Earth & Planetary Sciences at UC Santa Cruz

Fall 2018

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Chair's welcome

Greetings All!
Starting just my second year as chair but 26th year as a member of the department, I can assert that the general state of EPS is excellent. First, it's worth considering a number of recent department events and milestones. At the June commencement ceremony, EPS honored 65 graduates, one of the largest and possibly the most diverse group of graduates in department history. This reflects well on the department's continued commitment to high quality teaching/training, as well as efforts to create a welcoming environment for all who hope to pursue careers in the geosciences. The commencement speaker, Dr. Vincent Matthews, was one of our first graduate students, in fact the second to receive a Ph.D. (1973) from the program. He spoke fondly of his time here, and of taking advantage of the opportunities that came to him through the relationships he developed while a student at UCSC. If all goes well, it would appear that we will graduate another forty or so students in June 2019.
With the launch of an Environmental Sciences degree option, 2018 also marks the beginning of a new era for the EPS undergraduate program. The ESCI major is being offered jointly with the Ocean Sciences Department and with additional curriculum contributions from faculty in Microbiology and Environmental Toxicology as well as Environmental Studies. This collaborative effort, nearly 7 years in the making, was lead by Professors Patrick Chuang (EPS) and Raphe Kudela (OS), with input from faculty of both departments. Patrick is serving as the inaugural ESCI program director, and Raphe is the first associate director. Kudos to both for their efforts. The curriculum has a strong emphasis on the physical and chemical aspects of environmental processes, from climate and hydrology to biogeochemistry. As with the Earth Science major, a set of core courses (ESCI 100A-C) will serve as the foundation for the program addressing the fundamentals of environmental systems, with a strong emphasis on quantitative problem solving including numerical modeling. Beyond the foundation courses students will have a large variety of options for electives. As of this writing, the program already has a dozen declared majors.
In 2018 the EPS department also welcomed two new faculty, Dr. Margaret Zimmer who arrived in January followed by Dr. Mathis Hain who arrived in July.

Chair's welcome (cont'd)

Margaret is a hydrologist whose research focuses on catchment hydrology, with an emphasis on water cycle dynamics across a range of spatial and temporal scales. She has already launched projects investigating aspects of California hydrology. Mathis is a theoretical biogeochemist who studies the dynamics of global biogeochemical cycles on human and geologic time scales. Both will be offering courses integral to the Environmental Science and EPS majors. Along with hires of the previous 4 years, EPS now hosts a cohort of 5 assistant professors that has significantly shifted the demographics of the department.

Thanks to the generosity of Alumni, EPS also had a banner year for fund raising. A number of our endowments grew substantially in 2018, and a new endowment was started by a generous gift from UCSC alumni Dr. Thomas Bullen (PhD, Earth Sciences, 1986) and his partner Roger Koopmann (BS, Economics, 1980). Tom and Roger wished to support research opportunities for EPS undergraduates, and established the Support for Undergraduate Research in Geological and Environmental Sciences (SURGES) endowment. Tom passed away in September 2018, and the fund continues to grow with gifts in his honor. Please read more about SURGES elsewhere in this newsletter (p.27, p.32).

Last but not least, in maintaining a tradition of excellence in EPS, several senior faculty were recognized for their research achievements in 2018. Professor Francis Nimmo was awarded the Paolo Farinella Prize from the Europlanet Society for his contributions to the understanding of the internal structure and evolution of icy bodies in the solar system. Andy Fisher was elected AGU fellow for his contributions to understanding the dynamics of fluid flow through ocean crust and aquifers. Also elected AGU fellow, emeritus Professor Eli Silver and Associate Research Scientist Adina Paytan. And finally, I was awarded the Ida Benson Chair of Ocean Health, a 5-year endowed chair, notable as the first endowed chair for the department.

I close by noting that, once again, the EPS graduate program ranked among the top 20 in the U.S. News and World Report's 2019 Best Graduate Schools (10 in Geophysics & Seismology, 19 in Earth Sciences). To put this achievement in perspective, virtually all the other ranked programs are larger and exist on campuses that have been around much longer than UCSC, and so typically possess greater resources in the way of endowments for graduate fellowships, faculty chairs, and undergraduate support. To achieve and maintain such a high level of excellence while also educating 180+ undergraduate majors (one of the largest programs in the country) requires a truly uncommon commitment on the part of EPS faculty and staff. You will hear more about EPS community activities and achievements in the rest of this newsletter. Enjoy the stories, and please stay in touch.

We hope to see you in Washington DC for our

18th Annual UCSC EPS Alumni Event at 2018 AGU!

Tuesday, December 11, 2018

from 6:00pm - 8:30pm

Baby Wale, 1124 9th Street NW, Washington DC, 20001

(across from the convention center!!!)

Thanks to generous donation pledges to the EPS General Fund by some of our EPS Alumni Council members, we are able to afford to continue the tradition of our annual alumni event!

Go Slugs, You Rock!!

Department News

Jim Zachos

Nicole Feldl

Francis Nimmo

Prof. **James Zachos** was appointed to the Ida Benson Lynn Endowed Chair in Ocean Health

Prof. **Nicole Feldl** won an NSF CAREER Award

Prof. **Francis Nimmo** was awarded the 2018 Farinella Prize for studies on the satellites of the giant planets.

Prof. **Andy Fisher**, Emeritus Prof. **Eli Silver**, and Research Professor **Adina Paytan** all became Fellows of the American Geophysical Union.

Alum **Earl F. O'Bannon** (PhD 2017) received a Mineral and Rock Physics Graduate Research Award (Mineral and Rock Physics Section)

Alum **Lingling Ye** (PhD 2015) received the Keiiti Aki Young Scientist Award (Seismology Section) from the AGU.

Alum **Harold Tobin** (PhD 1995) received the Paul G. Silver Award, presented jointly by Geodesy, Seismology, and Tectonophysics Sections of the AGU.

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New Environmental Sciences Major Update

A new undergraduate-only major in Environmental Sciences was launched by EPS in partnership with the Ocean Sciences Department starting in the 2018-19 academic year. This new major covers topics ranging from climate change, water resources, air and water pollution, oceanography and atmospheric science. The overall goal is to teach students to apply knowledge and skills from the disciplines of physics, chemistry, and mathematics to these topics. It complements existing degree programs in Earth Sciences, Environmental Studies, and Ecology and Evolutionary Biology. One month after launch, there is considerable student interest in the major and we hope that over the next few years it will grow into an exciting and vibrant community similar to our successful Earth Sciences major. More information about the new major is available at: https://esci.ucsc.edu.

GEODES Geoscientists Encouraging Openness & Diversity in the Earth Sciences

Contact Us:
ucscgeodes@gmail.com

GEODES is a student-run discussion group that aims to promote communication and diversity within the EPS Department. In 2016 GEODES received the Chancellor's Achievement Award for Diversity.

Dear EPS community,

It's been a great year for GEODES (Geoscientists Encouraging Openness and Diversity in the Earth Sciences)! We are a grad student-run group focused on building community among EPS faculty and students, and breaking down barriers to inclusion of underrepresented groups in Earth sciences. Early last spring, we did our first fundraising drive, through UCSC's Giving Day. We were both thrilled and deeply humbled to receive $10,800 from 81 alumni, faculty, and current students! From the bottoms of our hearts, thank you! These funds, along with financial backing from the EPS department and donations from Woodstock's Pizza and Lagunitas Brewing, ensure the continued viability of GEODES by providing ongoing support for future events, and enabling growth in new directions.

Over the last year, we have hosted ten events, including workshops on inclusive teaching practices, racial diversity in the Earth sciences, work-life balance, and Imposter Syndrome; a mental health brown bag; a student research symposium; quarterly pizza dinners; an end-of year reflection and goal-setting event; and our ever-popular career panel. We look forward to hosting more events that bring the community together to discuss important topics and learn new ways to engage with each other. As always, we welcome any and all feedback! Just email us at ucscgeodes@gmail.com, or visit our website at http://ucscgeodes.wixsite.com/home for updates and resources.

Love,

GEODES

The Earth and Planetary Sciences Alumni Council (EPS-AC)

The EPS-AC meets annually at UCSC in the spring, and assists throughout the year with EPS development, networking, and alumni activities. Recently they have hosted alumni events in Houston (March 2017, Dec 2018) and New Mexico (October 2018), and also gave out the first Alumni Hall of Fame awards (see p.8)

The EPS-AC has been around long enough (since Spring 2013) that some of the original members have rotated off and new members have joined. Below is a listing of current members. Emails are included for the current Co-chairs - please contact them to share ideas and/or express interest in being part of the EPS-AC.

We thank these former EPS-AC members for their ideas, enthusiasm, and support:
Gregory C. Beroza, BS 1982
William Connelly, PhD 1976
Gerald (Jerry) Weber, PhD 1980

EPS-AC current membership:
Kevin Biddle, BS, 1973
Nancy Ann Budden, BS, 1974
Krystle Catalli, BS, 2005
Jon Erskine, MS, 1998
Richard Gordon, BA 1975
Shengwen Jin, Postdoc 2000
Charles A. Lawson, BS 1973
Stefano Mazzoni, BS, 2000; MS, 2002 - Co-Chair
(stefano00038@yahoo.com)
Laura K. Stupi, BA 1997, MS 2000
Michael Underwood, BS1976
Peter Vrolijk, PhD 1987 - Co-Chair
(pvrolijk@comcast.net)

EPS-AC dinner, May 2018

Alumni Event (Houston, 2nd Dec 2018)

Following last year's event in Houston, Stefano Mazzoni organized an afternoon event at St Arnold's Brewing Company. It was a beautiful day which brought out a huge crowd of people to the brewery. About 17 people attended (including 5 little potential future slugs): Stefano Mazzoni with little one in tow, Daniel Minisini and his two kids, Phil Teas and his guest, Shawn Adamson with his wife & two kids, Tim Cramer and his wife, Eric Peterson and his wife, Yingcai Zheng, and Adam Heffernan, While a few people had to back out last-minute, those who attended enjoyed the time to reconnect with old friends and meet some new fellow slugs here in Houston. The kids enjoyed handing out buttons and the adults enjoyed taking a beer glass home (and some groovy department t-shirts).

We are in the early stages of planning the next Houston meeting, likely in **Feb-March 2019**. Please contact Stefano at

stefano00038@yahoo.com

if you are interested in attending.

EPS alum event, Houston, Dec 2018

Alumni Hall of Fame

This year the UCSC Earth and Planetary Sciences Advisory Committee created an Alumni Hall of Fame to honor the achievements of our fellow undergraduate and graduate alumni. The members of the Alumni Council wish to recognize our alumni colleagues annually for their contributions and achievements built off the Santa Cruz experience.

Recipients of this year's award include Mike McGroder, Judy Parrish, Hilde Schwartz and Kathy Sullivan. This represents a start – we know that many more people are worthy of this recognition. Here is a brief description from each recipient about how her or his Santa Cruz education influenced their subsequent careers:

Mike McGroder

"In my career working in the oil industry, I was fortunate to work with hundreds of geoscientists from all over the globe. During many of those collaborations I became convinced that my training at UCSC in the late 1970's was second to none in terms of preparing me for all the complexities and challenges that petroleum geologists face in their daily work lives. The late 1970's was a time of great geologic excitement in California, just 20 years past the advent of plate tectonics as a new unifying theory. I remember spending almost every weekend studying field geology with great UCSC faculty mentors beneath the central California seacliffs, along the San Andreas fault, or in the Sierra Nevada. My love of field geology was born on those weekends and to this day I enjoy teaching it to the next generation as a semi-retired petroleum geologist and instructor for summer Field Camp for the University of Washington."

Judy Parrish

"From the day I matriculated as an undergraduate at the beginning of UCSC's third year, I was thrilled to be surrounded by so many smart students and such a young, enthusiastic, and approachable faculty. My questions were answered and challenged and soon were honed into research projects, so I learned the disciplines of research practically from the first day. That experience is what made my success as a researcher possible. UCSC is also where I learned the value of service as principal organizer of the first Earth Day at UCSC and leader of an initiative against sexual harassment."

Hilde Schwartz

"I had no idea when I completed my PhD in Earth Sciences at UCSC 35 years ago that I would return 15 years later to 'lecture' in my graduate department. And no idea when I began teaching at UCSC how enduring, rewarding, and fun the job would prove to be – in no small part because of the very strong field geology program I inherited from the incomparable Jerry Weber.

Hall of Fame (cont.)

Hilde Schwartz (cont.)

It's hard to imagine a better career than one that requires you to regularly work outside, with rocks and fossils, in the company of bright, inquisitive, intrepid students."

This was Hilde's final year teaching Summer Field. Summer Field alumni and current students presented her with this spectacular plaque to commemorate her years of outstanding teaching.

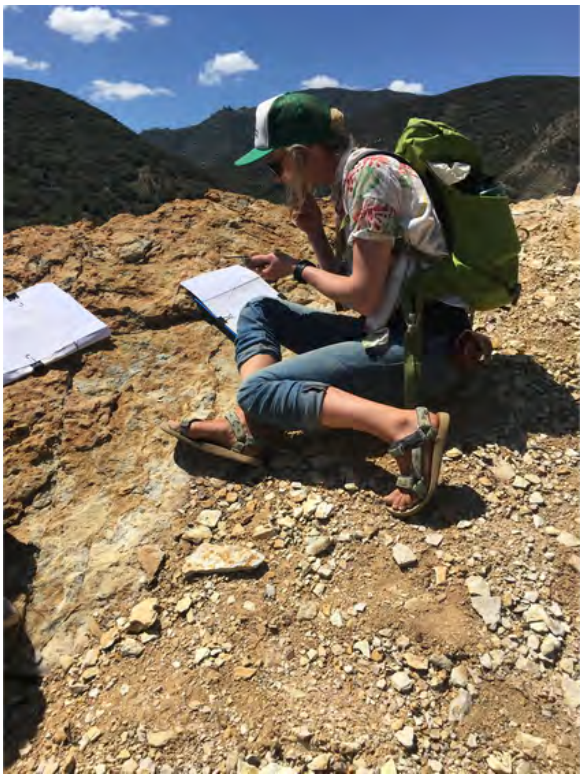
Kathy Sullivan

"It is no exaggeration to say that I owe my career to UCSC. I arrived on campus as a languages major and graduated as an earth scientist. That radical change was both triggered and enabled by UCSC's strong commitment to undergraduate education and teaching excellence. I discovered the field that would become my career thanks to the freshman breadth requirement and wise advice of my advisor, Prof. John Hummel. Professors Todd Newberry and Gary Griggs did more than merely teach the introductory marine biology and oceanography courses I took to satisfy that requirement. They infused the classes with passion, showing me how fun and rewarding the inquisitive, adventurous life of a field scientist could be; I was hooked. Many would scoff at the idea that a language major with none of the usual high school prerequisites could become a scientist instead, and some might not even allow the student to try. I met with nothing but encouragement from all quarters and support from faculty and fellow students when I hit the inevitable rough patches in the road."

Suggestions for nominations in future years are welcome and should be forwarded to Peter Vrolijk (pvrolijk17@gmail.com) or Stefano Mazzoni (stefano00038@yahoo.com) for consideration in next year's award.

Slugs in the Field
(Then and Now)

Field photo in Shimanto Belt, ca. 1982, from left to right:
Front row: Tim Byrne (Ph.D.), Professor Casey Moore, Peter Vrolijk (Ph.D.), Jim Sample (Ph.D.)
Middle row: Dan Orange (Ph.D.), Mike Underwood (B.S.), Mary Reid (B.S.), Don Fisher (Tim's former student)
Back row: Neil Lundberg (Ph.D.), Ken Tillman (Tim's student), Mark Brandon (B.S.), Brooks Clark (Don Fisher's student). Image courtesy of Mike Underwood



Summer Field Camp

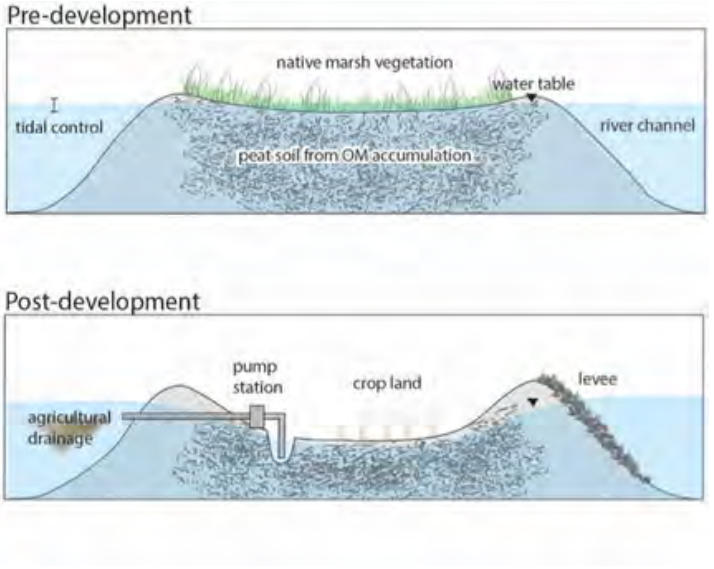
Profs. Slawek Tulaczyk and Terry Blackburn enjoying the ambience, Taylor Valley, Antarctica

JOIDES Resolution cruise, 2016
Sitting: Nicolette Lawler (B.S.), Francesca Meneghini (Post-Doc), Laura Wallace (Ph.D.), Demian Saffer (Ph.D.)
Standing: Mike Underwood (B.S.), Heather Savage (post-doc), Patrick Fulton (Post-Doc)

J. Casey Moore Fund Report

The Casey Moore Fund supports graduate student research. The 2017 awardee was Christina Richardson

After 200+ hours of filtering water and ~2 months cumulatively spent in the Sacramento-San Joaquin Delta in central California, I completed my final field work event in late September of 2018. This field work is in support of two chapters of my PhD research, which are focused on constraining both spatial and temporal variability in agricultural drainage geochemistry. Little work currently exists documenting the magnitude and geochemistry of agricultural drainage inputs to the Delta, an economically and ecologically valuable system to Californians.



The Delta is comprised of over fifty subsided islands, which discharge agricultural drainage into surrounding waterways (Fig. 1). One goal of my work in this system is to close the carbon (C) budget of Delta islands by examining lateral (e.g. dissolved) C exports. Island subsidence is currently thought to be driven exclusively by vertical (e.g. gaseous) C losses, though work in other peatlands suggest lateral C losses can be >10% of C budgets.

The J. Casey Moore Award has supported my efforts to better understand the biogeochemical processes driving lateral C loss from Delta islands. Of particular interest for understanding pathways for C loss and production are 13C/12C ratios of dissolved inorganic C (DIC). I used the J. Casey Moore Award to cover the costs of running δ13C-DIC samples.

Preliminary data suggests that this isotope tracer will be of great interpretive value. Agricultural drainage δ13C-DIC values appear spatially distinct and differentiable from infiltrating river water, and these values provide evidence of two distinct biogeochemical processes (respiration and methanogenesis). This work is important to improving management of the Delta as dissolved C losses may contribute to island subsidence, and the delivery of dissolved C from Delta islands to surrounding waterways can create water quality issues both in the Delta and in water exported to other areas of California.

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(across from the convention center!!!)

Undergraduate Awards

ALSO-MP OCEAN SCIENCES TRAVEL SCHOLARSHIP:
OMAR ROSALES-CORTEZ

ANDREW TARSHIS AWARDS:
ELIZABETH LANGDON-LASSAGNE
MATTHEW OLIVER

FRIENDS OF SEYMOUR MARINE DISCOVERY CENTER'S RESEARCH AND EDUCATION AWARD:
SAVANNAH MANGOLD

FUTURE LEADERS IN COASTAL SCIENCE AWARD:
LAUREL TEAGUE

FUTURE LEADERS IN COASTAL SCIENCE AWARD:
KAYLEE GLENNEY

THE GUNDERSON FAMILY AWARD IN COASTAL SUSTAINABILITY:
SHARON MULREADY

HOLLY DAY BARNETT SCHOLARSHIP:
MATTHEW OLIVER

KATHY SULLIVAN RESEARCH AWARD FOR UNDERGRADUATE RESEARCH IN SCIENCE AND TECHNOLOGY:
EMILY CARRENO

KATHY SULLIVAN RESEARCH IMPACT AWARD:
KYLE BERGERSON

SCRIPPS UNDERGRADUATE RESEARCH FELLOW (SURF):
OMAR ROSALES-CORTEZ

SILVIA MILLER'S LIFELONG LEARNER'S SCHOLARSHIP:
BRENDAN CHAPMAN

STARS SCHOLARSHIP FROM UCSC WOMEN'S CLUB:
BRENDAN CHAPMAN

STEM DIV PROGRAM:
ESTHER MUNOZ

THOMAS WALSH AWARDS:
LEAH BROWNE
SANDRA RAMOS HERNANDEZ

UNDERGRADUATE RESEARCH IN SCIENCE AND TECHNOLOGY AWARD:
THOMAS DEWEY
ESTHER MUNOZ

USRA INTERNSHIP AT NASA ASMES:
RICHARD NELSON

UCSC ACADEMIC CHALLENGE PROGRAM AND FOUNDERS SEMINAR:
KYLE BERGERSON

UCSC MUSIC DEPARTMENT'S CLASSICAL MUSIC ENDOWMENT:
THOMAS DEWEY

WEBER-HOLT GRANTS:
THOMAS DEWEY
MAIA HOFFMAN
NOAH LYMAN
RICHARD NELSON
RYAN NYBERG
MARISSA TAYLOR
DIMITRI VOYTAN

Undergraduate Degrees

MONICA APPIANO
OLIVER AZEVEDO
JOHN KYLE BERGERSON
KIARA BROUDY **
KENNETH BUI
CHELSEA BUTEUX
EMILY I. CARREÑO**
NICHOLAS CELLI
JUSTIN REID CLARK**
ELIZABETH COTTA
ISABELA DE LA ROSA
THOMAS C. DEWEY*
TREVOR EDWARDS
SARAH FARAOLA
SAMUEL FERDMAN*
RIOFA-GEAN TORRIJOS FERNANDEZ
CASEY FITZGERALD
SYDNEY C. GANEM
KODIE GARDNER*
VALERIE GARCIA
DIANA GINS
KAYLEE GLENNEY*
SAMUEL Z. HIRSCH**
MAIA VICTORIA HOFFMAN*
SCOT ITAKURA
KIERA JORDAN
REBECAH KENNEY*
ELIZABETH LANGDON-LASSAGNE**
ANNE LINGARD
SAVANNAH MANGOLD**
NICHOLAS A. MASON*
GRAHAM MCINTOSH
RANDI MEDINA
EMILIA MICHEL
SHARON MULREADY**
BRANDON NASR
ASHLEY NAVAS
RICHARD NELSON*
RYAN NYBERG*
KRISTINA OKAMOTO*
MATTHEW OLIVER
ROBERT OLSEN
ERIC PAN
ANTOINETTE PAPESH
CAMERON QUINN
RACHEL RAIKAR
THEA RANISH-ODONNELL
ALEJANDRA ROJAS
FERNANDO SALCIDO
DAVID SMALL*
JOHN STAPKE
MARISSA TAYLOR*
RYAN THOMAS
CJ VIGIL
DIMITRI VOYTAN**
SAMANTHA WHISMAN
MATTHEW WILLIAMS
RUBY WOOD**
DEMIR WORTHINGTON
SIERRA YUEN

* CANDIDATE FOR HONORS IN THE MAJOR
** CANDIDATE FOR HIGHEST HONORS IN THE MAJOR

Graduate Awards

BRUCE LANE SCHOLARSHIP:
BEN DEJARNATT

FUTURE LEADERS IN COASTAL SCIENCE AWARD:
CHRISTINA RICHARDSON

GAC CANADIAN TECTONICS GROUP JACK HENDERSON AWARD FOR BEST MS THESIS OF 2017:
KELIAN DASCHER-COUSINEAU

GEOLOGICAL SOCIETY OF AMERICA STUDENT RESEARCH GRANT:
CHRISTINA RICHARDSON

GSA/EXXONMOBIL BIGHORN BASIN FIELD AWARD:
BEN DEJARNATT

INTERNATIONAL ASSOCIATION OF GEOCHEMISTRY, STUDENT RESEARCH GRANT:
CHRISTINA RICHARDSON

J. CASEY MOORE FUND AWARD:
COLLEEN MURPHY

LOS ALAMOS NATIONAL LABORATORY HI-LAT PROJECT:
ZACK KAUFMAN

LUNAR AND PLANETARY SCIENCE CONFERENCE (LPSC) EARLY CAREER DEVELOPMENT AWARD:
MEGAN KELLEY

NASA EARTH AND SPACE SCIENCE FELLOWSHIP (NESSF) – 3 YEARS OF SUPPORT:
HUAZHI GE

NATIONAL SCIENCE FOUNDATION (NSF) GRADUATE RESEARCH FELLOWSHIP PROGRAM (GRFP):
ADRIENNE RICKER

NSF SCHOLARSHIP TO ATTEND URBINO SCHOOL IN PALEOCLIMATOLOGY:
WILL RUSH

PRESIDENTS'S DISSERTATION YEAR FELLOWSHIP (1 QUARTER):
SARAH WHITE
KYLE BROACH

ROBERT L. WIEGEL SCHOLARSHIP FOR COASTAL STUDIES:
CHRISTINA RICHARDSON

SPATIAL ISOTOPE SHORT COURSE SCHOLARSHIP:
ADRIENNE RICKER

STARS SCHOLARSHIP FROM UCSC WOMEN'S CLUB:
BEN DEJARNATT

STEPHEN JAY GOULD AWARD, PALEONTOLOGY SOCIETY:
ADRIENNE RICKER

Graduate Awards and Degrees

Graduate Awards Cont.

UCSC GRADUATE STUDENT ASSOCIATION TRAVEL GRANT:
RICARDO GARZA-GIRON

AARON AND ELIZABETH WATER'S AWARD:
(1 RECIPIENT THIS YEAR)
GALEN GORSKI

WELLS FARGO COASTAL SUSTAINABILITY FELLOWSHIP:
ANA MARTINEZ FERNANDEZ
SARAH BEGANSKAS

ZHEN AND REN WU MEMORIAL FUND AWARD IN GEOPHYSICS:
RICARDO GARZA-GIRON

KATHRYN D. SULLIVAN IMPACT AWARD:
SCHUYLER SMITH

GRADUATE DEGREES

Masteller, Claire
PhD (Fall 2017)
Biological and physical modifications to the onset of sediment transport

Pfeiffer, Allison
PhD (Fall 2017)
Sediment supply as a driver of river bed surface grain size and mobility, with consequences for aquatic habitat

Beganskas, Sarah
PhD (Spring 2018)
Runoff generation, infiltration dynamics, and recharge across multiple scales: Applications for improving groundwater supply and quality

Begemen, Carolyn Branecky
PhD (Spring 2018)
Melting glacial ice from below: from volcanoes to ice shelves

Chaves Sibaja, Esteban
PhD (Summer 2018)
Fault Zone Heterogeneity and Frictional Strength Variability During the Earthquake Cycle Along the Nicoya Peninsula Megathrust, Costa Rica

Petersen, Karen
MS (Fall 2017)
Impacts of seawater desalination brine on coastal environment

Adelstein, Esther
MS (Fall 2017)
Three-dimensional simulations of fluid and heat flow associated with faults in volcanic ocean cru

Yuan, Victoria
MS (Spring 2018)
Late Pleistocene Central Equatorial Pacific Temperature Drivers

Ballaron, Edward
MS (Summer 2018)
Environmental Changes on the North American Mid-Atlantic Shelf During the Paleocene Eocene Thermal Maximum

Where are they now?

Undergraduates have recently been able to add a Planetary Sciences concentration to their major. We asked a few of these students to explain what they've been doing since they graduated.

Alex Morgan
B.S. 2010
Research Geologist, National Air and Space Museum, Smithsonian Institution

I am currently focused on characterizing the processes that have affected the martian surface and what implications these have for the planet's former climate. In particular, I have been studying the valley networks and alluvial fans, both of which are testaments to a wetter climate than that observed today. This involves remote sensing analyses, quantitative modeling, and field work at terrestrial analogue sites across the world (namely Hawaii, Chile, and Australia) to better understand the evolution of the surface of Mars.

One of the fondest memories I have of UC Santa Cruz is the variety of geologic processes that are readily observable right on campus-there are very few schools where one can learn about a process in class and on a quick walk see its effects in action!

Alex studying alluvial fan stratigraphy in Death Valley

Noah Hammond
B.S. 2009
Postdoctoral Research Fellow, University of Toronto

I am a planetary scientist who studies the icy worlds of our solar system, including the moons of Jupiter and Saturn. I am interested in understanding the geologic history of icy worlds and determining how certain strange geologic features form on the surface of Jupiter's moon Europa. I use numerical models to investigate tectonic deformation and melt migration in icy bodies. Some of my favorite memories at UCSC are of hiking in the Pogonip, and performing in the student written Back to the Future the Musical at Porter College.

Georgia Peterson
B.S. 2014
Graduate Student, University of British Columbia

After graduating from UC Santa Cruz, I began working with Catherine Johnson at the University of British Columbia for my PhD. My work has focused on the tectonic history of Mercury, which exhibits a global pattern of compressional landforms. These

Where are they now? (cont.)

Georgia Peterson (cont.)

tectonic landforms have largely been attributed to global contractional stresses, due to interior cooling of the planet. I have been involved in mapping efforts that show how the global distribution of tectonic landforms vary in relief, length, and spatial density across Mercury's surface. I am currently studying what structural and/or mechanical lithospheric properties could explain the observed variations in tectonic landforms, as well as the importance of potential regional-scale stresses.

Some of the best times I had at UCSC were with the backpacking club, where we would plan trips to places like the Sierra Nevada or Big Sur. As an Earth Science major, I was excited to observe the processes we learned about in class, while hanging out with friends and going rock-hounding.

Joe Schools
B.S. 2014
Graduate Student, University of Maryland

I am entering the last year (hopefully) of my PhD at the University of Maryland, under adviser Laurent Montesi. My research focuses on the behavior of melt migration in planetary lithospheres, or as I like to think of it, the journey of melt between mantle and volcano. Specifically, I have been modeling melt migration and crystallization in the lithosphere of Mars and attempting to see how melt behavior at depth can influence the type and location of volcano that forms at the surface. Through a NASA Earth and Space Science Fellowship, I am also performing similar modeling efforts focused on Jupiter's moon Io. What I miss most about Santa Cruz is the campus itself. You don't fully appreciate being able to take a walk through the forest in the middle of the work day until you move to any other university campus.

GeoSlugs Go to Alaska - Both on Land and to Sea by Susan Schwartz

It seems like whenever and wherever there is a large geophysical investigation of an active fault system, there are GeoSlugs involved. The Alaska Amphibious Community Seismic Experiment (AACSE) is no exception. Some of the most powerful earthquakes and dangerous volcanoes ever recorded, including a magnitude 9.2 earthquake in 1964, occur in the Alaska-Aleutian subduction zone. As a result, many first order, outstanding questions about subduction zone processes and their hazards can be investigated along this margin. So, how do you study a subduction zone that's mostly offshore and only accessible by air or boat? Simple.

Figure 1. EPS Professor Susan Schwartz servicing one of the AACSE land stations at Nelson Lagoon, Alaska.

Start with 10 scientists, including EPS Professor Susan Schwartz (Figure 1) and alumnus Peter Haeussler, PhD, 1991 (Figure 2) engaged in dozens of planning conference calls; take 75 ocean bottom seismometers, OBS (Figure 3), 30 broadband stations, fishing boats, float and fixed wing planes, a helicopter, a 261 foot research ship; add a team of 12 OBS engineers, 24 ships crew, 12 Apply-to-Sail participants, including alumna Sam Hansen, PhD 2007 and present UCSC graduate student Heather Shaddox (Figure 4), 2 Alaskan K-12 teachers and 2 field engineers, including instrument specialist and alumnus Dan Sampson, MS 1986 (Figure 5). Then make the data open and accessible as quickly as possible. This is the Alaska Amphibious Community Seismic Experiment (AACSE), a major shoreline-crossing experiment consisting of 105 broadband seismographs and numerous accelerometers, seafloor pressure gauges, and temperature sensors deployed throughout the region spanning the Alaska Peninsula

Figure 2. EPS alumnus Peter Haeussler (right) teaching about the 1964 M9.2 Alaska earthquake to graduate students Amanda, Heather and Jefferson (left to right).

subduction zone (Figure 6). The Alaska-Aleutian subduction zone presents many contrasting behaviors including strong variations in earthquake occurrence and arc segments with fundamentally different volcano chemistry. Understanding how geologic structures or material properties cause this segmentation will better prepare us to develop long-term forecasts for the rates and effects of major earthquakes and volcanic eruptions. However, due to difficult logistics, low population density and few comprehensive studies extending offshore to include the forearc and subducting plate, Alaska has had relatively few large data collection efforts of the kind that would inform our understanding of these hazards. To make major advances on these problems

Alaska (cont.)

a community-designed amphibious seismic array has been deployed, recording earthquakes and other events both in the Alaska-Aleutian subduction zone and globally. AACSE is a “community” project in several ways. First data will be made available openly as rapidly as possible, so scientists globally can become involved with minimal barriers. Second, the experimental planning, design and participation has been as open as possible, beginning with a large planning meeting to evaluate several different scientific targets, followed by an open call for PI

Figure 3. EPS graduate student, Heather Shaddox getting ready to deploy OBS offshore the Alaska Peninsula.

Figure 4. EPS Graduate Student Heather Shaddox and University of Alabama Prof. Sam Hansen (UCSC PhD., 2007) on one of the OBS deployment cruises.

Figure 5. EPS instrument specialist, Dan Sampson rebuilding a seismic station after a bear vandal visit

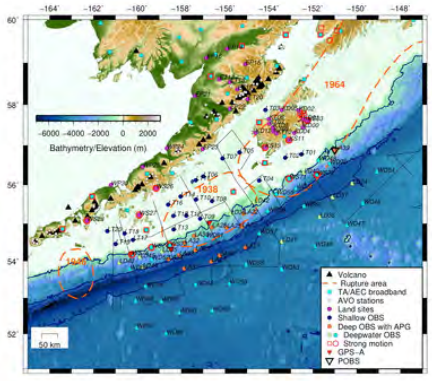


Figure 6. Community Seismic Experiment showing the location of land and ocean bottom seismometers as well as the rupture area of past large damaging earthquakes (dashed circles).

Alaska Cont.

participation, and public comment on draft deployment designs. Third, a major goal of the project is to engage a next generation of scientists and to broaden the potential user base, by teaching skills required to work with amphibious datasets to new populations. Each deployment and recovery cruise engages multiple early-to-mid career scientists without prior marine experience including graduate students and faculty. In these ways, AACSE helps build the community that can make use of this major new dataset. AACSE deployed and serviced seismic stations between May and September 2018 and will return to pick up ocean and land stations in late summer 2019.

We hope to see you at the 18th Annual UCSC EPS Alumni Event at 2018 AGU on Tuesday, Dec. 11 from 6:00PM-8:30PM at the Baby Wale, 1124 9th St NW, Washington DC, 20001

Gary Griggs' New Book

Gary Griggs' lastest book, Between Paradise and Peril came out in October. It is about the Monterey Bay Region, which seems to have it all – sandy beaches, sunshine, the redwoods and rivers – paradise for most of us. This scenic landscape that has drawn people here for hundreds of years owes its origins to the underlying geology and climate, and both of these are somewhat unpredictable. Earthquakes and landslides, floods and droughts, El Niños and seacliff erosion all take place more frequently than we care to remember. Yet they are a fundamental part of this landscape we inhabit and that we can expect to experience for as long as we have an Earth.

www.facebook.com/UcscEPS

Vince Matthews's 2018 Commencement Address

Vince did his PhD with Aaron Waters and was Chief Geologist for the state of Colorado for many years. He is now writing a book "Land of Ice: A Guide to Colorado's Glacial Past."

In a few minutes, you are going to be branded as a UCSC graduate. That will open doors for you for the rest of your life because you must be awesome just to be admitted to this place, much less graduate from it. When I thought about what I'd like to have in my hip pocket, if I were sitting in your place, I kept coming back to the words of a famous poem by former Poet Laureate, Robert Frost:

Two roads diverged in a wood
and I, I took the one less traveled by
and that has made all the difference.

For me, these lines have two main messages: first, "live your dream", and second, "don't be afraid to try new directions or ideas in your research, in your career, or in your personal life." I'd like to give you two examples of 'live your dream'. The first a big one, and the second, not so big.

In 1971, I was riding back to campus from a field trip to the Sierra foothills. The gal sitting next to me said, "Do you mind if I ask you a personal question?" I replied, "No, but I may not answer." She continued, "Do you remember when you were teaching Field Methods and took us to the Pinnacles?" I responded, "Yes." She asked, "Why did you ask Kathy to drive one of the vehicles?" My reply was, "I don't know, I just thought she was the best qualified to drive. Why?" She said, "Well, I have been on field trips at Berkeley, Davis, and Santa Cruz; and that is the first time that I have seen a female asked to drive a vehicle on a field trip." I responded, "I just felt she was a better choice to drive than any of the guys." As you will see, it turns out my judgement appears to have been fairly good.

That was the environment that Kathy graduated into, i.e. one where females were not even asked to drive vehicles. But she didn't let that slow her down, because Kathy had a dream. And, live that dream she did! The next time I saw Kathy was in a photograph. She was in a flight suit standing next to a NASA U-2 plane which she was flying for practice to become an astronaut. And, what an astronaut she became; --- three Space Shuttle missions, including deployment of the Hubble telescope, and the first American female to walk in space. You may know her as Dr. Kathryn Sullivan, the recently retired, Under Secretary of Commerce for Oceans and Atmosphere, and Administrator of the National Oceanographic and Atmospheric Administration (NOAA). Kathy LIVED her dream! And, you should live yours.

The second was a personal experience. In the mid-1970s, I had just completed a research project on structures along the Front Range of Colorado and was writing up the results. As I was driving to Denver to teach a night course in plate tectonics, I began thinking about where to publish the paper. As I thought about it, I realized that other researchers were finishing up similar projects throughout the West. I thought it would be great to get all these papers into one volume somewhere. Then I started thinking about who might put this together.

Vince Matthews Cont.

And, I couldn't think of anyone. The thought popped into my head, “What if I acted as editor for a volume and these papers together?” I could have an introductory paper by the chairman of the geology department at Texas A&M, a contribution from a full Professor at the University of Arizona about the Colorado Plateau, and a closing paper on how these structures fit into plate tectonic theory, by a full Professor at Stanford.
And then I thought, “Who am I to think that I could get people of this caliber to contribute papers to a volume edited by an unknown, Associate Professor at a small midwestern university? These volumes are done by famous guys at Princeton or Columbia, etc.” So, I dropped the idea. Fortunately, I wasn't to Denver yet, and a few miles farther down the road, I thought, “What have I got to lose, other than people thinking I'm out of my league?”

Long story short, the result was Geological Society of America Memoir 151, Laramide Folding Associated with Basement Block Faulting in the Western United States, a collection of 16 papers edited by Vincent Matthews. It begins with an introductory article by the chairman of the department at Texas A&M, and it concludes with a plate-tectonic paper by the full Professor at Stanford.

About five years ago, that professor came up to me at a GSA meeting and said, “I want to thank you for inviting me to contribute that paper. Walt and I got a lot of mileage out of it”. It is the first paper to suggest that flat-slab subduction created the Laramide structures in the Rocky Mountain foreland. It would have been easy to drop my original idea. I'm glad that I didn't. And, don’t you be afraid to follow through on your ideas.

Finally, look around you at the people sitting in this room. Your classmates here are the beginning of your professional network. This time last year I was in Los Alamos, New Mexico at a get-together of UCSC students from the early 1970s, who meet every couple of years. We are all pretty much in our 70s now, but we still enjoy each other.
Let me tell you a little about some of our diverse careers. There is Rich who spent his career as a geologist with the U. S. Forest Service . There are Jim and Mel who spent their careers with the U.S. Geological Survey. There is Andrew who was a geologist with BLM. There is Dani who became head of the Engineering Section of the Israeli Geological Survey and a Professor at Hebrew University. Nao and Rogers built their own Engineering Geology firms, and John built a mineral exploration company. Kevin rose through the ranks at Exxon and served alongside Rex Tillerson. Dave had a successful career at Amoco and retired as President of BP-North America. Jerry taught Field Camp at UCSC. And then, there is the ‘Santa Cruz Mafia’ at Los Alamos National Laboratory: Wes, Dave, Fraser, Jamie, Schon, Bob, and Don. Your UCSC degree opens a plethora of opportunities.

Before leaving campus, please commit to each other that you will stay in touch throughout your careers. You never know when these connections can help you. My contemporaries at UCSC helped on the following:

1. obtaining a job in industry,
2. getting a decade-long jump on most of industry in using microseismicity to analyze hydraulic fracturing results, and
3. obtaining a sabbatical professor to work on an important research problem.

All these examples were mutually beneficial to each of us.

I congratulate you on your accomplishments. And, I wish you great success in your careers and a wonderful life.

Earth and Planetary Sciences at UCSC
Where do we come from? What are we? Where are we going?
by Rob Coe

In September 1967, two years after it opened for students, UCSC offered its first class in geology. Our founder, Aaron Waters, was enticed to UCSC to build a new geology program after a distinguished career as a petrologist, volcanologist, and all-around field geologist at Stanford, the USGS, Johns Hopkins University and UC Santa Barbara. Landing Aaron was a major coup for Santa Cruz. He was at the top of his professional trajectory, recently elected to the National Academy (1964), and deeply involved training NASA astronauts for the Apollo missions (1964-67). At Newbury Volcano near Bend, Oregon, he taught them to recognize basic rock types, to interpret volcanic features, and especially how to distinguish volcanic from impact craters. Among the many astronauts he trained were members of all seven lunar Apollo missions, including nine who actually walked on the Moon.

Aaron Waters training Apollo astronauts at Newbury Crater, Oregon, in 1966. Photo by Bob Garrison.

In June 1966 I jumped at an invitation to be interviewed by UCSC's Vice Chancellor of Natural Sciences, Francis Clauser, while I was still writing my thesis and before a chair had been identified to start a program in geology. I was very attracted by the UCSC experiment to create a non-traditional UC campus that encouraged new approaches to university education. In summer 1967 I accepted a job offer from Aaron Waters, and in January 1968 I arrived in Santa Cruz after a postdoctoral stint in Australia.

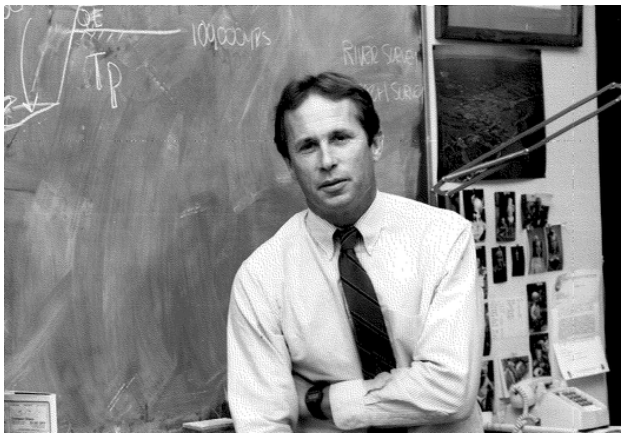
I taught my first course that Spring, an undergraduate seminar on the plate-tectonic revolution that was just unfolding. It was typical of Aaron to let me teach it, even though he was not a believer in the new paradigm at the time. Besides us two, Aaron had enlisted the services of James Gilully that academic year, a fellow National Academy member recently retired from the USGS, and brought Casey Moore with him from UCSB as a teaching assistant while he was finishing his senior year, just before he started graduate school at Princeton in the Fall.

Born in the cauldron of 1960's counter-culture, civil rights movement, and Vietnam War, UCSC in the early years presented a turbulent mix of activity and experimentation. A new college was opening every year. Most of the natural scientists were crowded together in the building now known as Thimann Labs. The grading system was pass/fail plus a written evaluation, intended to nurture learning for its own sake. Each faculty appointment was 50% in a college and 50% in a "board of studies"--a weaker academic entity than a department, an arrangement designed to spur cross-discipline interactions--and both entities demanded serious engagement from each of their members. Secretarial, teaching and research support were parsimonious and also centralized in the colleges and divisions. Fortunately, most of us professors were very young, mainly in our late twenties and thirties, with enough energy to sustain the highly excited state demanded to operate this elaborate system. Over the years, however, in a series

Rob Coe (Cont.)

of transitions both large and small, the system decayed inexorably to a lower-energy, more conventional state. The term "Board of Studies" persisted in official usage until 1997, though by then the disciplines had operated as de-facto departments for quite some time. In retrospect, it wasn't feasible to maintain the original system, given the same funding, student-faculty-ratio, and research-productivity expectations as at other UC campuses. Nonetheless, some of the early idealism persists, especially a significant faculty commitment to teaching and undergraduate research. In the face of all this ferment, Aaron was a steady, tolerant figure standing mainly above the fray and focused on starting the new department.

On the one hand, he gave us great freedom to teach how and to a large degree what we wanted. There was no way we could cover even a standard curriculum with only a handful of professors, and he was agnostic as to what curricular design was best. He'd taught under many different ones, had concluded that any of them can work well as long as the faculty is good, and so he let us choose. On the other hand, it was axiomatic that we all engage in creative research. How else could we inspire the next generation of earth scientists? I remember him saying a department is only as good as its faculty, and it was clear that by that he meant distinguished in research. But what kind of research was entirely up to us as individuals. Though obviously he had his own preferences, he was broad minded and forward looking. In just our third year as a "Geology Board" he instigated a discussion on what we might call ourselves instead. We chose Earth Sciences because, despite its meaning literally the same thing as Geology, we felt it conveyed a greater openness to less traditional areas such as geochemistry and geophysics. Looking back on our first five years, the amount that got accomplished seems impossible. By means of a deft sleight of hand entailing a cooperative educational agreement Aaron arranged between UCSC and Stanford, he got our PhD program approved at UC Systemwide by the end of the first year. It was announced in the 1968-69 course catalog when we had only three faculty! By that time his top pick, Bob Garrison, had arrived as associate professor in sedimentology, after overlapping one year with Aaron at UCSB in 1965-66 and spending the next two years at the University of British Columbia.The following year Gary Griggs and Othmar Tobisch came from OSU and the USGS, respectively, as assistant professors in marine geology and structural geology, along with our first crop of graduate students. And just before he stepped down as Chair at the end of the 1970 academic year, Aaron enticed Casey Moore back from Princeton as acting assistant professor while he was still writing his thesis. Our new Chair Bob Garrison kept the hiring juggernaut going, with Léo Laporte joining the faculty from Brown in 1971 as professor in paleontology and paleoecology, and Jim Gill in 1972 from ANU in Canberra as assistant professor in geochemistry.



Gary Griggs in 1989

In those early years we all had to stretch ourselves perilously thin, setting up the geology major, curriculum and facilities and getting our own research programs going, not to mention meeting our college teaching and advising obligations. There were no research start-up packages and we all taught a full load. For me, besides an upper division course in geophysics, I taught another in geochemistry, a lower division GE course "Two Great Debates" that compared the ice-age and plate-tectonic paradigm shifts, and a section in the Crown College core course. In those days graduate and undergraduate

Rob Coe (Cont.)

students took mainly the same courses, a disparity made easier to bridge by the brilliance of the early undergrads. UCSC was swamped by applications then, and admission was so competitive that half of my fifteen first-year Crown College advisees were valedictorians of their high schools, and all had college-board scores in the 700's.

Besides teaching, I was put in charge of purchasing and overseeing the X-ray diffraction equipment for the department, despite knowing little more than Bragg's law. I also hustled money from the committee to buy geophysics books for the library and crystal-structure models of minerals. Remember those stick models composed of red, silver, black and brown wooden balls? We still have some of them almost 50 years later.

In July 1972 Aaron retired, Bob was awarded a Guggenheim Fellowship for a year's research at Oxford University, and Léo Laporte took over as Chair for the next three years. One year later we awarded our first four PhD's. These graduates, three of whom were supervised by Aaron, went on to distinguished and wide-ranging geological careers in the natural resources industry, the Los Alamos National Laboratory, the USGS and academia. Hiring under Léo continued apace: Ken Cameron in petrology from SUNY Stonybrook and Eli Silver in marine geophysics from the USGS in 1973, followed by Al Smith in seismology from MIT in 1975. Earth Sciences had grown in just eight years to a faculty of ten, with areas of expertise that we classified as hard-rock, soft-rock, and no-rock. For the next eleven years we remained at this plateau of 10-11 faculty members, although enrolments in both undergraduate and graduate students increased substantially. It took until 1978 for the department to finally break the gender barrier, first with the arrival of Shirley Dreiss from Stanford in hydrology, and then four years later with Karen McNally from Caltech in seismology.

Today, only one of the original ten professors remains in active service, Gary Griggs, still going strong after 49

Shirley Dreiss

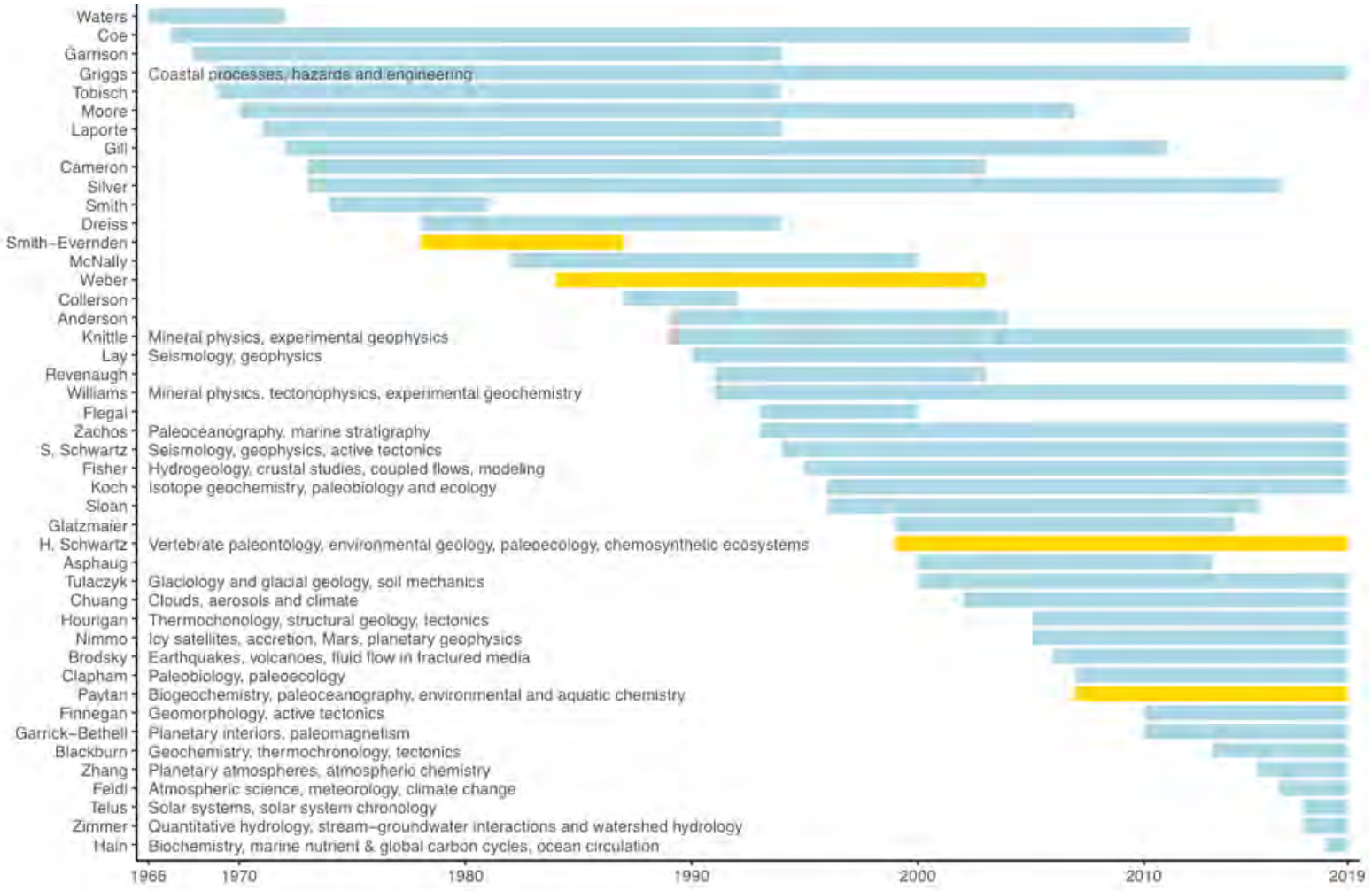
years of teaching and research and 26 years as Director of the Institute of Marine Sciences. Since 1986 the faculty has doubled in size, though growth has been far from monotonic. You can follow the various arrivals and departures in the time-line figure at the end of this account. Our original three general categories of faculty expertise, hard-rock, soft-rock and no-rock, have expanded and intertwined organically, and our number of undergraduate majors now is the largest in the UC system. A large part of what makes the whole endeavor rewarding is coming across our former students, undergrad and graduate, who are doing so many interesting things across the country and around the world. The department has increased steadily in national ranking, and our faculty and researchers have received many honors and awards for their scientific accomplishments, far too many to enumerate here except for a few recent examples. Last Spring Jim Zachos was elected to the National Academy of Sciences, bringing

Rob Coe (Cont.)

our number to three with Gary Glatzmaier and Thorne Lay. In August three members of department were elected as Fellows of the American Geophysical Union, tying Caltech and MIT for the most per institution for 2018. Of our last four faculty hires, three are women and we are preparing an offer for a fourth as I write now. We've partnered with Ocean Sciences to offer a new Environmental Sciences undergraduate degree program, and Jim Zachos is co-leader of the new campus-wide strategic-planning initiative "Earth Futures."

In 1992 at a memorial service for Aaron Waters I imagined what he might say to us about the department that he started: "Pretty good, but probably not as good as you may sometimes think you are."

Now, 26 years later, I believe he would be genuinely pleased and proud of the scholarly proficiency of our faculty and researchers and, especially, of the myriad accomplishments of three generations of UCSC Earth and Planetary Sciences students. Much of the inertial guidance with which he launched the department is still operating and serving us well: a spirit of cooperation that rises above most petty turf wars, a practice of searching broadly and hiring the best scientists rather than filling particular disciplinary pigeonholes, an enduring commitment to excellence in teaching at all levels, and a philosophy that values the varied contributions of all to the creative enterprise.



Timelines of active service for EPS ladder faculty (blue) and long-term lecturers (gold), plus areas of expertise for those not now retired. (Figure credit Matthew Clapham.)

Tom Bullen (1951-2018)

The EPS community lost a good friend with the passing of Dr. Thomas (Tom) Bullen in September 2018. Tom received his Ph.D. in Earth Sciences at UCSC (1986), and had a distinguished career with the U.S. Geological Survey, completing studies on a variety of topics in involving metals geochemistry and isotopics, addressing problems in hydrology, geology, soil science, and paleoclimate. In addition to being highly regarded for studies he directed, Tom collaborated frequently with colleagues around the world, including many students and junior researchers. He was a kind, smart, thoughtful man.

Tom felt it was especially important to recognize how a small grant he received as an undergraduate helped to set the direction of his career in Earth Science, and remembered fondly his time in Earth Sciences at UCSC as a graduate student. Roger told me that he views the SURGES Fund as a perfect way to memorialize Tom's life, career, and contributions. You can read more about the SURGES Fund at the EPS website: https://eps.ucsc.edu/support-us/

Earlier in 2018, Tom and his husband, Roger Koopmann (UCSC, 1980, B.A. Economics), established a new endowment called, "Support for Undergraduate Research in Geology and Environmental Science (SURGES)." Interest generated from this fund will be used to make awards to EPS majors as they develop and complete research projects as part of their degree program at UCSC. Because it is an endowment, awards will not diminish the fund, which will grow as a result of new contributions and interest. As noted in the "Letter of Gift" that established the SURGES Fund, "Tom and Roger hope that this gift will serve as a legacy and inspire others to contribute to this endowment and increase its impact."

If you remember being at UCSC with Tom Bullen, please contact me, send stories or photos, and we can include them in a future newsletter: afisher@ucsc.edu

Telling time with Dirt and Ice in Antarctica

by Graham Edwards

In October and November of 2017, I traveled to Antarctica with UCSC Professors Terry Blackburn and Slawek Tulaczyk and fellow UCSC graduate student Neil Foley. We spent our field season in Taylor Valley, one of the epically arid, snow-free McMurdo Dry Valleys of West Antarctica. Taylor Valley lies nestled within the lower slopes of the Trans-Antarctic Mountains on the edge of the Ross Sea. The upper end of the valley is occupied by Taylor Glacier, an outlet of the East Antarctic Ice Sheet that is unique among glaciers in that its snout is stained bright red from a fissure, aptly named Blood Falls, that erupts salty 'brines.' In contrast, most of Taylor Valley is ice-free and covered in glacial sediments that are punctuated by a few perennially frozen lakes and small glaciers descending the valley walls from the neighboring Asgard Range and Kukri Hills. During our field season, we collected sediments from the walls and bottom of Taylor Valley as well as the sediment-laden ice from the bases of Taylor Glacier and the nearby 'alpine' glaciers fed from the local mountains.

Blood Falls, Antarctica

My primary scientific interests are in geochronology and low-temperature earth system processes that partition isotopes of uranium and the daughter isotopes produced by its radioactive decay. The samples of sediment and ice we collected from Taylor Valley returned to UCSC and the W.M. Keck Isotope Lab where I have begun measuring the chemical and isotopic compositions of these materials to assess 1.) the timescales of glacial sediment production in Taylor Valley and 2.) the timescales and mechanisms of sediment-ice interaction within Taylor Glacier and the smaller alpine glaciers of Taylor Valley. To accomplish this, I utilize the radiogenic daughter isotopes produced in the decay chain of 238U, known as U-series radionuclides.

A good isotopic geochronometer fractionates, or separates, some parent isotope from its radiogenic daughter isotope(s). In most geologic applications this is accomplished by a chemical fractionation where the parent element is incorporated into some material while the daughter is excluded. In the case of the glacial sediments of Taylor Valley, however, we are mostly concerned with a parent and daughter of the same element: parent 238U and the first long-lived daughter product in its decay chain 234U. Rather than a chemical fractionation, we rely on a physical fractionation, namely the ejection of 234U atoms from the surface of glacial sediments by the high-energy recoil of 238U's radioactive decay.

In the interior of all U-bearing rocks, the high-energy radioactive decays of 238U atoms result in a dance of recoiling daughter nuclei throughout the rock. Over million-year timescales, the respective decay rates of 238U and 234U eventually establish an equilibrium between their relative amounts.

If a rock is ground into very small grains, their surfaces become large enough relative to the overall grain mass, that measurable amounts of 234U are lost from these grain surfaces, and the long-lived, 'secular' equilibrium

Antarctica, cont.

between parent and daughter is lost. More 238U decays over time and 234U is lost, the disequilibrium between parent and daughter grows. By measuring the relative amounts of 238U, 234U, and other U-series radionuclides in fine sediments we can assess how long ago these sediments were crushed, or comminuted, from a larger rock, a technique known as comminution dating.

Conversely, if the recoil-ejected atoms of 234U are caught in some medium surrounding the sediment grains, there will be an excess of 234U and other 238U-series radionuclides held within that medium. For ice-bound sediments held within glaciers, this glacial ice serves as a perfect reservoir for those ejected atoms, and by measuring the U-series isotopes in the ice and icebound sediment, as well as some physical characteristics of the sediments, we can calculate a U-series ice age.

We can use comminution dating to assess the timescales of fine sediment production in Taylor Valley. The valley walls rise precipitously above the valley bottom, in some places to heights over 2 km from floor to peak. Yet, there is no consensus on how old the Dry Valley landscapes are and when this sharp relief was produced. Further, the local climate is so cold that Taylor Glacier is frozen at its base within Taylor Valley. Because cold-based glaciers cannot slide along their frozen bases, it is generally thought that they are ineffective at comminuting sediments, and Taylor Glacier should not have been capable of eroding the valley under these conditions.

By measuring the comminution ages of sediments from different heights on the walls of Taylor Valley, we can compare when the sediments were comminuted. If all the sediments are very old, Taylor Valley is an ancient (several million years old) landscape, and Taylor Glacier acts as a bulldozer moving ancient sediments through the valley. But if the comminution ages of sediments from the valley floor and ice of Taylor Glacier are young, this

suggests that Taylor Glacier is a powerful erosive force and may have been burrowing its way down into the valley gradually over the last several million years.

We can use U-series ice dating of the sediment-laden ice at the bases of the glaciers in Taylor Valley to ascertain the timescales of when sediments were incorporated into this ‘basal’ ice. By studying the chemistry of the basal ice as well, we can understand whether sediments were incorporated into the ice under conditions of salty, melted water (brines) or if they were incorporated into the ice under dry, frozen conditions. Together, this information will help us determine how sediments are incorporated differently into Taylor Glacier versus the nearby alpine glaciers and the timescales over which this process occurs. Further, by understanding the interaction between potential brines beneath Taylor Glacier and its basal ice, we will better understand how a structure like Blood Falls functions and, more importantly, how U isotopes are fractionated and stored beneath ice sheets.

With the samples we collected back in Santa Cruz, and a lot of time invested into developing methodologies to make these measurements, I am excited and motivated to start answering some of these key questions about Taylor Valley and the chemistries that exist and evolve at the base of glaciers and ice sheets!

Ten Years After by Thorne Lay

On May 12, 2008, a huge earthquake struck along the eastern margin of the Tibetan Plateau, adjacent to the Sichuan Basin. The earthquake had a seismic surface wave magnitude of 8.1, placing it as the largest earthquake to strike within continental crust in the last 60 years. Massive damage occurred along a rupture zone that extended 300 km northeastward from the initiation point. Sliding on the fault lasted 110 s and involved combined thrust and right-lateral strike-slip faulting with surface displacement of up to 11 m. The tectonic setting involved eastward extrusion of Tibet against the strongly resistant crust of the Sichuan Basin. About 88,000 lives were lost and 374,000 people were injured in the earthquake, and many towns and villages along the Longmen Shan frontal range were destroyed by a combination of shaking and land-sliding. This event was pivotal for earthquake science and geophysics in China, mobilizing the entire nation to respond to the massive catastrophe on an unprecedented scale. Entire towns were relocated out of the steep valleys within the 4.0 km topographic relief of eastern Tibet; extensive field and geophysical investigations of the earthquake and its aftershock sequence were undertaken, and vast seismic and geodetic ground deformation monitoring networks were deployed across China.

An International Conference for the Decade Memory of the Wenchuan Earthquake was held in Chengdu, Sichuan, China May 12-14, 2018. Professor Thorne Lay was invited to give opening remarks and a keynote speech in his capacity as President of the International Association for Seismology and Physics of the Earth's Interior (IASPEI). The conference was organized by the China Earthquake Administration and involved high-level participation by the State Counselor of the People's Republic of China and the Governor of Sichuan Province.

With over 1000 researchers, emergency management leaders, and science administrators in attendance, this was perhaps the highest profile international conference for the Earth Sciences yet to be held in China. Three days of research presentations and poster sessions displayed research and societal response efforts from the past decade. The earthquake hazard in the region had been underestimated and the faulting may have been influenced by impounding of a nearby reservoir, prompting extensive investment in

Opening session remarks by Thorne Lay, President of IASPEI.

Ten Years After Cont.

earthquake monitoring and forecasting efforts in China, along with revised engineering practices.

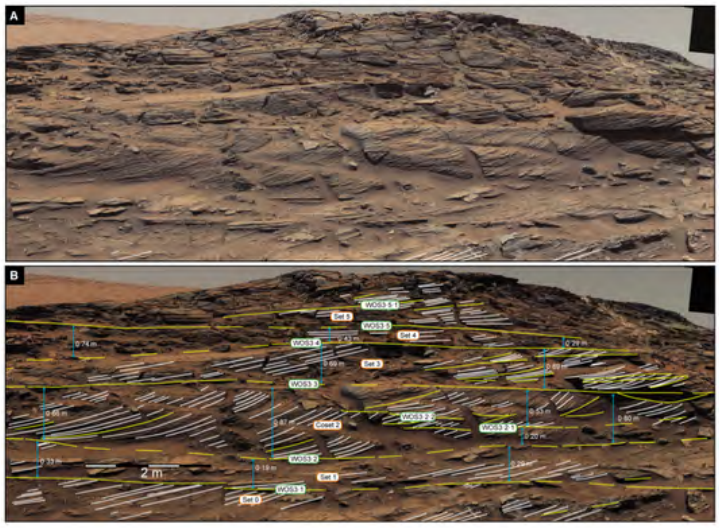
Field-trips after the conference provided an opportunity to visit devastated towns along the rupture zone that have been preserved as earthquake memorials. Even ten years after the event, visiting these sites provides sobering testimonial to the destructive force of a large earthquake; heart-wrenching even for a long-time great earthquake researcher like Professor Lay. Subsequent to the meeting he has completed an invited review paper on the earthquake faulting as deduced from field observations, seismic recordings, and geodetic observations, with the images of the destruction forever seared into his perspectives.

Damage in the earthquake memorial town of Beichuan, China. (T. Lay)

Field Geology on Mars
by Dave Rubin

Since 2012, Dave Rubin has been working as a Participating Scientist on NASA's Mars Science Lab, rover Curiosity. His operational role is as a Surface Properties Scientist, working with the rover drivers to plan daily drives that will achieve science objectives while keeping the rover safe from damage from rocks, or becoming trapped in sand. (He was selected for this role because of his past experience doing fieldwork on dunes — including getting vehicles stuck and extracted from in sand in Utah, Australia, Fiji, and China's Qaidam Basin). His science role is as a sedimentologist and aeolian geomorphologist, using ground-based images to interpret the origin of sedimentary rocks and dunes.

Since 2017 he has worked on fluidized sediment injection pipes, aeolian sandstones (see Figure), stratigraphy of Mt. Sharp, and modern dunes in the Bagnold dune field in Gale crater.



Original and interpreted images of aeolian cross-bedded Stimson sandstone at the Williams outcrop, Emerson plateau, Gale crater. Strata were deposited by dunes that migrated from the right to left in the image (northeast). From Banham et al. (2018).

Update on Development by Andy Fisher

EPS Development Milestone: Graduate Fellowships
It has been a longstanding goal that the EPS Department at UCSC would be able to provide graduate student funding independent from limited campus and external sources. We are excited to announce that, by combining income generated from the Waters and J. Casey Moore Endowments, we will be making the first EPS Department Fellowship awards for graduate students during the 2018-19 academic year. We will continue making research awards with income generated by other funds that target graduate students, as their endowments grow towards fellowship levels. The evaluation criteria to be used for EPS Graduate Fellowships are being discussed, and likely will target current students as they advance their research towards degree completion. We look forward to growing these and other funds that support graduate students (Wu, Eli Silver, and Earth's Environment Funds), which will help EPS to maintain a strong reputation for nurturing outstanding talent and launching successful careers in research, industry, public service, and other fields.

SURGES support for EPS Undergraduate Researchers
There is a separate write-up in this newsletter (p.27) about the new Support for Undergraduate Research in Geological and Environmental Science (SURGES) Fund, which specifically emphasizes support for undergraduates who want to get research experience. We are grateful to Tom Bullen and Roger Koopmann for launching and endowing this fund, which will serve EPS and Environmental Science majors for decades to come. Other EPS funds that emphasize undergraduate research and education continue to grow (Earth's Environment, Eli Silver Fund, Weber-Holt, Holly Day Barnett), supporting more of our majors every year.

Support for EPS Special Needs
We recently received a significant donation to the EPS Special Needs Fund, to assist with a wide variety of alumni, teaching, and research support. We are grateful for contributions to this fund, which is flexible and can be targeted towards short-term goals.

EPS-AC Leadership and Membership
Since it was started in 2012, the EPS Alumni Council (EPS-AC), has been led by Mike Underwood (BS, 1976) and Peter Vrolijk (PhD, 1987), helping EPS to extend connections with former department members, and to develop a focused approach to social activities and fund-raising. It was always planned that AC members would rotate on and off, and new leadership would step up. The Spring 2018 EPS-AC meeting was Mike Underwood's last as co-chair (thank you!), and Stefano Mazzoni (BS, 2000; MS 2002) kindly agreed to take over this role. Peter will remain as co-chair with Stefano, for the time being, but we anticipate welcoming a new AC co-chair in the next year or so. Meanwhile, if you want to tell Stefano or Peter about your ideas for events, development, or anything else, or express interest in joining the EPS-AC to help guide future activities, please email them directly: stefano00038@yahoo.com, pvrolijk@comcast.net.

Other exciting EPS Development activities and accomplishments are highlighted elsewhere in this newsletter, and at our website (https://eps.ucsc.edu/). Please stay in touch.

Andy Fisher (afisher@ucsc.edu)

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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 help to build endowments that have enduring benefits for future generations of EPS students, and provide much-needed immediate support for 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: **`http://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 a variety of EPS development options; 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:
- Jim Zachos (Department Chair): 831-459-4644, jzachos@ucsc.edu
- Andy Fisher (EPS Development Coordinator): 831-459-5598, afisher@ucsc.edu
- Grace Caslavka (Department Manager): 831-459-4478, gcaslavk@ucsc.edu

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

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

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): _____

EPS Development Options (updated Summer 2018):

☐ **J. Casey Moore Fund**

The Casey Moore Fund supports current EPS graduate students as they conduct thesis-related research. ***We are close to offering fellowships using interest from this endowment!***

☐ **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 conducting research involving water resources, climate change, and Earth's landscapes and aquatic systems.

☐ **Eli Silver Earth and Planetary Science Opportunities Fund**

The Eli Silver Fund supports EPS undergraduate majors and graduate students, contributing to costs for professional development, education, and living expenses.

☐ **Aaron and Elizabeth Waters Fund**

The Waters Fund honors the department's founding chair and his wife, supporting excellence in graduate research with awards for thesis proposals and fellowship support.

☐ **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.

☐ **Support for Undergraduate Research in Geological and Environmental Sciences Fund**

The SURGES Fund supports undergraduate students as they complete research projects, giving students a chance to consider career and graduate school options.

☐ **Holly Day Barnett Fund**

The Holly Day Barnett Fund supports an annual award to an outstanding EPS major with interests in Environmental Earth Sciences.

☐ **Earth and Planetary Sciences Special Needs Fund**

This unrestricted endowment generates interest that supports immediate EPS research, education, and development needs, directed flexibly as needed on short notice.

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

1970

David F. Work, MS

Retired, director on two boards. Trustee for 3 non-profit orgs.

1971

Gary Holzhausen, A.B.

I'm retired now. But still doing some interesting work with fracture mechanics and hydraulic fracturing. In particular, I've been involved with application of shallow hydraulic fractures for environmental remediation (cleanup of dirty soil).
We're on our way to Argentina and Chile to see the Andes for the first time. No grandchildren yet, but we're getting closer! I remember meeting Bob Garrison, Rob Coe and Othmar Tobisch at Aaron Water's house in Santa Cruz during the summer of 1968. They were all new hires and were arriving at UCSC for the first time. Keep up the good science and avoid politics. UCSC already has enough of the latter!

1973

James R. Hein, PhD

Retired 3 December 2018, 2 months shy of 45 years with the USGS. EPS was a small department with an excellent group of professors and grad students. So many opportunities to learn from the best earth scientists of the day, who taught seminars on a regular basis.

1974

Nancy Ann Brewster Budden, Earth Sciences

Accepted a new position July 2018, advising the Under Secretary of Defense for Research and Engineering, as Director for Special Programs (Space, Undersea Warfare, Special Comms, Artificial Intelligence).

1977

Lisa Wright, BS

I retired from ConocoPhillips in Scotland, after spending some time time building reservoir models for a high-pressure, high-temperature gas field. Scotland was wonderful! Before that I spent 26 years with Anchorage, mostly working Kuparuk & satellite development for COP, which let me wear a variety of different and fascinating professional hats. Alaska was wonderful too. After we left Scotland, my husband Greg got a job teaching in Florida, but it wasn't for us and we moved to Anacortes in 2014 (north of Seattle). We do a lot of sailing, hiking, and generally enjoying life. Greg is teaching, and I have also written a book (Between the Swastika and the Bear, by Andrew Jurkowski & Lisa Wright). It's my father-in-law's memoir of his life in Poland from 1925 until his escape to the west in 1948. I remember field trips: finding outcrops of the Kyanite/Sillimanite/Andalusite triple junction in the Sierra foothills and visiting Death Valley and the Mojave Desert with Weber & friends. Best wishes!

Larry Smith, B.S.

I got promoted to full Professor this past year, as I'm in my second year as department head of the Geological Engineering department at Montana Tech. I try to work on my research into the geochonology and sedimentology of glacial Lake Missoula deposits in western Montana when other duties allow. With retirement on the horizon, I'm looking forward to some simplification in my schedule and more travel. My wife retired when we were on sabbatical at DTU-Riso, Denmark. She reminds me that I cannot work forever! I'm still enjoying ice hockey along with cross country and telemark skiing and the great outdoors of Montana. I look back with admiration on my professors and fellow students that I learned so much from, even when my performance was lack luster. Eli Silver really helped me improve my writing in Applied Geophysics labs! As I always tell my students, the best geologists see the most rocks (or sediments, soils, or landforms), and you really don't understand an outcrop until you've visited it six times.

Frank Perry, B.A.

I currently work for the City of Capitola as curator of

the Capitola Museum. I just became a grandfather. My favorite memories are of field trips to the eastern Sierra. The geology and other science classes I took have served me well through the years. Though I am not working directly in geology, it is surprising how often I draw upon the fine education I received at UCSC. It was great to see five of my professors over the past year or so.

1979

Judy Parrish, PhD

I retired in 2011, but have been more active in research than ever. I remember Cotton, Steve Rowland's dog (and a lot of other good memories, but Cotton was special). I was very honored to be elected to the EPS Alumni Hall of Fame this year

Bruce Lymburn, BA

For the last 14 years I've been the General Counsel of Clif Bar & Company. I went to law school at UC Berkeley, and graduated in 1982. My wife Linda and I raised three sons in Piedmont (in the Bay Area), and we have a beach house in Capitola. My favourite memory is trying to figure out the origins of the campus Mima Mounds with Professor Gary Griggs. Still working on it....Still fondly remember my earth sciences studies at UCSC. Still in touch with Gary Griggs!

1982

Mark Maki (imemaki@gmail.com)

I have continuing interests in the philosophy of science, and was very involved in Earth Sciences during an exciting phase of 'discipline evolution'. In this short span of time, there were a number of changes in basic concepts and experimental practices. I personally know the topics presented by John McPhee in his geological opus magnum...and some of the people he referred to for expert advice. Real geology begins with real fieldwork, and is usually difficult, expensive, dangerous, time-consuming, but rarely dull. Physics, chemistry, biology, and mathematics are the foundation, and it helps to be very athletic, possessed of stamina, have excellent color perception, to be a puzzle-solver, and be familiar with field hazards. Most of the notable contributors in this science have spent a good amount of time looking at the evidence (typically in the field...it is too costly to transport a six-ton slab back to the office for review.) Finally, you must be very creative, there are numerous obstacles waiting in every phase of decipherment of the records of former worlds. The method of multiple competing hypotheses is given preference in most modern analysis. (photo, surveying the Central Alaskan Range, third highest mountain range in the world. This project comprised decades of work and multi-national contributions of scores of government, university, and commercial scientists, culminating in the discovery, some years later, of the Pebble porphyry, S Alaska, one of the largest gold deposits in the world. My ascent of Mount Rainier, in a late spring blizzard, was given attention by Lou Whittaker in his memoir... I climbed the Grand Teton with Bill Briggs, the month following his record-breaking ski descent.)

1984

Parke Snavely, PhD

I recently retired from ExxonMobil after 36 years in Research, Exploration and Development. Currently pursuing consulting and training opportunities worldwide. Just returned from Poland where I am assisting in the evaluation of unconventional resources in the Baltic Basin. Claire is continuing in her role as Geologist and GIS Manager at Phase Engineering in Houston. Our older daughter, Allison, is living happily in Denver and our youngest,

Rachel, has recently completed her MS in Geospatial Science and will be starting with the EPA in January. I remember outstanding faculty and close-knit geoscience community...and Friday beer hour. Repeal Prop 13 in 2020!

Peter Plumley, PhD
I have been at Syracuse University since 1985. My current affiliation is with the College of Engineering & Computer Science as Research Associate Professor in the Department of Civil & Environmental Engineering.
I'm also giving back to society through a parallel job at the regional science center (Milton J Rubenstein Museum of Science & Technology - MOST) as Chief Program Officer. While serving as Assistant Dean in the College, I created four Design Build and Compete events to encourage 4th - 12th grade students to experience thermodynamics, civil & structural engineering, programming, and aerospace engineering. We run these programs at the MOST utilizing college undergrads as event staff. Enrollment has increased significantly through recruitment of local HS students. My favourite memory is running for pleasure on the forest trails and riding my bike up through the cattle pasture. My wife and I enjoy the area and visiting the Earth and Planetary Sciences Department and meeting old colleagues and faculty. Wish we could visit more frequently. But I'm not retired yet - likely teach for another few years.

1989
Jim McRea, Earth Sci
Our daughter is now at UCSC. My favorite memory is of Summer Field.

1990
Glenn Nelson, Ph.D.
I have been employed as a Senior Software Engineer and Architect at Fleet Numerical Meteorology and Oceanography Center in Monterey for 13 years. I am primarily responsible for ensemble forecast verification software. I expect to retire in the next year or two. We still live in Santa Cruz. On the Friday after the Loma Prieta earthquake (Tuesday, 17 Oct 1989, M 6.9) I was working in the seismology lab when a Japanese news team arrived. They asked for someone to guide their helicopter to see the fault and waved a few Benjamins. All the other graduate students pointed to me. Off we went - one door on the 4 seater had been removed so that the cameraman and I had a clear view below, esp. when the helicopter tilted to the side! We saw no fault rupture (no surprise) and landed at the base of campus next to the chopper of VP George Bush! Then we proceeded on a ground tour in their rented Mercedes, finally finding a fissure on Summit Road (though only a surface disturbance, not the actual fault, it was good enough for the news). Most Sundays I enjoy a cutthroat game of cards with Prof. Schwartz and other old friends. Most Saturdays I'm hiking somewhere in the SF Bay Area and I try to impart some knowledge of geology to my 20 or more companions.

1991
Fred Hochstaedter, PhD
I'm in my 21st year of teaching Earth Sciences at Monterey Peninsula College. This means I've spent more than 30 years in the Monterey Bay Area since moving to Santa Cruz for grad school in 1985.

1994
Matthew Huisman, BA
Local Boston Group meets for fun and Beata runs it. I married Andrew Dundin in Barrington, RI on Sept 2, 2018. Fairy Land was always fun. I loved my UCSC experience and love the family I made there.

Gabriel Filippelli, PhD
I started as Editor-in-Chief for the newest American Geophysical Union journal, GeoHealth, in 2017. The journal aims to bridge the divide between the geosciences and the human health sciences. This gap has been recognized as well by the launch of a new AGU Section called GeoHealth, which has received over 33 session proposal for the Fall Meeting 2018!

I look forward to continuing to feature outstanding and impactful research findings, hopefully from some fellow GeoSlugs! Definitely one of my favorite GeoSlug memories was the first Quarter seminar which involved field work and introduced me to some of the amazing UCSC faculty, as well as my own graduate school cohort.

1995

Chuck Carter, Earth Science
Geophysicist.

Harold Tobin, PhD
I have recently moved from University of Wisconsin-Madison to the University of Washington, where I am now director of the Pacific Northwest Seismic Network and professor of Earth and Space Sciences. Other Slugs here at PNSN are Renate Hartog and Alex Hutko. Some details in these links:
https://environment.uw.edu/news/2018/07/harold-tobin-named-director-of-pacific-northwest-seismic-network/
I'm happy to hear from UCSC Earth Science folks in Seattle or those just passing through!

1997

Celina Hernandez, B.S.
I dabbled in Geotechnical industry after graduating and then worked for many years in the environmental consulting industry. I moved into the public sector in 2017 at the Regional Water Board, San Francisco Bay Region. I've been living in Oakland for about 16 years. Eight of those year with my partner, Joe, who is also a Slug. The best decision we made was taking a year off to travel to parts of Asia and Europe in 2013. My best memories are from the field classes with Gerry Weber. Worked and studied hard with some fun mixed in. Thanks, Gerry, for keeping my love for geology strong through college and after. Wherever I go, I'm always looking at rocks and the landscape to understand the geology and Joe expects this from me, too!

1999

Philip Stauffer, Ph.D.
I continue to work at Los Alamos National Laboratory, developing simulation capabilities, mentoring Ph.D. students and postdocs, and managing a range of projects. One of the more exciting science projects is an experimental study of heat generating nuclear waste located 2100 ft underground in the WIPP facility. In Nov 2018 our National Risk Assessment Partnership team received an R&D100 award for developing a set of tools to analyze the risks associated with injecting CO2 into the Earth. The kids are growing up fast, Denali is in 9th grade, Carson in 4th, and Jasper in 2nd. They sure keep us busy! I have fond memories of Friday beer hour with the other grad students and faculty. I hope that this tradition is still going strong!!!

2000

Jon Lear, MS
Water Resources Manager at Monterey Peninsula Water Management District,Married to a Biomechanical Engineer. Field Camp,Advisory committee member for Mid County Groundwater GSA plan. Vice chair of Seaside Groundwater Basin Technical Advisory Committee. Officer in Monterey Bay Geological Society.

2001

Louis Arighi, BS
Recently joined RPS Group as a Project Manager in their Mountain View office. I moved back to Santa Cruz with my wife, Emily, also a Banana Slug. My favourite memory is Ken Cameron telling his Intro to Field Methods class that faults couldn't turn more than 17 degrees, then being shocked a week later when he realized we all thought he was serious. I feel lucky to have been in the last group to do summer field with Gerry Weber, which was an unforgettable experience.

Matthew Huber, PhD
I am happy to announce receiving the AGU Atmospheric Sciences Section "Ascent Award" for mid-career scientists. It is with great pleasure that I wanted to let everyone know that former UCSC

undergraduates, Jon Buzan and R. Paul Acosta received PhDs with me in 2018. Both are advancing on to fantastic post-docs. Please congratulate them!

2002

Timothy Nielsen, BA
CA Professional Geologist #8855. Now Operations Manager at Seton Scientific. One memory is when I found my Best Buddy Ever, Bernie, a Westie. Also trying to make ukuleles out of angry junk pallet wood and old wine boxes. Also dawn patrol Surfing the Lane, riding my bike up, starving warp-speed downhill after geomorph, fat lunch burrito at Planet Fresh downtown. I gave UCSC my all and sometimes got barely passing grades. Still the best decision I ever made.

Tyler Ladinsky, BS
I'm currently working for the California Geological Suvery, Seismic Hazard Zonation Program where I focus on delineating and zoning active faults throughout California. Additionally, we preform expert peer review of consulting geologic reports for schools and hositpals throughout California (ie CGS note 48). My favourite memory is summer field camp at the Poleta Folds and June Lake! And New Idria. All with Hilde! ,Always enjoy meeting our geologists who went to UCSC.

Stefano Mazzoni, MS (BS 2000)
Started a new job at Sanchez Oil & Gas, working New Ventures, in May 2018. Our daughter turned 5 in August and started Kindergarten this fall.

2003

Eric Peterson, B.S.
Currently Gulf of Mexico Exploration Geophysicist at BHP Petroleum. Fascinated by salt tectonics, seismic imaging/interpretation and finding prospects. My favorite memory is hanging out with the locals during campfires on the Geology Field Mapping Trip in New Idria, CA run by Hilde Schwartz.

2004

Edmond Lee, B.S.
Currently working in the regulatory field as an engineering geologist for the City of Los Angeles.My favorite memory is the satisfaction of completing my reports for summer field at Poleta Folds & June Lake after the long field days of mapping and compiling the data.The campus has changed so much since I had graduated. I hope to visit the campus again someday.

2005

Ben Melosh, BS
Research geologist, USGS, Menlo Park. My favorite memory is the time Matt Paulson accidentally ran over a snake during summer field camp in 2005. We cooked the snake and ate it because it didn't seem right to let it go to waste. When the sun was setting we would go up on this ridge over looking a huge expanse of desert and hit rocks into the abyss with a baseball bat that Matt brought. The cracking sound the carbonate made when you struck it perfectly is still one of my favorite sounds. Matt passed away this year in January, his memories will always loom larger than life.

2006

Nate Bogie, BS
My wife and I had a baby, Asa Wolfe Bogie, born in June. My favorite memories are the field trips! Exploring the Coast Ranges, and Eastern CA.

2007

Christie Rowe, PhD
Got tenure; had a baby, Samuel Casey Rowe Kirkpatrick (named after Casey Moore). My favorite memory is when Ian Howat got kicked out of the Catalyst for telling the bouncer he was a PhD student (and trying to enjoy his pint outside on the sidewalk).Thanks for putting together the newsletter!

2008

Astrid Leitner, B.S.

I received my PhD this year!!!! Dec 2018 will be my graduation date, and I have successfully defended and submitted my dissertation at the University of Hawaii Manoa in the Oceanography department. My dissertation title is "The Influence of Abrupt Submarine Topographies on Local Community Ecology at Various Scales". My favorite memory is daily group homework/study sessions in the physical sciences building,

Corina Forson,B.S.

I am the Chief Hazard Geologist for the Washington Geological Survey ,married with a baby! My favorite memory is Summer Field camp with Hilde Schwartz and the 2008 class.

2009

Jennifer Small (Now Jennifer Small Griswold), PhD

I received tenure and was promoted to Associate Professor at the University of Hawaii at Manoa in July 2018.We bought house in Palolo Hawaii (with tenure we plan on staying in Honolulu long term!) Geoslugs should come for a visit! My favorite memory is Department Picnics - specifically the baking/food contests. The one that involved using Velveeta cheese as clay was particularly fun! I also loved the t-shirt contests.

2010

Sora Kim ,Ph.D

I spent 18 months as an assistant professor at University of Kentucky, but accepted and started a tenure track faculty position at UC Merced in March 2018. I have two kids who are 4.5 and 1.5 years old who keep my life busy.

Jake Kramarz, BS

MS in Hydrology from Colorado School of Mines; interned with Marin County Stormwater Pollution Prevention Program and Environmental Science Associates; worked for Stillwater Science (Berkeley); now work for Clearwater Hydrology (Berkeley). I got married two months ago! We met at UC Santa Cruz in 2008! Field Camp!

2011

Zach Mayo,BS

Upon graduating from UC Santa Cruz I spent nearly 7 years in the geological, geotechnical, and environmental consulting industry anchored in the Bay Area and working throughout the United States. I have now moved on from consulting and am serving as an Engineering Geologist with the California State Water Resources Control Board in the enforcement division for water rights. I really enjoy the public sector and have been enjoying the interaction with water rights stakeholders and believe I am making a positive impact at the state level. One of our intro to field geology trips was around Halloween and the weather was poor at best. Our first night was quite rainy and windy. If I am not mistaken, I believe one of my fellow slugs had a leaky tent and abandoned his tent for warmer and drier conditions. To his surprise, he arose from a friend's tent only to find that his tent was nowhere to be found. Thinking this was a prank he asked around if someone had stolen his tent and belongings in the tent, which would have been a logical thing to think our class would do. We geared up and headed out for the day to hike, map, and nap. On the final stretch of the day while the class was heading back to camp we stumbled upon a vinyl heap of gear in a drainage ditch being pinned down by tree branches. Our homeless slug had found his tent and some of his belongings well over a mile from camp thoroughly soaked with tent poles snapped like twigs. His tent must have caught a strong gust of wind and sailed to its current resting place. He claims he had staked his tent, but I remain skeptical. I thoroughly enjoyed my time at UC Santa Cruz and miss many of the professors, staff, and my fellow classmates. I hope everyone is doing well.

2012

Dione Rossiter, PhD

Climate Specialist, Office of Sustainability, San Mateo County and Adjunct Professor, Dept. of

Meteorology & Climate Science, San Jose State University. I recently moved back to the Bay Area after 5 years in Washington DC and 1 year traveling through Mexico!

Marissa Castillo, Earth Science-environmental geology
Promotion to Supervising Environmental Health Specialist in Merced County August 2017. My four year-old started preschool in August 2018.

Francesca Spinardi, BS
I worked at the USGS for two years, then got my masters in 2017, currently working on PhD in Earth sciences at the University of Waikato, New Zealand. I met my husband during Cal. geology, he too is an earth scientist. We recently got married last year. My favorite memories are Summer field, Death Valley field trip, setting up piezometers for Groundwater in stormy weather, volunteering for fun projects with graduate students. I still think of my time as a Geoslug fondly. The department has always had a great staff and faculty. I learned a lot and much of that has carried me on into career opportunists, while also giving me appreciation for this planet we are on.

2014

Kyle Johnson, B.S.
I took first steps in a geology career beginning a job in June 2018 as a Wellsite Geologist (aka mudlogger). Duties are primarily to ID the rock cuttings from oil/gas and geothermal drill rigs from up to 15,000 ft depth. I took my GIT test in October, and feel strongly that I passed. I have been considering getting a Masters degree in more of an environmental field such as hydrology or geotechnical/engineering. Working 12 hour shifts for weeks on end will be getting rather tiresome soon! I am continuing to love my lifestyle working weeks on-weeks off, based in Mammoth Lakes, CA. I continue to rock climb and am developing my backcountry skiing/mountaineering skill set in my backyard! My favorite memories are Summer Field 2013 and Structural Geology 2012 - cultivating friendships with peers, graduate TAs and professors in the field, classroom and the pubs. Designing and testing equipment for Slawek Tulaczyk's Glaciology lab to be sent to Antarctica sub-glacial drilling program, WISSARD. I am seeking out previous classmates working in the Earth Sciences to hear how they like their jobs, and lifestyle in order to assess what subfield I wish to pursue. I also invite current students or recent graduates to contact me for advice in education, oil and gas industry, or a rock climbing partner!

Neal Hetzel, Environmental Geology
After graduating, I moved to Finland for three years to play professional soccer. I moved home this past year and am serving in AmeriCorps for 10.5 months with the Watershed Stewards Program, helping put on watershed restoration events and teaching watershed related subjects to school children in Humboldt County where I am serving. My favorite memory is when I failed my first ever upper division earth sciences quiz and thought the world was going to end. I ended up with a B in the class and graduated with honors. Life goes on!

2016

Michael Nayak, PhD
PrincipaI Investigator, LANDIT [Long-duration Antarctic Night and Daytime Imaging Telescope], a 2018-2020 joint NSF-AFOSR project based at the South Pole. Currently resident at South Pole for austral summer 2018.

Julie Passantino, Environmental Geology
Science Teacher - jobs will be available soon in the PVUSD school district if interested. My favorite memory is working in the Slough with my class cohort and taking sediment samples to write our final paper. That was the most amazing class with Ana. Teaching students about science is rewarding and exciting! To get others excited in geology and to see them pursue it is amazing.

Alex Steely, PhD
I manage the geologic mapping and geothermal exploration group at the Washington Geological Survey. My favorite memories are drippy rainy days walking in the redwoods. Also, the time I saw a bobcat catch and eat a snake on my bike ride to campus.

2017
Tyler Paladino, BS
This fall I started grad school! I'm enrolled in a PhD program at Idaho State University in Pocatello, ID. I'm studying all things volcanology on both Earth and Mars. Currently, I'm investigating how explosive eruptions on Mars could potentially lead to hydrated regolith using complex simulations and super computers! Later I'll also be studying how Martian lava texture morphologies evolve over time and also how they can affect habitability. Super neat stuff and I'm loving every minute of it! ISU's department reminds me a lot of UCSC. Miss my slugs! My favorite memory is presenting crackpot planetary ideas in Ian's class!

Nadim Abu Hashmeh, Earth Sciences w/ Planetary Science Concentration
Since graduating from UCSC, I've taken part in atmospheric science research (NASA/SJSU internship), cosmochemistry lab development + meteorite microprobe analysis (UCSC EPS Junior Specialist), and remote sensing image analysis of Saturn's rings using Cassini data (SETI/NASA Ames Data Analyst). My undergrad experience with the EPS department afforded me this diverse and invaluable set of experiences, and I am forever thankful for it. Being able to count on seeing friendly and welcoming planetary science and earth science majors huddled across one or two large tables in the S&E library at any given time of day or year has always been special to me. You know a department is special when you float the idea of taking on a minor or second major just to spend more time around the department.

Jordi Vasquez,BS
After just six months in Glendale working for the California Department of Water Resources, I transferred to the Fresno office and have been here since June! My work continues to focus on long-term water supply planning as well as decreasing the energy intensity of managing California's water. My favorite memory is Field during EART 109 with Hilde Schwartz! I am working with UCSC to form a Slug alumni chapter for the San Joaquin Valley chapter if anyone is interested in joining!

2018
Vicky Yuan, MS
I completed my MS thesis entitled “Late Pleistocence Central Equatorial Pacific Temperature Drivers”. Immediately following the completion of my thesis and year long part-time teaching at Hartnell College, I started an intensive urban teaching residency at the American Museum of Natural History (NYC) in June. UCSC provided the environment for me to figure out that, while I love research and the practice of science, sharing that excitement and respect for science through teaching is what I enjoy most. I hope to leverage my research background, museum resources, and teaching experience gained at UCSC to effectively teach in high need public schools. So far it's been a great opportunity to work with scientists and educators figuring out what good science teaching looks like!

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