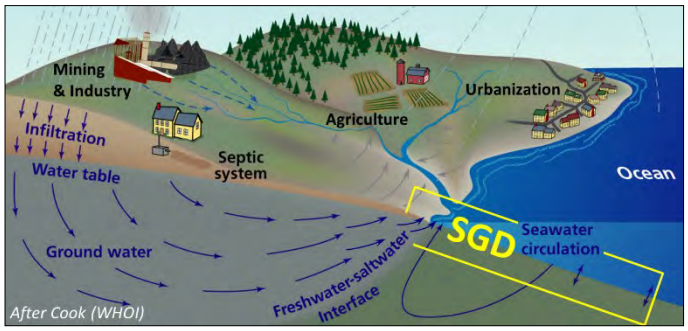


Figure 3. *Submarine groundwater discharge (SGD) is an important vector for the land to see transport of chemicals, such as mercury.*

Bioaccumulative CH_3Hg^+ is generated in coastal aquifers and transported to the ocean via SGD.

SGD may be the predominant source of both Hg^{II} and CH_3Hg^+ in some nearshore environments.

When the flux of SGD is high, the solubility of mercury in seawater appears to increase. This phenomenon could affect the transport and bioavailability of mercury.

Increased groundwater temperature may enhance bacterial CH_3Hg^+ production, suggesting diurnal and seasonal changes play an important role in mercury bioavailability. This finding also has implications for climate change impacts on global mercury cycling.

I recently found out that I will be receiving the 2015 Geological Society of America *Doris M. Curtis Outstanding Woman in Science Award*, largely based on my dissertation work. This recognition is a tribute to the many individuals and organizations that have been an integral part of my career. However I owe a special debt of gratitude to the ~35 undergraduate field and lab volunteers whose dedication made my research possible (Fig. 4).

During the final years of my PhD, I started thinking about postdoc options and decided to aim for a position in Carl Lamborg's lab at Woods Hole Oceanographic Institution (WHOI) in Massachusetts. At a conference I knew Carl was attending, I was determined to meet him and mention the word "postdoc". I was thrilled when Carl suggested I apply for a WHOI postdoctoral fellowship, and elated when my proposal was successful. While at WHOI, I have worked primarily in coastal saltmarsh systems, which sequester CO_2 through the formation of carbon-rich peat. Because mercury binds to sediment and organic carbon, saltmarshes may be important to nearshore mercury dynamics, and their response to sea level rise could affect mercury loading to marine waters. Carl is also involved in a in a number of exciting collaborations in which I have participated. We have investigated mercury uptake in bats from mining and non-mining regions of the Amazon Rain Forest; mercury transport in the Fraser River, Canada; genetic markers associated with bacterial mercury transformations in soil;

Figure 4. *Some of the ~35 undergraduates who contributed to my research.*

and the effect of reactive oxygen species on mercury cycling in natural waters. The past two years have been tremendously rewarding – I have grown as a scientist and formed some life-long friendships.

My time at WHOI is drawing to a close and I will be returning to California in November as an NSF Postdoctoral Fellow at UC Irvine in Kate Mackey's lab. I plan to investigate how the seasonal bloom and die-off cycle of phytoplankton influences the biological uptake and fate of mercury in productive coastal lagoon systems (Figs. 1 and 6). I have also been actively applying to faculty positions and hope to join an institution that emphasizes both teaching and research. One of the most important discoveries I have made on this journey is how much I enjoy working with students. The enthusiasm of my mentees in the face of inclement weather and long hours sustains my motivation – they embody the wonderment of science!

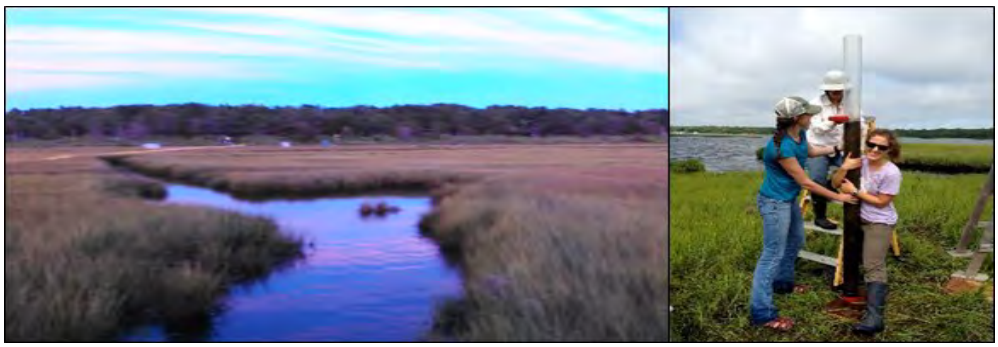


Figure 5. *Two undergraduate interns and me (on the ladder) collecting a coastal saltmarsh sediment core in Cape Cod, MA.*

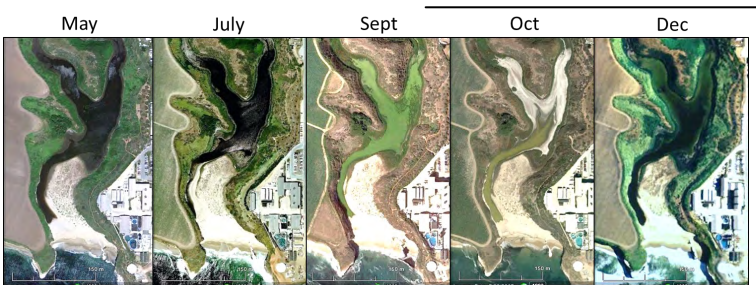


Fig 6. *Seasonal changes in water quality in a California coastal lagoon.*

Summer Field Camp, EART 188A, Poleta Field Belt

WHAT IS THE VALUE OF A GEOSCIENCE EDUCATION? THE ROAD LESS TRAVELLED

By Bob Garrison

Those among you who are teachers will know that following the lives and careers of former students is among the privileges of this profession. We may share their satisfaction when success occurs and provide support when they encounter the inevitable set backs in life.

When thinking about the purposes of education, I am reminded of the founder of earth sciences studies at UCSC, Aaron Waters, whose favorite word regarding education was "opportunity", by which he meant our obligation to provide opportunities for young people. Echoing this sentiment, Donald Kennedy, former Stanford president, wrote in his book *Academic Duty*: "The university is above all else about opportunity: to give others the personal and intellectual platform they need to advance the culture, to preserve life, and to guarantee a sustainable future. Could anything possibly matter more than that?"

Our immediate aim in the EPS Dept. remains providing the best possible scientific education. Broader goals include fostering creative thinking and originality, attributes that can provide opportunities in the geosciences, but also in fields outside the traditional definitions of geosciences. The geosciences with their emphases on reconstructing past events and predicting future ones, and with their combination of empirical and intuitive thinking, are particularly valuable in a variety of careers, some seemingly removed from a narrow definition of geoscience.

In this regard, below are sketches of four UCSC alumni whose careers have deviated from a traditional pathway. They may have taken "the road less travelled", to paraphrase the poet Robert Frost, but their accomplishments are firmly rooted in their education as geoscientists – the platform that provided opportunities for them to explore wider worlds.

Bob Garrison

CONCRETES OF THE FUTURE - - - AND OF ROMAN TIMES

Marie Jackson's career was unconventional from the start. After two years as a psychology major at UCSC, she added an additional major in Earth Sciences in her junior year, graduating with a double major in these two subjects in 1976. Over the years she has developed an interdisciplinary research program that integrates geological, engineering, and archaeological science to describe the material characteristics of ancient Roman architectural and maritime harbor concretes formulated with pyroclastic rock. The overall objective of this research is to apply the knowledge and expertise of Roman builders to develop high performance, modern concretes using volcanic rock pozzolans (materials that react with lime (CaO) in the presence of moisture to produce durable cementitious binding hydrates.)

The road to this enterprise has been neither straightforward nor easy. After doctoral graduate studies in structural geology in France and at Johns Hopkins and Stanford, she secured a position focusing on rock fracturing at the USGS, only to lose this job during a severe governmental cutback. Taking time off with her family, she spent a year in Rome and began exploring the tuff building stones and concrete masonry of republican and imperial Roman era monuments. This provided the springboard to many collaborations and publications with Italian and American colleagues and an eventual research position at UC Berkeley, where she is a Project Scientist researching unconventional, environmentally friendly concretes in the Department of Civil and Environmental Engineering.

Figure 1. Marie Jackson holding ca. 1900-year-old concrete drill cores from Roman edifices constructed during the reign of Emperor Trajan (98-117 CE). The lower core at left is from the Markets of Trajan (~110 CE) in Rome, the one on the right is from Portus Traianus (~115 CE) in Ostia, about 15 km downstream along the Tiber River. Both contain tuff and brick coarse aggregates, but the mortars have different volcanic ash pozzolan and the hydration of lime and mortar mixing procedures were also very different. These are some of the very best architectural and harbor concretes that were made by imperial Roman builders.

This trajectory began at UCSC where courses by Jim Gill (mineralogy) and Rob Coe (geophysics) provided the basis for her later work in understanding the geochemical and mechanical properties of both rocks and cements. Of equal importance was her senior thesis, supervised by Othmar Tobisch, on the Ortigalita fault, which separates the Great Valley Sequence and the Franciscan Formation, work carried out on a cattle ranch founded by her Basque great-grandfather 135 years ago. But the allure of Rome and its multitude of ancient edifices served to change the direction of her research, although earth science remains a major component.

Applying knowledge of volcanological processes to understand pyroclastic rock deposits and successions in the Alban Hills south of Rome, she reconstructed their subsequent alteration in different pedogenic and ground water environments. Her discoveries on the origin of the authigenic mineral assemblages in these volcanic rock pozzolans, as well as the evolution of crystalline cementitious hydrates in ancient Roman cements, have been fundamental to her current research at UCB aimed at reproducing these materials in forms that are consonant with modern industrial uses. She also uses her knowledge of mechanics and fracture processes to explore the mechanical properties of these materials. The Roman concrete materials are environmentally sustainable, since they produce substantially less carbon emissions, have very long service lives, and develop specialty and regenerative properties that are not present in conventional Portland cement concretes.

Currently Dr. Jackson also serves part time as project director of a new drilling project at Surtsey volcano, in Iceland, through the International Continental Drilling Program (surtsey.icdp-online.org/). Surtsey is now 50 years old, and hydrothermal alteration in its tephra deposits seems to represent a geologic analog for the mineralogical processes that occur in much older Roman concrete structures.

She notes that: "I think it is important for people to know that 'alternative' positions in the geosciences really are possible, and that multidisciplinary research endeavors may start slowly but with proper support and perseverance can make important contributions".

CHANCE AND PREDICTION AS A CAREER

Ken Pisciotto's career trajectory has been forged by a combination of curiosity, family needs, financial downturns, and available opportunities. It has included sailing the world's oceans, probing global sedimentary basins, and analyzing risks. A turning point was the financial meltdown of 2008-2009. It is a career that has been varied and unpredictable.

Underlying his diverse jobs are his strong quantitative skills. Following undergraduate work at Stanford, he came to UCSC in the mid-1970s, completing his Ph.D. thesis in 1978, a seminal work on California's Monterey Formation that integrated field, geophysical, and geochemical data. For the next two years he served as shipboard scientist for the Deep Sea Drilling Project, followed by 13 years in petroleum exploration with Standard Oil of Ohio and British Petroleum (BP) based in San Francisco. This latter work included two years with BP based in London where he was part of a quantitative basin analysis group that evaluated future petroleum provinces worldwide.

Responding to his family's wish to return to the Bay Area and seeking stability from the often-turbulent petroleum industry, in 1995 he found an opportunity with the American International Group (AIG) in San Francisco where he headed the environmental insurance engineering group. There he applied the risk training and experience acquired in the petroleum industry to the insurance field. His aptitude for quantitative analysis was key in this new focus on risk assessment, although his geological background was also important.

Much like its application in the petroleum industry, where he routinely utilized Monte Carlo simulation to evaluate the probability of finding oil and gas in a prospect or region and in what amounts, Ken and his team utilized Monte Carlo simulation linked to other decision tools such as decision tree software. These tools served to develop and predict the probability cost of environmental cleanup projects and proposals, and to compare these costs with the costs proposed by companies seeking insurance to help protect from cost overruns on these projects. The uncertainties surrounding these projects derived from a range of variables such as the extent of soil and groundwater contamination, and locations and costs of disposal facilities.

The 2008-2009 financial collapse led AIG to sell assets and significantly reduce the work force, right at the time Ken was discussing a transfer to one of those AIG assets -- the Hartford Steam Boiler Inspection and Insurance Company (HSB). A former colleague at AIG had just moved to head HSB, and, recognizing Ken's skills, persuaded him to join this company in Connecticut where he became Senior Vice President for Engineering. HSB's primary business since its founding in 1866 has been insurance for equipment breakdowns, which in the late 1800s were commonly the explosions of steam boilers.

Figure 2. Ken Pisciotto at his desk in Hartford

Utilizing his experience in loss control engineering gained through his work at the ill-fated AIG, he currently manages a large group of engineers and inspectors who review equipment risks for modern instruments in the medical, manufacturing, and other industries. He also leads efforts to develop new insurance products and quantify risks in the energy field (e.g., energy efficiency, solar insurance products, batteries and other energy storage products, performance products, and renewable energy investments). In addition, research by his group evaluates potential risks, sustainability, and investment opportunities for water and other natural resources.

In retrospect, he states: "I'd say most of my career/job change decisions were made by following what interested me and, of course, having the opportunities available. My move into the insurance world was driven more by the need and desire to stay in the SF Bay Area and to have a more stable employment so that I could provide for my family. Once in and committed, however, I did my best to find out what was most interesting and how I could apply my professional and management skills and experience from the more traditional geology career to my new one."

THE VISUAL DIMENSION OF THE SCIENCE OF GEOLOGY

As an adolescent **Johnathon Turner** accompanied his family on numerous visits to the mountains and wild places, experiences that implanted a love for nature, leading in turn to a major in earth sciences at UCSC and, eventually, also to a career as a glass artist, currently working in Santa Cruz. Very recently, he has changed his surname to 'Turner' from 'Schmuck' to avoid confusion with the pejorative connotation of the latter in several languages.

Viewing Othmar Tobisch's stunning images of thin sections adorning the hallways in the Applied Sciences Bldg. affirmed Johnathon's view of the considerable aesthetic merit in geology. His inclination toward art became crystallized during a field geology course taught by Gerry Weber, who recognized Johnathon's pleasure in observing the qualities of rocks and encouraged him to pursue his aesthetic sensibilities and interest in the visual arts.

During his final years before graduating with a B.S. in earth sciences in 1986, he supplemented science courses with courses in art history and drawing, experimenting with ceramics and painting. Finding these media too quiet and slow, he migrated to glassblowing courses at San Jose State Univ. and very quickly realized a love for the molten world that had earlier captured his imagination during studies of volcanic processes at UCSC. Following his studies at SJSU, he honed his skills through further studies at institutions on the east and west coasts, interspersed with internships at diverse glassworks across the country plus exhibitions both here and abroad, the latter including Venice, Cairo and London.

Reveling in the physicality of the medium and in the ease with which a three dimensional object could be created from a mass of molten glass, he began to construct a series of futuristic objects, followed by works that echoed the everyday nature of glass and by glass sculptures with a fractal nature. These early works gained critical praise and helped him to win a Fulbright Scholarship to the Canberra School of Art in Australia, where he was introduced to the 'Roll Up' technique of glassblowing. Following this process, a piece of blown glass is finished by using traditional cold-working techniques (involving alteration of glass after cooling by sandblasting, grinding, polishing, etc.) on the outer surface of the glass, transforming the glass into something more like stone than glass.

Figure 3. Jonathan Turner using the 'Roll Up' technique in his Santa Cruz workshop

Figure 4. "Rift", a geologically inspired glass vase created by a combination of the 'Roll Up' and coldworking processes. Similar objects made by Johnathon are on display in the atrium floor of the Earth & Marine Sciences Building.

Because the qualities of the Roll-Up glasswork reminded him much more of rocks than of glass, he began to mine his geologic background, leading him to create geologically-inspired glasswork (Fig. 4) -- and to come full circle back to his origins in geology and his great adoration of the outdoors.

In addition to his Fulbright, he has received recognition in the form of awards from a number of glass institutes and exhibitions. His career has included ongoing teaching at workshops and seminars across the U.S., Spain, Australia and Canada. His several publications explore both the mechanics and aesthetics of glassmaking, and include a book, *The Joy of Coldworking*, the first extensive treatise on coldworking techniques. Taking inspiration from his Australian mentors, Johnathon has imbibed the quiet sensitivity that goes into his unique brand of coldworking, where one needs to watch, listen to, and continuously to touch the object being created, actions essential for thoughtful engagement in the creative process.

Viewing his glasswork as part of a life-long love affair with the outside world, he continues to receive artistic inspiration from the rich visual world geology presents.

BIOMINERALIZATION AND GEOCHEMICAL PATHWAYS

Brent Constantz's unconventional career has roots in his family of medical professionals. He recalls that his M.D. father told him "we always do service" and further emphasized the importance of tackling problems whose solutions had big consequences. Absorbing this background led him to follow pathways in his education and professional life that were unique and at times risky. It was his background in the geosciences, however, that provided the platform for him to apply geochemical principles in unique ways to take on important medical and environmental issues.

Figure 5. Brent Constantz at a celebration of UCSC's 50th year

Those pathways began with his undergraduate work at UC Santa Barbara, where he came under the spell of James Valentine, a noted paleontologist whose unorthodox views on the evolution of morphological novelties became part of the canon and spiked Brent's interest in how invertebrates create their skeletons. In the early 1980s he came to UCSC to begin work in paleontology under the guidance of Léo Laporte, who like Valentine, encouraged "out of the box thinking". While some faculty advised Brent to work on more conventional paleontological problems, Léo supported Brent's interest in the budding field of biomineralization (how organisms produce minerals) and his decision to do Ph.D. research on the skeletal ultrastructures of corals, work completed in 1986.

The mid-1980s, however, proved an inauspicious time for recently minted Ph.D.s in the geosciences. The petroleum industry had experienced one of its periodic severe downturns, and jobs were sparse in both industry and academia. Between 1986 and 1988, he managed to receive post-doctoral fellowships, first at the USGS and then as a Fulbright Scholar at the Weizmann Institute in Israel. During this period, he considered abandoning geology and attending medical school, following in his father's footsteps. It was, however, his connection in Israel with Prof. Hans Lowenstam, one of the pioneers of research on biomineralization, who supported his passion for the subject that would lead to his subsequent career.

Returning to a still job-poor environment for geoscientists in the U.S. in the late 1980s and with few job opportunities, he decided to apply his knowledge of biomineralization to medical issues, focusing initially on low bone density conditions (osteoporosis and osteopenia) that affect more than 44 million people in the U.S. and hundreds of millions more worldwide. During the next two decades he formed two start-up companies, assembling small teams of talented chemists to investigate calcium-phosphate cements that could be injected to strengthen weakened bones.

The advances in bone cement chemistry made by these two enterprises yielded products that are commonly used in many operating rooms that perform orthopedic surgery. During this same time period, he also created another medical start-up, a cardiovascular device company addressing pathological calcification of the cardiovascular system

All of the above enterprises build on geochemical knowledge of carbonate and calcium-phosphate mineral phases. These principles are also at work in two of his later start-ups, one focusing on "green chemistry, the other on the production of low carbon products for the built environment. This latter utilizes a process that captures carbon dioxide in marine waters using a biomimetic process inspired by marine biomineralization, forming calcium carbonate under very similar physical and chemical condition, using the same underlying fundament mechanism Yet another recent start-up aims to tap relatively particle-free, deep water from the Monterey Submarine Canyon for desalination. Along with his colleagues in these enterprises, he has obtained more than 150 patents for innovative processes.

Although no one, including Brent himself, could have predicted this trajectory of accomplishments in the entrepreneurial world, his ability to combine scientific and managerial skills, plus his faith in his father's admonition to tackle problems with big consequences are ingredients that are instructive for us all.

We hope to see you at the Thirsty Bear Brewing Company for our
15th Annual UCSC Earth & Planetary Sciences Alumni Event at Fall AGU!

When? **Tuesday, December 15th, 2015**
from 6:00pm - 8:30pm

Where? **Thirsty Bear Brewing Company**
661 Howard Street, San Francisco, CA 94105
http://www.thirstybear.com/

THIRSTY BEAR BREWING COMPANY • SAN FRANCISCO

AGU FALL MEETING
San Francisco | 14 – 18 December 2015

Alumni Notes

1973

James R. Hein, Ph.D: In May 2015, Jim was presented with the Distinguished Service Award by the Secretary of the Department of the Interior, the highest honorary recognition an employee can receive within the DOI. The award was for his outstanding contributions to science in the fields of marine geology and geochemistry.

Jim's current research follows two paths, deep-ocean mineral deposits and paleoceanography. His resource work involves research on ferromanganese crusts, manganese nodules, seafloor massive sulfides, phosphorites, barites, and other marine mineral deposits. Much of his work in paleoceanography applies a range of isotopic proxies to the condensed stratigraphic sections of ferromanganese crusts to better understand regional and global oceanic and climatic changes; this work is carried out with Alex Halliday and others at Oxford University.

Jim has been very productive through the years authoring more that 250 peer-reviewed papers, and editing/co-editing six books and four special issues of journals; he is also associate editor of Marine Geology and Marine Georesources and Geotechnology. Jim is regularly sought after as a keynote speaker at seminars, workshops, meetings, and conferences. Many of the workshops and seminars are to train scientists and students from developing countries in deep-ocean mineral resources and global activities associated with those resources; the last such workshop was in Timor Leste.

Jim's work also involves collaborations and consultations with national and international agencies, for example the International Seabed Authority (ISA) for which he has taught workshops and participated in seminars for member States, including two talks at the United Nations in NYC. Jim is scientific advisor to the Department of State on issues related to the International Seabed Authority. He has taught many workshops for South Pacific Community (SPC), participated in seminars and cooperative research projects, and evaluated their programs. Jim has led cooperative research cruises on US, UK, Russian, German, Japanese, and Korean ships and has worked throughout the global ocean. Jim is also a Fellow of the Society of Economic Geologists and Geological Society of America, and past president of the International Marine Minerals Society, for which he is currently on the Executive Board.

Now Jim is a senior scientist (ST) at the USGS and his office and lab are at the Pacific Coastal and Marine Science Center in Santa Cruz, Ca. On February 11, 2016, Jim will have been with the USGS for 42 years. Jim currently has three PhD students, two at UCSC, and a Post-doc research scientist. Jim looks back fondly at his days in graduate school at UCSC working with Gary Griggs (Gary's first PhD student), Bob Garrison, and Rob Coe, and during his final year with Casey Moore; each was truly a great mentor. Jim is thankful to Eli Silver, who facilitated the introduction that launched Jim's career at the USGS.

1978

Sandy Carlson, BS: Hard to believe, but I have been teaching at UC Davis in the Department of Geology (now Earth & Planetary Sciences, too) for 29 years. My research on brachiopod morphology, ontogeny, and phylogeny continues with my current Ph.D. student Natalia Lopez Carranza, and post-docs Holly Schreiber and Dave Bapst. We are preparing manuscripts and will be giving talks on our research at the Annual GSA meeting in Baltimore in November. I recently submitted an NSF proposal to work with new Stanford faculty member Erik Sperling to embark on phylogenomic studies of living brachiopods, in order to better understand their relationship to other metazoans, and their interesting mineralization history. I continue to serve as the Past-President of the Paleontological Society, chairing the PS Medal and the Schuchert Award committees, which are two of the main awards given by the society each year for excel-

lence in scholarship in paleontology. In October 2014, I agreed to become the Interim Director of the UC Davis CalTeach/MAST (Mathematics and Science Teaching) program, which is designed for undergraduate STEM majors who would like to explore career options in K-12 education. All these activities have kept me quite busy, in addition to sending our son off to college this fall in engineering, while our daughter pursues a major in political science. My life at UCSC was one of the most amazing and valuable times of my life, and I thank everyone who was associated with the Board of Earth Science (as it was called then), but most particularly Leo Laporte and Casey Moore. They inspired me to follow a career in this field, and I am so very grateful for that!

David Greene, BS: I have been teaching structural geology at Denison University, a liberal arts college in central Ohio, for almost 20 years now; with research projects presently in the Mineral King area in the southern Sierra Nevada, and the Confusion Range in western Utah. I have also developed a workshop program teaching earthquake-resistant building techniques to rural builders in Guatemala. Many of us in the geosciences have heard the phrase "Earthquakes don't kill people, buildings do", and after years of teaching about earthquake-resistant building techniques to American undergraduate students, I decided to see if I could bring this information to the people who need it most; the self-trained rural builders and contractors who are still responsible for most new construction in the developing world. I've been able to make two teaching trips to Guatemala in recent years, and hope to continue this project as funding becomes available.

1980

Maya Elrick, BS: I have been at the University of New Mexico now for 25 years! My research focus is in carbonate sedimentology and paleoceanography studying the effects of paleoclimate and sea-level change of deep-time Earth history (pre-Cenozoic). My research and my student's research takes me to beautiful and often remote places and keeps us happily 'imprisoned' in the stable and radiogenic isotope lab preparing and analyzing samples. My daughter is headed off to college next year and I tried my best to get her to consider USCS; she wants to forage her own path and not go where 'mom went' though.

1982

Bob Wright, PhD: Only recent significant news for me is my "retirement" from full-time work as of December 31, 2014 after 45+ years. I have some ongoing work for the next several years with the California Department of Water Resources (DWR), serving on several Director's Safety Review Boards for DWR dams and related facilities, that will keep me" involved." I plan to spend a significant amount of my now "free" time traveling. I am happy to note that over the years I have hired a number of graduates from UCSC and they all have been outstanding geologists; many going on to have significant careers in consulting and teaching. I have a small collection of fairly nice rocks and minerals that I would be happy to donate to the Department; let me know if you are interested.

1984

Jim Falls, BS: This is my 20th year working in the woods of northwest CA as a field geologist in the California Geological Survey's Forest and Watershed Geology Program. There are three of us in the Eureka field office, and we review timber harvest proposals from an Engineering Geological perspective as part of the State's oversight and permitting process. We help fine-tune, and modify (and sometimes reject) harvest plans as a means of reducing their overall impact on the environment. While at UCSC, I worked for Rogers Johnson and Gerry Weber, so I was well primed for this job, thanks to their excellent mentorship: The Santa Cruz Mountains were my other classroom. In 1995, I replaced a man who'd retired after 16 years up here, and thought "Who in his right mind would do the same job for 16 years straight?!" Haha! That's me in spades! Given the

mountainous country, the work is often strenuous, involving whitethorn, poison oak, occasional "gravitational incursions", and yellow-jackets, (El Nino may actually bring serious rain this winter!) but at least I'm not sitting behind a desk! I get to see vistas of the Northern California coast few others ever do. I'm good to go as long as my knees and back hold out! On the personal front, Laura (my wife of 34 years) and I are up to our eyeballs raising a 12 year old girl. Our hair is an entirely different color now, but we think things will turn out OK. Film at 11 on that front!

1987

David Smeeth, BS: David is busy teaching math and science to 9th and 10th graders at the Verde Valley School in Sedona Arizona (vvsaz.org). Verde Valley is an International Baccalaureate high school, and attracts students from all over the world. David particularly enjoys working with teenagers and draws much of his passion for teaching from their energy, curiosity, and desire to know more about the world around them.

1991

Dan Orange, PhD: Just shy of 8 years living in Indonesia, DanO, Bonnie and the Clementines (our lil' Oranges) returned to USA living and Santa Cruz in the summer of 2014. We are relishing every moment of clean air, ease of living, and yes, even not-so-bad traffic. The 3 kids are now in 3 different schools, all within walking /scooter / bicycling distance. Bonnie is president of the Mission Hill Junior High PTA, is in the Pacific Voices choir, and spends a fair amount of time chauffeuring the kids. ONE (Oro Negro Exploration LLC), the start-up that DanO founded with two of the other founders of their Indonesia start-up, Black Gold, including Phil Teas [Ph.D., 1998], is built around using sea floor mapping as a fast and relatively inexpensive tool for de-risking the hydrocarbon prospectivity of offshore frontier basins. ONE is currently teaming with TGS-Nopec on "Gigante", a multi-client mega-survey of the entire Mexican Gulf of Mexico deeper than 750m, plus the Yucatan slope and the Belizean slope. This ~625,000 sq. km. program, currently underway with the first of 3 multibeam vessels plus 1 coring/heat flow vessel, will include a minimum of 1200 geochemical piston cores, 120 Jumbo Piston Cores (20m), and 120 Heat Flow stations. Oh – and DanO is back on the air on KZSC on the "Bushwhacker's Breakfast Club", Friday mornings from 6-9am...at least every Friday when he is in town.

1992

Rich Koehler, BS: I will begin a new job this fall as an assistant professor at the University of Nevada, Reno, Mackay School of Earth Sciences and Engineering and Nevada Bureau of Mines and Geology.

1995

Kirsten Menking, PhD: Successfully went through the promotion process and became a full professor in the Department of Earth Science and Geography at Vassar College, where she has been teaching since 1997. Shortly thereafter, she was named to the Althea Ward Clark endowed chair in Environmental Science. In the spring of 2014, the second edition of her textbook, Environmental Geology: An Earth System Science Approach, was published. Co-written with Dorothy Merritts and Andrew DeWet at Franklin and Marshall, the textbook contains a number of boxed features discussing the importance of Earth science to public policy and emerging research in the field, both designed to spark students' imaginations and keep them reading. If you're looking for a new textbook for your introductory level course, please contact W.H. Freeman for a desk copy and check it out!

1997

Katherine Howard Fernald, MS: I am thoroughly enjoying teaching introductory geology at New Mexico State University - Alamogordo. Although, there is a distinct lack of glaciers in New Mexico.

1998

Phil Teas, PhD: I am once again partnered with Dan Orange in a new company named ONE. This follows collapse of our previous company Niko (which had bought out Black Gold). We had managed to drill several wells back in 2013 across Indonesia, which was exciting and stressful. The new company is focused on conducting bathymetry surveys globally either as spec programs or contracted. We had collected about 1 million square kilometers in Indonesia and find the data incredibly interesting. So, branching out and trying to increase the amount of seafloor mapped. Some big surveys coming up! Personally, I have moved to Bali and am remodeling a house, almost finished. It's kind of like Santa Cruz with 3rd world flair and Hindu temples.

2001

Louis Arighi, B.S., After earning an MS at Oregon State, and dabbling in geotechnical engineering and surface water sampling in Seattle and central Illinois, respectively, I returned to the Bay Area to work for an environmental consulting firm in Oakland. In 2010, I followed my wife (a fellow Banana Slug from the history department) to Switzerland, which was a great learning experience, and a beautiful (though very expensive) place to live. After returning once again to the Bay Area in 2013, I jumped back into environmental consulting with Trihydro in Concord, CA. Currently I'm working with a variety of clients on environmental assessment, mitigation, and remediation projects around the Bay Area in in the Central Valley of California.

2002

Brigette A. Martini, PhD: In capsulizing my life post-UCSC…I become slightly concerned. I believe I may have a serious attention span issue. I left Santa Cruz for Sydney, Australia – living and working there for almost four years in the private survey sector (airborne hyperspectral imaging) and traveled the world, seeing much of Oz (more than most Aussies), Greenland, Europe and Africa. I was a private consultant in remote sensing in Ashland, OR for two years before then switching gears and heading out to Ohio where I was on the AFIT Physics faculty at Wright-Patterson AFB for three years teaching physics and remote sensing to both Air Force and Naval aviators and navigators. I then went 180 degrees and took a job as a green-fields exploration geologist in Reno, NV working for Ormat – the largest geothermal company in the world (which – isn't saying TOO much – geothermal…always the bridesmaid). I was their only volcanologist, so got handed Alaska, California and Hawai'i. Nice! Since leaving Ormat, the last five years have been filled with more time in Sydney, grabbing a husband (hi Chris!) and now back working for another Aussie company called Corescan based in Perth, Australia (which builds and runs automated, hyperspectral corelogging systems mainly for the resource industry). I live and telecommute (and ride in a lot of planes) from Bend, OR. Any slugs ever passing through Bend, holler at me; I'll take you on the Ale-Trail to our 16 breweries here in town! Geo-Paradise….
brigettemartini@gmail.com

John Cook, MS: My wife Kathy and I are still climbing on a regular basis and have become somewhat of fixtures at Pinnacles. I have replaced almost 100 old bolts there since apprenticing with our local AS-

CA (American Safe Climbing Association) crew – Bruce Hildenbrand and Clint Cummins. I have helped with a PCAD event the last few years – Pinnacle Climber Appreciation Days – we work on improving climber approach trails and reinforcing/refurbishing/nurturing some of the more frequently used climbing areas – in conjunction with the park service and a local advocate - Larry Arthur from Mountain Tools in Carmel. Brad Young (the current Pinnacles climbing guidebook author) and our friendly crew from the Mud N Crud Forum are also heavily involved with climbing activities at Pinnacles. We call ourselves the Masters of Mud. I have been fortunate to be involved in establishing some fun new routes and restoring older ones. I have also been involved in establishing some new routes in The Alabama Hills and on Sonora Pass Highway. My teaching load has suffered the last few years from low enrollment and online changeovers. I taught 6 sections at San Jose State last year but that evaporated this year with people returning from vacations and sabbaticals. It looks like things will work out for me to have some classes at West Valley and DeAnza again this year.

2004

Pete Adams, PhD: I'm happy to report (for the Alumni news) that I was awarded tenure with promotion to Associate Professor within the Department of Geological Sciences at the University of Florida. I'd be interested in seeing any GeoSlugs that may be passing through Gainesville in the future.

2007

Mike Hutnak, PhD: It's been a big couple of years for me. I set up a partnership between the UCSC/OSU Academic Heat Flow facility and Fugro GeoConsulting, and have been providing heat flow data acquisition and consulting services to the commercial market worldwide. I'm in the process of developing and building the next generation of heat flow equipment, and should have the first set completed this winter.

2010

Pete Lippert, PhD: Currently an Assistant Professor at the University of Utah. I realize I may be too late to contribute to the EPS Newsletter, but just in case I'm not, I'm sending a photo of EPS alumni. All 5 of us received some of our academic training at UCSC in some incarnation of EPS. Here we're pictured at sunset overlooking the northern foothills of the Uinta Mountains in south-central Wyoming. All 5 of us are involved in IODP Expedition 342 science, and we were together for the 2nd Post-Cruise meeting that was held at Snowbird Resort, Utah in September 2015.

From left to right:
Don Penman (PhD 2015, shipboard scientist, currently a Flint postdoctoral fellow at Yale University)
Pete Lippert (PhD 2010, shipboard scientist, currently assistant professor at Univ. of Utah)
Dick Norris (BSci 1981, shipboard scientist and Co-Chief Scientist, currently professor at UC San Diego)
Wendy Kordesch (BSci 2008, shore-based scientist, currently a PhD student at Univ. Southampton, UK)
Steve Bohaty (PhD 2006, shore-based scientist, currently Lecturer (equivalent to assistant professor) at Univ. of Southampton, UK)

Slugs not pictured but involved with Exp. 342 include Jim Zachos and Howie Scher.

2013

Krista Myers, BS: After graduating from UCSC in Spring 2013, I worked as a glacier guide on the Matanuska Glacier in Alaska. I did two seasons of glaciology related field work on the Matanuska with UCSC Professor Slawek Tulaczyk before getting a job as a geologist at an environmental consulting company (Stantec) just over the hill from UCSC in Los Gatos. I stayed at Stantec for a year and half before getting accepted to Louisiana State University to start a PhD with Dr. Peter Doran to study climate change, hydrology, and planetary science. I received the NSF Graduate Research Fellowship Program (GRFP) grant in Spring 2015, and I am deploying to Antarctica (for the first time!) to work in the Dry Valleys in October 2015. Hope all is well at UCSC!

David Mason, BS: I graduated Fall of 2013. For the year of 2014 I worked as a elementary science teacher in the spring inspiring young minds and for the summer I work for the national park service at the Oregon caves national monument. I worked as a tour guide and researcher. My research was on micro faults and how they affected the cave development and formations. Funding ran out and my research cut short. I started working for the navy as a civilian in March 2015. I work with radiation and do environmental monitoring to make sure the navy doesn't affect the environment. The types of monitoring I do are soil, water, air, shoreline and marine life. It's interesting work and I have the job for at least 2 and a half years.

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When? **Tuesday, December 15th, 2015**
from 6:00pm - 8:30pm

Where? **Thirsty Bear Brewing Company**
661 Howard Street, San Francisco, CA 94105
http://www.thirstybear.com/

AGU FALL MEETING
San Francisco | 14 – 18 December 2015

Update on Earth and Planetary Sciences Development
Andy Fisher, EPS Professor and Development Coordinator

EPS had a reunion!

EPS celebrated UCSC's 50th anniversary with an action-packed department reunion (May 8-10, please see photos on p.5), featuring alumni and faculty speakers, a poster session with current graduate and undergraduate students, two field trips, fine beer at a local brewery, a breakfast gathering at Steamer's Lane, and lots of time to catch up and reflect on the last five decades of hard work, professional achievements and fun. It was great to see so many old colleagues, and to meet families and make new friends. Our alums have had (and continue to have) interesting and high-impact careers, and it is gratifying to hear their stories and learn about our department's influence across a many disciplines and professions. The reunion could not have been held without a lot of work by many people, but I especially want to recognize: Judy Van Leuven and Amy Kornberg (EPS Office, logistics, organization, management); Mary Bannister and Kevin Biddle (outstanding alumni speakers), Thorne Lay and Slawek Tulaczyk (compelling faculty speakers), and Gerry Weber and Casey More (amazing field trip leaders). We received staff support from the PBSci Development Office (J.J. Mack), partial funding from the PBSci Dean's office (thanks, Dean Koch), and a tasty keg of craft ale from alumnus, Peter Burrell. Most of all, I want to thank our participating alumni and families who took time from their busy lives to come back to UCSC, attend these events, and share stories about their days as students and professional Earth and Planetary Scientists.

EPS has an Advisory Committee!

The EPS Advisory Committee (EPS-AC) helps to set and meet development priorities and plays a critical role in connecting the department to our alumni network. The EPS-AC is chaired by Mike Underwood (BS, 1976, underwoodm@missouri.edu) and Peter Vrolijk (PhD, 1987, pvrolijk@comcast.net), and last year, we added two new members: Krystle Catalli (BS, 2005) and Stefano Mazzoni (BS, 2000; MS 2002). We continue to have participation on the EPS-AC by Gerry Weber (PhD, 1980), Chuck Lawson (BS, 1973), Greg Beroza (BS, 1982), Bill Connelly (PhD, 1976), Laura Stupi (BA, 1997; MS, 2000), Richard Gordan (BA, 1975), and Shenwen Jin (Postdoc, 2000). Please feel free to contact Mike and Peter with ideas, encouragement, or questions about how you can get involved with EPS alumni activities, including regional mini-reunions/social gatherings, which are to be a focus of the coming year.

EPS has development goals!

The EPS website highlights several development goals (https://eps.ucsc.edu/support-us/index.html), particularly those supporting our students.

Scroll down to funding priorities and links to get more information and/or make contributions. Here are a couple of highlights for the current year:

(1) The J. Casey Moore Fund now has >$150k in contributions. Interest from this fund currently supports student research activities. Once we reach $300k, this fund can start supporting graduate fellowships. **NOTE:** there is a 1:1 match for this fund in 2015! *Your generous contribution will be doubled.*

(2) The Weber-Holt Fund is approaching $200k, and continues to support many of our majors to attend the Summer Field program. *Please help to support this critical part of the EPS curriculum.*

Two newer funds are also making good progress:
(3) The Wu Fund is currently endowed with almost $50k, and we have a short-term target of bringing this fund up to $75k, helping to support graduate students in geophysics.
(4) The Earth's Environment Fund was created to support student research involving topics such as water resources, climate change, and the evolution of landscapes and aquatic systems. **NOTE:** there is a 1:1 match for this fund in 2015! *Your generous contribution will be doubled.*

EPS has a future – *please be part of it!*

As you can read elsewhere in this newsletter, EPS at UCSC continues to be highly successful, attracting outstanding faculty, lecturers and young researchers; producing and distributing new ideas, tools and knowledge; and supporting the training and professional development of numerous students and other scientists. In the last few years, we have welcomed amazing new colleagues, accumulated many awards (to faculty, researchers, and students), and acknowledged the achievements of our senior colleagues – a few have "retired," but they remain active and appreciated members of the EPS community.

If you have not done so recently, please visit our News page (https://eps.ucsc.edu/news-events/recent/index.html), and prepare to be amazed at awards, high profile publications, and other activities through which EPS at UCSC is making headlines and having an impact.

We value your ideas and ongoing support. Please consider how you can engage the EPS Department and contribute to programs you think are important. As always, we welcome your suggestions for ways that we can be more effective in growing and sustaining the EPS community.

Please let me know what you think. Andy Fisher (afisher@ucsc.edu)

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Earth and Planetary Sciences Department
University of California, Santa Cruz
1156 High Street
E&MS Building, Room A232
Santa Cruz, CA 95064
http://eps.ucsc.edu

Ways to Give to the Earth and Planetary Sciences Department at UCSC

Your contribution can help to build an endowment that will have lasting benefit for future generations of EPS students, or you can support ongoing needs in teaching, research and service.

On the next page we describe current high-priority EPS development goals.

(1) Please Give Online
Please visit the EPS web site for information on current funds/endowments and EPS Department priorities:
`https://eps.ucsc.edu/support-us/`

We recently updated this part of the EPS website. You can read about current development priorities, and after choosing the fund/endowment of your interest, you will be transferred directly to a page where you can enter the amount of your gift and credit card information.

This is the easiest way to support the EPS Department!

(2) Please Give by Check or Credit Card
Please use the form on the next page to prepare your donation. We list the four highest EPS development priorities; more information for each of these can be found at the website above.

(3) Please Call or Email for Information
We are glad to discuss your interest in supporting EPS at UCSC, and to provide information that may be helpful in directing your contribution to be consistent with your goals.

Please contact:
- Judy Van Leuven (Department Manager): 831-459-4478, judy@ucsc.edu
- Quentin Williams (Department Chair): 831-459-3132, qwilliams@pmc.ucsc.edu
- Andy Fisher (EPS Development Coordinator): 831-459-5598, afisher@ucsc.edu

(4) Please check with your employer to see if they will match your donation!

Donor Name(s): _____

Address: _____

Email: _____ Telephone: _____

Gift amount: $ _____ Gift designation: _____

Please attach a check payable to the UC Santa Cruz Foundation (with fund/endowment designation written under "Memo"), or enter credit card information:

Credit Card Type: Visa ☐ MC ☐ Discover ☐ AmEx ☐

Credit Card #: _____ Expiration Date (Mo/Yr): _____

Name on Card: _____ Signature: _____

My company will match my gift (company name): _____

Please mail to: UC Santa Cruz, MS: PBSci Development, 1156 High St, Santa Cruz CA 95064

Or donate online at https://eps.ucsc.edu/support-us/index.html

Four highest EPS Development Priorities (Fall 2015):

Casey Moore Fund
The Casey Moore Fund supports current EPS graduate students as they conduct thesis-related research. ***Match alert!*** Contributions up to $5000 for the current calendar year will be matched 1:1 by a generous alumnus.
Double the impact of your contribution by donating before the end of 2015.

Gerald Weber and Suzanne Holt Fund
The Weber-Holt Fund supports EPS majors while they participate in summer field camp, an iconic experience that satisfies the "capstone course" requirement applied to all undergraduates at the University of California.

Zhen and Ren Wu Memorial Award Fund
The Wu Fund supports EPS graduate students in geophysics as they conduct thesis-related research, with an emphasis on students seeking careers in exploration industries.

Earth's Environment Fund
The Earth's Environment Fund supports EPS graduate and undergraduate students as they conduct thesis-related research involving topics such as water resources, climate change, and the evolution of landscapes and aquatic systems. ***Match alert!*** Contributions up to $5000 for the current calendar year will be matched 1:1 by a generous alumnus.
Double the impact of your contribution by donating before the end of 2015.

For all of the above funds, our goal is to build endowments that will assure benefit for years to come. If you would prefer to provide support that can be used immediately, it should come as no surprise that the department welcomes these gifts as well:

☐ **Earth and Planetary Sciences Fund**
This unrestricted fund supports immediate EPS research, education, and development needs.

Please see http://eps.ucsc.edu/support-us/index.html **for more development options**

UC Santa Cruz

Earth & Planetary Sciences

1156 High Street
Santa Cruz, CA 95064
http://eps.ucsc.edu

☐ Please Update My Contact Information

Name _____ **Telephone** _____ **E-Mail** _____

Year _____ **Degree** _____ **Is This A New Address?** ☐

Address _____
Address City State Zip

News about myself and other classmates

Please use space below and continue on facing page. Let us know where you are and what you are up to!

May we publish your comments on the Earth and Planetary Sciences website under Alumni? ☐Yes ☐No
☐ I would prefer my comments to appear only in the Earth and Planetary Sciences newsletter.

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Katharine M. O'Brien
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Kristine and Keith Pankow

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