

UC Santa Barbara Earth Science

Chair's Letter: Andy Wyss

Dear Alumni and Friends,

Approaching the end of the year of our epic solar eclipse, it is my privilege to share with you exciting happenings in the Department.

The year kicked off with the hiring of two new faculty members. We are delighted to have Professors Zachary Eilon and Kristin Morell joining our ranks (p. 5).

At the other end of the career arc, in June Doug Burbank transitioned from "active-duty" Professor to Professor Emeritus.

In April we were visited by our dear friend, Professor Emeritus Mike Fuller (former Chair), who has been enjoying another paradise, Honolulu Hawai'i, since leaving UCSB (p. 6).

Our graduate students hosted a highly informative Graduate Alumni Career Panel, in April, including three fabulous panelists, Elizabeth Cochran, Doug Erwin, and Mark Grivetti.

In September we feted our new cohort of graduate students with a trip to Santa Cruz Island (photo above).

Profiles of two of our esteemed graduate students (pp. 8-9) provide a glimpse into that program. We showcase (pp. 2-3) our capstone undergraduate Summer Field course, which visited Ghost Ranch, New Mexico, and Santa Cruz Island.

Public support meets our basic teaching needs, but preserving the truly exceptional quality of our programs requires supplemental resources. Our students' benefit tremendously from the generosity of our community of supporters, to whose commitment we are deeply indebted.

Wishing you health, tranquility, and contentment in the New Year.



Faculty Awards



SUSANNAH PORTER

We are proud to announce that Susannah Porter was selected as the 2017 recipient of the Geological Society of America's Division of Geobiology & Geomicrobiology's post-tenure award!

This award recognizes Susannah's many influential contributions to understanding late Proterozoic and Cambrian life, including the origin of mineralized skeletons. These findings propelled her recent promotion to full professor, during her promotion case last fall, making the GSA's bestowal of this recognition both fitting and timely.

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Photo: Santa Cruz Island by Scott Condon

Summer Field 2017: New Mexico

by Alex Simms

For the first half of summer camp this year, we traveled to Ghost Ranch, New Mexico, to explore the Mesozoic rocks of the southeastern Colorado Plateau. Two teaching assistants, 11 students, and I crammed into two Suburbans to travel the nearly one thousand (918) miles to Abiquiu, New Mexico. The purpose of the camp was to allow students to examine, map, and even measure section within the classic units of the Colorado Plateau including the Chinle, Morrison, Dakota, and Mesa Verde formations (groups). These classic units, combined with the spectacular folds and faults of the Colorado Plateau and adjoining Rio Grande rift, provided an excellent backdrop for learning how to piece together the geology of a region. Students mapped in the eastern San Juan Basin and adjacent Chama basin, but also had the opportunity to use their measured sections to piece together the transgressions and regressions of the Cretaceous interior Seaway.

We enjoyed the warm weather (98+), plentiful sunshine, and occasional thunderstorms.

A dip in the local reservoir was a welcome way to end the day. We also enjoyed the company of the plentiful elk that wandered through our mapping areas. Unfortunately, we didn't have any bear sightings this year.



Students mapping a large normal fault juxtaposing the Poleo Sandstone and the Upper Shale Member of the Chinle Formation (Group) near Ghost Ranch, New Mexico. The hoodoo and butte are also capped by the Jurassic Entrada Formation—a classic Eolian unit within the Colorado Plateau.
Photo: Alex Simms

Summer Field 2017: Santa Cruz Island

by John Cottle

The second three weeks of Summer Field saw the students travel to the Santa Cruz Island Reserve with Prof. John Cottle. The class was transported to the island and deposited at Prisoner's Harbor courtesy of an Exxon crew boat. After setting up camp at Christy Ranch, the students' first project involved mapping in Laguna Canyon. This exercise introduced the students to emerging digital field mapping techniques including use of iPhones, iPads and GIS to produce digital geologic maps and cross sections. After honing their skills, the students were let loose in Posa and Saucos canyons to map the SW corner of the island—an area familiar to many alumni, I'm sure!

Santa Cruz Island provides the students with many challenges that extend their geologic training, including

mapping metamorphic and plutonic rocks, documenting rapid facies changes in sedimentary and volcanic units, and learning more about Quaternary geology and active tectonics. When not diligently engaged in geologic mapping, students spent their free time exploring the island, with favorite pursuits among the group including cross-country running through head-high fennel, bald eagle spotting, and snorkeling at Christy Beach.

Overall, the group was very motivated and took to the challenge of mapping on Santa Cruz Island with enthusiasm. The group adapted well to using the new digital methods and was able to produce impressive professional geologic products.



2017 Summer Field class in the middle of the main mapping area, at the head of Posa Canyon, on Santa Cruz Island. Santa Cruz Island provides students with a challenging environment in which to map a range of rock types and learn about Quaternary geology and active tectonics.

Photo: Camille Collett

DISTINGUISHED ALUMNI 2017

Annually, the department honors two of its alumni—one from academia, and one from industry—celebrating their accomplishments and providing our current students with exemplary role models.

GERALD BAWDEN



Gerald began his academic career at Arizona State University before he transferred to UCSB where he earned a Bachelor of Science in 1991. Art Sylvester asked Gerald to join his undergraduate surveying crew and for the next three summers he and a number of his classmates spent their time in the field collecting detailed geodetic surveying data across active tectonic and volcanic structures throughout California. Leading Art's surveying crew provided Gerald with a fundamental understanding of tectonic geodesy that he ultimately shaped into a career.

He received a M.S. and Ph.D. from UC Davis using the up and coming technique of GPS to measure and model the post seismic deformation associated with the

1952 Kern County Earthquake. In the process, he developed new tools to characterize the onset of fault development by applying the structural geology concept of Riedel Shear to seismology. This changed our understanding of seismic hazards in the southern Sierra by recognizing a newly forming strike slip fault near the Lake Isabella Dam.

Gerald was awarded a NASA funded postdoc position at the USGS in Menlo Park where he used the newly evolving space geodesy technique of InSAR to understand how groundwater pumping was masking tectonic motion across the Los Angeles Basin. He permanently joined the USGS to apply various geodetic techniques to advance our understanding of

(Continued on page 9)

ALAN KRUSI



I discovered geology by accident. In 1975, I transferred to UCSB from the US Naval Academy as a junior, without a major or area of interest. I drifted into the geology department, largely out of curiosity and with few expectations, enrolled in a couple of geology courses that fall. One was "Intro to Field Studies", taught then by Art Sylvester. As many others also have experienced, it was the beginning of an exciting learning journey in critical reasoning, self-discipline, writing precision and high achievement which didn't end for me at graduation.

After summer field, I was hired as a staff geologist by Dames & Moore, a large consulting engineering firm, and I began my nearly 40-year career

in the worlds of applied sciences and engineering. Unfortunately, my days in the field were limited to six years as I successively took on more management duties. For the next several decades, I managed various engineering and applied sciences businesses. In 2003, I was named CEO of Earth Tech, a global engineering company with 7,500 employees in 13 countries. Earth Tech was acquired by AECOM in 2007, and I stayed with the company until my retirement in 2015. The last position I held at AECOM was as head of mergers and acquisitions. Over eight years, we acquired 27 companies including one of our largest public competitors.

My career embodies many

(Continued on page 9)

ZACH EILON

Zach Eilon studies tectonic processes, employing seismological data to make images of the Earth's crust and upper mantle. Earthquake waves arriving from around the world carry signals of the interior structure, which Zach uses to extract information about the temperature and composition of the tectonic plates, the presence of melt, and even the strain fabrics accrued as rocks deform deep beneath the surface.

Zach's research often involves deployment of dense arrays of seismic instruments to focus on Earth structure at the plate boundary scale. Recent experiments involved fieldwork in Iceland, Papua New Guinea, Washington, North Carolina, and Ethiopia, and he is currently a co-



PI on the international Pacific Array of Arrays, with the first ocean-bottom seismometer deployment scheduled next spring.

Born and raised in London, England, Zach completed undergraduate and masters degrees in Natural Sciences at the University

of Cambridge before moving to the US in 2010 for a year of study at Harvard. In 2016, he completed a PhD in geophysics at Columbia University, having focused his research on continental rifting and mid-ocean ridge structure. He arrives at UCSB after a year of post-doctoral research at Brown University, where he has been developing an innovative imaging method to study the formation and modification of continental cratons by allying multiple seismic data types.

When not pondering the mysteries of shallow Earth structure, Zach spends his time with his wife, Rachel (a Goleta native who is thrilled to be back in her home town), cooking, running, and bemoaning the ineptitude of the England soccer team.



KRISTIN MORELL

Kristin Morell is a field geologist who researches how mountains are built and destroyed by studying the interactions between plate tectonics and Earth-surface processes.

Her recent work using LiDAR topography and paleoseismic trenching has discovered new active

faults in southern British Columbia that were previously considered inactive since the Eocene. This work has important implications for regional seismic hazards, given that these newly identified fault networks underlie significant population centers and infrastructure.

Kristin also has a research program in the high mountains of the Indian Himalayas, where she is using the shape of rivers and rates of erosion to understand how and why earthquakes, such as the 2015 Nepal earthquake, are created.

Beginning with her masters work, she has spent more than a decade working in the southern Central American subduction zone of Costa Rica and Panama. There, she uses field mapping, geochronology,

remote sensing, and landform analysis to investigate how rates of subduction and the elevation of the subducting seafloor influence mountain building.

Kristin comes to us from the University of Victoria, in British Columbia, Canada, where she was an Assistant Professor for 3 and a half years. Before moving to Canada, she was a postdoc at the University of Melbourne, in Australia, after receiving her PhD from Penn State in 2011.

Kristin was born in Wilmington, Delaware, but her childhood was spent in places as far removed as Tampico Mexico, and rural Tennessee. Kristin is looking forward to returning to the USA, where she can enjoy a warmer climate and discover the active tectonics of her new backyard.

FULLER VISIT



Left to Right: Art Sylvester, Jim Kennett, Jim Mattinson, Mike Fuller, Rachel Haymon, Ken Macdonald, Jim Boles, Cliff Hopson.

In April the department received a welcome and long overdue visit from Professor Emeritus and former Chair Michael Fuller. Since accepting an early retirement incentive during the economic downturn of the mid 1990s, Mike has been hiding out at the University of Hawaii, where all those tropical wonders have only brightened his good cheer. To celebrate, the emeriti congregated at the freshly re-opened establishment formerly known as The Faculty Club.

WHAT ARE THE ALUMNI DOING?
We'd love to hear from you. Send us your information and we'll include it in our next issue, as space permits.

GEAR DRIVE THANK YOU *Julie Zurbuchen*



The UCSB AAPG Student Chapter would like to extend a huge thank you to everyone who donated and participated in this past spring's gear drive and raffle. Thanks to geologic gear donations, several undergrads won tents, sleeping bags, Brunton compasses, and other valuable field equipment. We have also been able to start a free camping gear rental system

so students will have one less worry in the field. Additionally, we'd like to thank the Santa Barbara Museum of Natural History, the Santa Barbara Zoo, the Wolf Museum of Exploration and Innovation (MOXI), Santa Barbara Axxess, the Santa Barbara Museum of Art, and the Nelson Winery for their generous donations which helped raise over \$250 for our student chapter!

We Wish ...

12-passenger van for field trips.

No single piece of equipment would be of greater benefit to our field studies program than our own van. This would allow us to take our students into the field as often as needed and with minimal cost. We would happily brand such a vehicle with your name (or sponsoring company) if you realized this long held department wish.



Your Ideas Welcome

We truly welcome your thoughts. What lessons did you take away from here? What needed the most help or support? We are very interested in your input, and greatly value your perspective.

Thank you all so much!

Andy Wyss, Chair

With Appreciation

Earth Science Fund Drive

The Earth Science Department wishes to thank the following for their generous donations.

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We've made a good faith effort to recognize all of our wonderful donors above. If we've overlooked you, please accept our apologies and let us know.

Thank you

Thank you very much for the generous grant. I wouldn't have made it without you! —NK

Thank you so much for the opportunity to attend Summer field. The Department Field Award is incredibly generous. —AG

I would like to thank you for the Department Field Award. It has been a huge help in financing my upcoming summer field course to New Mexico and Santa Cruz Island! I am honored to be a recipient and very excited for the weeks ahead! Graduation, field camp, and friends! —MC

One of my favorite things about studying at UCSB is being able to go on field trips. I get to visit beautiful places, make new friends, and learn things about what it means to be a geologist that a book could never teach me. ... I am incredibly grateful... —CJL

Graduate Student Spotlight



AL GREANEY

I'm a fourth year PhD candidate studying geochemistry, but I'm a relative newcomer to the UCSB Earth Science Department. I graduated from University of Illinois with a BS in 2014, and immediately began my

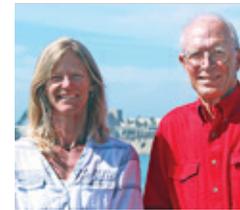
PhD with Roberta Rudnick at the University of Maryland. In 2016, I moved to UCSB to continue my PhD alongside Roberta, and was warmly welcomed into the department by the students and faculty.

My research is centered around molybdenum (Mo) geochemistry, where I seek to refine its use as a tracer of atmospheric oxygen throughout Earth's history, as well as understand the behavior of Mo during mantle melting and crust formation. My work has shown that, in contrast to previously held assumptions, Mo does not partition into sulfides in magmatic systems, which has significant implications for its use as a proxy for atmospheric oxygen. Additionally, my recent study of Mo stable isotopes in continental weathering products suggests that the onset of atmospheric oxygen at 2.4 Ga led to immediate oxidative weathering of the continental crust.

This unique project allows me to explore the worlds of high and

low temperature geochemistry, as I attempt to track the behavior of a geochemically distinct element. Through this work I've collaborated with researchers at UMD, UCSB, and Arizona State University, and have been fortunate enough to present my research at annual AGU meetings, as well as the 2016 Goldschmidt Conference in Yokohama, Japan and the 2017 International Kimberlite Conference in Gaborone, Botswana.

GSIS AWARD



Congratulations to Art Sylvester and Libby Gans for having their *Roadside Geology of*

Southern California receive the 2017 Best Guidebook Award from the Geoscience Information Society Guidebooks Committee of the Geological Society of America. What an outstanding distinction!



STAFF SPOTLIGHT: STEVE KAISER

Steve Kaiser joined the Department of Earth Science as a Development Engineer, in May.

Steve received his BS in Electronic Engineering Technology from Cal Poly SLO and MS in Scientific Instrumentation from UC Santa Barbara in 1986.

Since then he has had a long and varied design career in industry, traveled extensively supporting instrumentation, and directed the electronic shops at UC

Irvine and UC Riverside.

He is a specialist in the electronic circuitry and computing intelligence embedded inside measurement instrumentation, and interfacing them to the real world.

In the evenings, he and his wife enjoy walking to neighborhood parks with their trusty dog Kona, a Belgian Malinois mix.

JUSTIN TRAN

I am a 5th year BS/MS student under Dr. Dave Valentine, and have been in the department since my admission into UCSB. My first class in the department was taught by Dave, and I distinctly remember being in awe of the videos he showed of a submarine with robot arms collecting methane samples on the seafloor. The following summer, I went on a research cruise with the lab in the Gulf of Mexico; it felt surreal diving in a submarine that I had seen in Dave's lecture from my freshman year. The time I spent on the research cruise sparked a passion for travelling that drew me to study abroad in New Zealand during my junior year.

After being awarded the SMART Scholarship (which I heard about



through another department's email) for the BS/MS program, I began my own research with Dave and alumnus Dr. Burch Fisher. I am currently investigating the relationship between seafloor geomorphology and natural hydrocarbon seepage

by using bathymetry data from an autonomous submarine (AUV Sentry), and will be employed as a civilian oceanographer for the Littoral Battlespace Sensing for Unmanned Systems program at the Naval Oceanographic Office. I will always be grateful for the wide range of motivated people and fantastic opportunities that the Department has exposed me to, because they have shaped me both personally and academically.

Gerald Bawden

(Continued from Page 4)

water resources. He was among the first scientists in the US to begin systematically using ground-based LiDAR as a research tool.

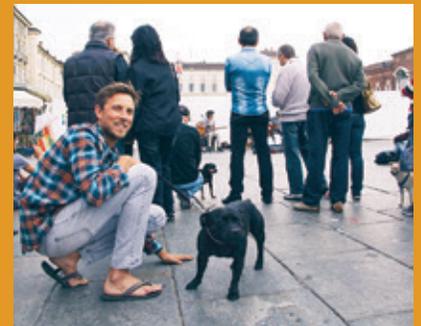
Gerald is now on an extended detail (loan) from the USGS to NASA Headquarters in Washington D.C. as a Program Scientist responsible for the Natural Hazard research portfolio. He is part of the Earth Surface and Interior Focus Area and Terrestrial Hydrology Programs. He also supports the NASA ISRO Synthetic Aperture Radar (NISAR) mission, the Surface Water Ocean Topography (SWOT) mission, the UAVSAR Airborne Program, NASA Space Geodesy Program, and the Alaska Satellite Facility (ASF). Gerald credits UCSB and Art Sylvester for springboarding his academic research career.

Alan Krusi

(Continued from Page 4)

responsibilities, both technical and financial, but began in the Geo Department at UCSB where I developed the key learning and thinking skills which served me well over my career -- core learnings about my own strengths and limitations, the scientific methods of inquiry and critical analysis, and the uncompromising standards of execution excellence. These were nurtured at UCSB under the guidance of the staff and faculty of the Geological Sciences Department, for which I am very grateful.

STAFF SPOTLIGHT: BAS KOSTER



Bas Koster joined Earth Science as Principal Lab Mechanician, in September. He completed his degree as a fine woodworker in monumental restorations in 2003, in Amsterdam

Since then he has had a long and varied career in design, woodworking and furniture-making in Sweden, Switzerland, Holland, Portugal, Costa Rica and the USA. He has a broad range of skills and techniques for the workshop setting, with a passion for coming up with creative solutions.

After work he and his pregnant wife, Grace, enjoy taking their dog Luna, a English Staffordshire terrier to the beach.

RACHEL HAYMON



Rachel Haymon received her PhD from the Scripps Institution of Oceanography in marine geology/geochemistry in 1982, and joined UCSB's Marine Science Institute. Rachel was part of the team that first found deep-sea "black smoker" hot springs on the volcanic mid-ocean ridge (MOR).

From petrologic/geochemical evidence, she unraveled how black smoker mineral deposits develop as the underlying volcanic-hydrothermal

system evolves. To probe the underlying system, Rachel mapped ancient analogs of MOR hot spring deposits exposed by active mining in the Oman ophiolite. This revealed the first examples in the geologic record of fossil macrofauna preserved in hydrothermal deposits, and led her to new ideas about along-strike segmentation of MOR hydrothermal systems linked to magmatic segmentation. Pursuing these ideas, Rachel led seagoing expeditions to the East Pacific Rise (EPR), starting in 1989 with an expedition to photographically map the segmented spatial distribution of hydrothermal, volcanic, tectonic, and biological features along an 83 km segment of the EPR crest. To achieve this feat, it was necessary to develop new methods of acoustic near-bottom navigation (using GPS) and employ Geographic Information Systems (GIS) with marine data for the first time. In 1991, Rachel led a submersible expedition back to the mapped area, and dove into a never-before-witnessed, deep-sea eruption of the MOR.

Among many unique phenomena documented, extensive blooms of chemosynthetic microbes on/under the seafloor were most astounding, and resulted in a major paradigm shift about how planets give rise to life.

During subsequent expeditions (1992-96), Prof. Haymon along with many students and colleagues revealed how EPR hydrothermal systems and ecosystems evolve following eruptions. Haymon later led efforts to establish EPR 9°-10°N as a highly successful NSF/Ridge2000 study site. Subsequently, she explored hydrothermal systems on MOR flanks and at MOR/hotspot intersections.

Currently, she is co-PI with Prof. Robin Matoza on a project in the Cascades to develop a volcanic mudslide (lahar) detection system that can be used to warn threatened populations.

Prof. Haymon joined the Earth Science Dept. faculty in 1992, teaching Intro Oceanography; ESS-Solid Earth; Mineralogy; Submarine Hydrothermal Systems; Field Studies in Marine Geochemistry (teaching many at sea); and others. She received three UCSB Residence Hall Outstanding Faculty Member awards. She also served, in 2002-03, as Director of UCSB's Interdepartmental Graduate Program in Marine Science. She is a Fellow of the Geological Society of America; a co-recipient of the Newcomb-Cleveland Prize from Science Magazine; and a recipient of the Hans-Pettersson Bronze Medal from the Royal Swedish Academy of Sciences. Rachel thanks many UCSB students, alums, staff, and faculty, and her husband and colleague, UCSB Emeritus Prof. Ken Macdonald, for all that they did together.

Faculty Awards



ROBERTA RUDNICK

Roberta was awarded the Harry H. Hess Medal, which is given annually to one honoree in recognition of "outstanding achievements in research on the constitution and evolution of the Earth and other planets."



JOHN COTTLE

John Cottle was selected as the winner of the 2018 Emerging Leader in Atomic Spectroscopy Award. This award, presented by *Spectroscopy*, recognizes "the achievements and aspirations of a talented young atomic spectroscopist who has made strides early in his or her career toward the advancement of atomic spectroscopy techniques or applications."

The Search for Stromatolites

by Stan Awramik

I am passionate about stromatolites. Stromatolites are laminated biogenic sedimentary structures produced by microbes, primarily cyanobacteria. They occur in a variety of shapes and sizes. Size ranges from millimeters to meters and shapes include domes, columns, branched columns, and cones. Stromatolites represent the oldest, confident record of life, going back 3.4 billion years. Their record continues through the Precambrian and Phanerozoic, and are found forming today in lakes, streams, springs, and marine waters. I love studying them in the field. My quest to understand stromatolites has taken me to Western Australia, China, Mauritania, Kenya, Canada, and even California. I study stromatolites of all ages including Recent ones in Shark Bay (Western Australia), the Bahamas, and Great Salt Lake, Utah.

There are significant changes in stromatolite shapes through time. The Proterozoic contains conical forms and columns, many of which are elaborately branched. Some shapes have restricted time ranges and are index fossils. Yet Phanerozoic and Recent shapes are mostly domes and simple columns without restricted time ranges. I'm still trying to understand factors controlling the shape and distribution of shapes through time.

Currently most of my field work is in Wyoming, Colorado, and Utah, where I study stromatolites of the non-marine Eocene (~50 Ma) Green River Formation. These lake deposits have the richest and most diverse assemblage of stromatolites known. Surprises happen in field work. Last summer, studying repetitive cycles of stromatolite beds and oil shale revealed that each stromatolite bed contains a different set of stromatolites. We're trying to figure out this unusual occurrence.

Giant, bulbous stromatolite from the 50 million-year-old Green River Formation in Colorado.
Photo: HP Buchheim



STAFF SPOTLIGHT: TIM CUELLAR



During his 15 year tenure as Department Lab Mechanician, Tim has played an invaluable role in assuring smooth operation with the same spirit, energy, and love as predecessors George Hughes, Bill Bushnell, and Joe Cisneros.

You may find Tim renovating an office for a new faculty member, moving furniture incessantly, manning the BBQ for the Graduate Research Review, driving a forklift to place outdoor rock specimens, fabricating lab equipment, or coordinating Department activities and needs with campus construction.

Tim is the go-to, can-do man on the Geology 18 spring and fall field trips. He maintains field gear, supervises trip logistics, drives the supply truck, oversees a cooking party, and emcees campfire festivities on "skit night."

Tim, aka DJ Tibonious, hosts "Cold Cuts at Breakfast," featuring RB, funk, and sweet soul sounds of yesteryear, on campus radio station KCSB-FM before work each Wednesday morning,

Tim says "It's easy enough to be pleasant when life goes by like a sweet song, but the man with a big smile is the man you want when every thing goes dead wrong."

Well, Tim, here's to you for your big smile and for all you do for the Department. We appreciate your work and thank you for it.

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Santa Cruz Island, California. Photo: Scott Condon

EARTH SCIENCE NEWS