Department of Earth and Planetary Science

Alumni Update • 2012-2013




University of California, Berkeley

Santa Barbara's Day

Peggy Hellweg, Bruce Buffett and Horst Hellweg

Pam Kaercher and Daniella Rempe

Chris Johnson, Octavia Compton, Marissa Tremblay and Noah Randolph-Flagg

First years doing their skit. Kathleen Woodell, Avinash Nayak, Stephanie Weurth, Jake Edman, Octavia Crompton, Xueling Liu, Courtney Sprain, Noah Randolph-Flagg

David Mangiante (singer) and band members.

Jane Kanitpanyacharoen and Eloisa Zepeda-Alarcon

Cover photo: Berkeley-led field expedition to the El Tatio geyser field in Chile, elevation 4,200 m. Instruments were deployed within and around the geysers to understand how and why geysers erupt.

Photos by: Carolina Munoz and Max Rudolph

Editors
Judith Coyote
Layout
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State of the Department, 2012-2013

Dear Alumni and Friends,

The past year has been an eventful one. Support for Proposition 30 last November brought stability to the University's budget, but many of the challenges we face after years of declining state funding have not changed. Even with these difficulties the department has reached new heights. Our undergraduate program grew to 160 majors across the six specializations, and we increased the size of the incoming class of graduate students this fall. Meanwhile our faculty members continue to push the forefront of research. In September the US News and World Report rated Berkeley as the best public university in the world. The recent 2013 QS World University Rankings in Earth and Marine Science ranked Berkeley in the top position, tied with Harvard, an improvement from the previous rankings.

Assistant Professor Nick Swanson-Hysell arrived on campus this September and has begun to build a new research lab that will combine geochemical and geophysical techniques to reconstruct the tectonic and environmental history of the Earth over the past billion years. We also welcome back Professor Bill Dietrich after a term away at NASA's Jet Propulsion Laboratory. Bill and the science team on the Mars Rover program have discovered the most definitive evidence to date of standing water on the surface of Mars in the distant past. During the past year Professor Paul Renne made news by unambiguously establishing the synchrony of the mass extinction at the Cretaceous-Paleogene boundary and the Chicxulub bolide impact. Professor Barbara Romanowicz used innovative seismic computations to reveal a new style of mantle flow below oceanic plates. I am also delighted to report that Roland Bürgmann was selected as a Fellow of the American Geophysical Union in 2013. This honor comes on the heels of Roland's recognition as the recipient of the 2012 Faculty Award for Excellence in Postdoctoral Mentoring.

The Undergraduate Majors program continues to be a source of great pride for the department with six specializations covering the full spectrum of activities in Earth and Planetary Science. The remarkable growth in the number of undergraduate majors reflects the expanding relevance of Earth and Planetary Science, as well as the extraordinary efforts of our Student Affairs Officer, Catherine Pauling.

Catherine Pauling has ably guided a generation of undergraduates through the process of selecting courses, identifying internships and achieving their career goals. As Catherine retires at the end of 2013, we offer our sincere thanks for the years of outstanding service to the Department. One of Catherine's many accomplishments is to encourage our undergraduates to take advantage of the opportunities to participate in research projects on campus and around the world. This is one of the many advantages of attending a great research university, and we will work hard to continue Catherine's legacy.

Research experience expands students' appreciation of Earth and Planetary Science and sharpens their focus on career goals. In many instances these activities are made possible by Ramsden scholarships. These scholarships offer a meaningful and tangible way to assist the next generation of Earth Scientists. We are very grateful for the generous donations we receive to support to our undergraduate and graduate students, particularly at a time of diminishing institutional funding.

Our department's legacy is the success of its alumni and we like to share those activiites with our community. Please ensure that we have your latest contact information so that you receive the updates. As always, it is a pleasure to thank the EPS staff for making this Alumni Update possible.

Bruce Buffett

Department Faculty Research Activities

Allen, Richard M., Professor, Ph.D., 2001, Princeton University. Now exploring the use of smartphones to collect earthquake data for research and hazard mitigation. The goal is to track earthquake shaking across urban areas.

Alumbaugh, David L., Adjunct Professor, Ph.D., 1993, UC Berkeley. Completed a model resolution analysis of marine electro-magnetic exploration technologies currently being employed to de-risk petroleum drilling in deepwater environments.

Banfield, Jillian F., Professor, Ph.D., 1990, Johns Hopkins. Geomicrobiology, microbial ecology and evolution; nanoparticles in the environment.

Bishop, James K.B., Professor, Sc.D., 1977, MIT/WHOI Joint Program in Oceanography. Chemical, physical, and biological controls on the cycles of carbon and related chemical species in the ocean; robotic instruments for ocean exploration.

Boering, Kristie A., Associate Professor, Ph.D., 1992, Stanford University. Atmospheric chemistry and climate; field, laboratory, and modeling studies of the stable isotopic compositions of atmospheric trace gases; photochemical isotope effects.

Buffett, Bruce, Professor, Ph.D., 1991, Harvard University. Developed a stochastic model of magnetic reversals from a 2-Myr time series of paleointensity.

Bürgmann, Roland, Professor, Ph.D., 1993, Stanford University. Explored postseismic deformation from M9 subduction zone earthquakes in Sumatra and Japan to better understand the megathrust earthquake cycle and time-dependent hazard in these regions.

Chiang, Eugene, Professor, Ph.D., 2000, Caltech. Performed numerical simulations of how dust grains sediment in circumstellar disks to form planetesimals.

Cohen, Ronald C., Professor, Ph.D., 1991, UC Berkeley. Studied the role of soils and fires in the atmospheric nitrogen cycle using space-based UV-visible spectroscopy.

Collins, William D., Professor in Residence, Ph.D., 1988, University of Chicago. Global climate models; interactions of sunlight and heat with the Earth's surface and atmosphere; applications of remote sensing to understand climate processes.

Cuffey, Kurt M., Professor, Ph.D., 1999, University of Washington. Glacier mechanics; paleoclimatology; environmental isotope geochemistry; river processes.

DePaolo, Donald J., Class of 1951 Professor of Geochemistry, Ph.D., 1978, Caltech. Currently working on isotopic fractionation during crystal growth, geochemistry of Tibetan granites, U ore deposits, and carbon sequestration.

de Pater, Imke, Professor, Ph.D., 1980, University of Leiden. Radio and infrared observations of the Solar System, including giant planet atmospheres and Jupiter's magnetosphere.

Dietrich, William E., Professor, Ph.D., 1982, University of Washington, Seattle. His research group showed experimentally the necessary conditions for sustained river meandering and presented a theory predicting valley spacing.

Dreger, Douglas S., Professor, Ph.D., 1992, Caltech. Wave propagation; earthquake source physics; earthquake hazards; realtime seismology; nuclear monitoring.

Fung, Inez Y., Professor, Sc.D., 1977, MIT. Climate change; global carbon cycle; geophysical fluid dynamics and large-scale numerical modeling; remote sensing of the Earth.

Ingram, B. Lynn, Professor, Ph.D., 1992, Stanford University. Completed a study using oxygen and carbon isotopes in varved lake sediments from the Gulf of California for assessing Holocene changes North American Monsoon and past solar variability.

Jeanloz, Raymond, Professor, Ph.D., 1979, Caltech. Turned helium and diamond into fluid metals above pressures of 1 and 10 Mbar, respectively, in line with theoretical predictions applied to the interiors of giant planets.

Manga, Michael, Professor, Ph.D., 1994, Harvard University. Published a book with Chi Wang on "Earthquakes and water" - showed that many hydrologic responses to earthquakes are caused by permeability changes produced by shaking.

Militzer, Burkhard, Associate Professor, Ph.D., 2000, University of Illinois. Predicted with computer simulations that water ice assumes a new superionic form in the interiors of Uranus and Neptune.

Pride, Steven R., Adjunct Professor, Ph.D., 1991 Texas A&M. Developed new models for how seismic waves can mobilize liquid pollutants and hydrocarbons trapped on capillary barriers in porous media and applied these models to a test site in Oklahoma.

Rector, Jamie, Professor, Ph.D., 1990, Stanford University. Seismic techniques for characterizing reservoir properties and processes; seismic reflection imaging; borehole seismology; near-surface seismology with applications to environmental remediation.

Renne, Paul R., Professor in Residence, Ph.D., 1987, UC Berkeley. Launched an NSF-funded project to build a "designer" reactor based on deuterium fusion to produce a high flux of nearly monoenergetic neutrons for Ar/Ar geochronology.

Richards, Mark A., Professor, Ph.D., 1986, Caltech. Mantle convection and large-scale mantle structure; dynamics of terrestrial planets; dynamics of global plate motions; regional crustal deformation and earthquake hazards.

Romanowicz, Barbara A., Professor and Director, Berkeley Seismological Laboratory, Doctorat d'Etat, 1979, Université de Paris. Used anisotropic wave-form tomography to reveal two distinct layers in the lithosphere under the North American craton.

Romps, David M., Assistant Professor, Ph.D., 2005, Harvard University. Our group uses theory, simulation, and observation of clouds and atmospheric dynamics to improve our understanding of Earth's climate.

Self, Stephen, Adjunct Faculty Member since 2012; PhD 1974, Imperial College, London, UK. Steve studies volcanic rocks in many parts of the world, including lava effusions, explosive eruption products, and the impact of volcanism on the atmosphere. Current research interests and papers include mechanisms and products of flood basalt and explosive super-eruptions.

Shuster, David L., Associate Professor, Ph.D. 2005, California Institute of technology. Studied timescales of mountain topography development in New Zealand and European Alps, and magnetization of early Solar System condensates.

Swanson-Hysell, Nicholas L., Assistant Professor, Ph.D., 2011 Princeton University. Developed constraints on Proterozoic Earth history through field-based projects in the Midcontinent Rift of Ontario, the Umkondo province of Botswana and the Tambien Group of Ethiopia.

Emeriti

Alvarez, Walter, Professor, Ph.D., 1967, Princeton University. Gave the annual campus Faculty Research Lecture in April, about Earth History and Big History, introducing the zoomable timescale of the entire past, "ChronoZoom" (search for it on the web!).

Brimhall, George H., Professor, Ph.D., 1972, UC Berkeley. Completed geological mapping in the Pioneer Mountains of Montana where a Cretaceous formation bears evidence of early uplift of the Rocky Mountains.

Bukowinski, Mark S.T., Professor Emeritus, Ph.D., 1975, UC Los Angeles. Physics and chemistry of planetary interiors; mineralogy; high pressure mineral physics; planetary structure and evolution.

Johnson, Lane R., Professor Emeritus, Ph.D., 1966, Caltech. Seismology and physics of the Earth's interior and wave propagation; seismic source theory; applied geophysics.

Kirchner, James, Professor Emeritus, Ph.D, 1990, UC Berkeley. Showed that stream chemistry time series have a common fractal structure that makes water quality trends difficult to detect and predict.

Morrison, H. Frank, Professor Emeritus, Ph.D., 1967, UC Berkeley. Applied geophysics: electrical and electromagnetic methods for mapping subsurface conductivity; cross-well electromagnetics for reservoir characterization; numerical modeling and inversion.

Sloan, Doris, Adjunct Professor Emerita, Ph.D., 1981, UC Berkeley. History of San Francisco Bay, Foraminifers in Bay sediments, biostratigraphy

Wang, Chi-yuen, Professor Emeritus, Ph.D., 1964, Harvard University. Continued to work on problems related to earthquake-induced transport. Collaborated with Wang-Ping Chen using results from seismic tomography to constrain temperature beneath Tibet.

Wenk, Hans-Rudolf, Professor Emeritus, Ph.D., 1964, University of Zurich. Focus has been on anisotrophy in the deep earth--with high pressure experiments--as well as anisotrophy and preferred orientation in shales and returning to the enigmatic mechanical twinning in quartz.

Garniss Curtis, Pioneer of Precision Fossil Dating, Died at 93

by Robert Sanders

This article was originally issued as a press release by Berkeley News Center. Written by Robert Sanders, Media Relations | February 26, 2013

BERKELEY —

Geologist Garniss H. Curtis, a professor emeritus of earth and planetary science at the University of California, Berkeley, whose pioneering use of radioactive isotopes to date relatively young rocks provided the first solid timeline for human evolution, died Dec. 18 in Orinda, Calif., at the age of 93.

Garniss Hearfield Curtis, professor emeritus of Earth and Planetary Science.

Curtis collaborated with late UC Berkeley professors John Reynolds, a physicist, and Jack Evernden, a seismologist, to take advantage of the radioactive decay of potassium into argon in volcanic rock to determine how long ago the rock formed. Using this potassium-argon method, they established precise dates for recent geologic time periods that allowed Curtis to assign dates to fossilized human remains and prove they were much older than once thought.

"Reynolds developed a precise way to date meteorites in the 1950s, but it was Garniss who adapted the technique to work on geological problems," said G. Brent Dalrymple, emeritus professor and former dean of the College of Earth, Ocean and Atmospheric Sciences at Oregon State University in Corvallis. He first met Curtis while obtaining his Ph.D. at UC Berkeley in the 1960s.

Since the late 19th century, radioactive isotopes such as uranium and potassium have been used to date billion-year-old rocks, but dating young rocks was a challenge because the radioactive decay products in such rocks are present in minuscule quantities. Using then-new ultra high vacuum systems combined with mass spectrometry, UC Berkeley researchers were finally able to count these atoms and provide precise dates on young rocks.

"Garniss was the first to show that you could date things younger than a couple of million years, and he teamed up with the Leakeys to date their finds in Olduvai gorge in Kenya," said Curtis's former student Paul Renne, now director of the Berkeley Geochronology Center, which Curtis founded. "His major contribution was putting numbers on the timescale of human evolution."

"This work formed the quantitative ground work for paleoanthropology and human evolutionary history by providing a set of 'clocks' with which to read and hence interpret past events in proper sequence," wrote geologist George Brimhall in a 1989 letter recommending Curtis for a Berkeley Citation, an honor bestowed by the chancellor for distinguished or extraordinary service to the university.

JAVA MAN

Among Curtis's accomplishments was a discovery in the late 1990s with UC Berkeley geologist Carl Swisher that startled paleoanthropologists. They determined that the million-year-old human ancestor Homo erectus survived in Asia until some 50,000 years ago, meaning that this hominid species and modern humans, Homo sapiens, coexisted. The idea that humans did not evolve along one single lineage, but instead, branched off into ancestors that included some dead ends, with only modern humans surviving to the present, is well established today.

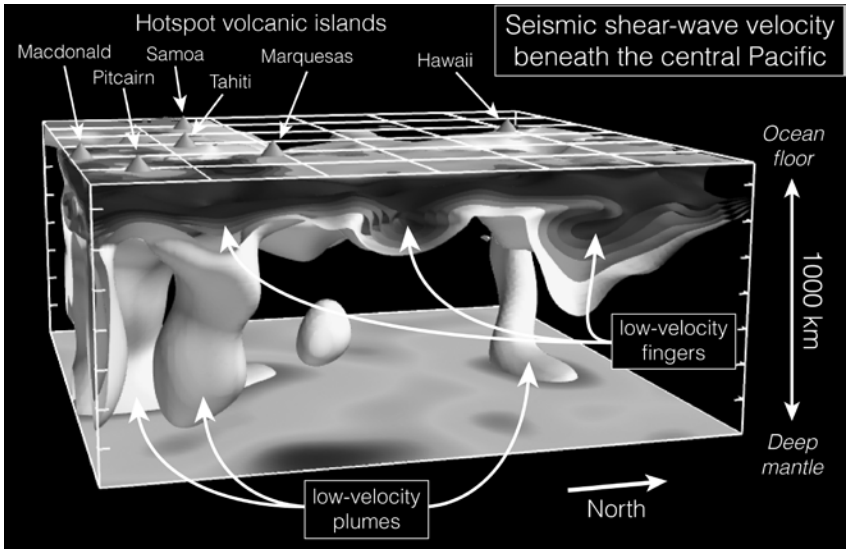
The story of this discovery and its implications was detailed in the 2001 book "Java Man: How Two Geologists Changed Our Understanding of Human Evolution," by Swisher, Curtis and writer Roger Lewin.

Once he had adopted Reynolds' techniques, Curtis "was always coming up with ideas about new things to date, from geological periods to glaciation," Dalrymple said. He would seek out colleagues with fossils from eras he was interested in and then date the volcanic rocks above and below the remains' deposits to assign a precise date.

Seismic Shear-Wave Velocity Beneath the Central Pacific

by Barbara Romanowicz

In a paper recently published in Science Express (http://www.sciencemag.org/cgi/content/abstract/science.1241514), graduate student Scott French, former graduate student Vedran Lekic (now assistant professor at the University of Maryland) and Barbara Romanowicz used a novel tomographic approach based on seismic waveform inversion to develop a global model of shear velocity structure in the upper mantle. This approach uses the power of modern computers and numerical wavefield computations to exploit information about mantle structure contained in all the wiggles of three component broadband seismic records from hundreds of earthquakes at hundreds of stations around the world.



The shear velocity model of the upper mantle thus constructed reveals the presence of low velocity channels at the base of the oceanic asthenosphere. These quasi-periodic finger-like structures of horizontal wavelength ~2000 km, stretch parallel to the direction of absolute plate motion for thousands of kilometers and extend in depth from the low-velocity zone down to about 350 km (figure 1). Most prominent in the Pacific Ocean, they are also observed in the Atlantic and Indian oceans. At least in the Pacific, they correspond to a strong periodic signal of the same wavelength in the earth's geoid, when filtered in the direction of the Pacific Plate motion. Below 400 km depth, shear velocity structure is organized into fewer, undulating but vertically coherent, low-velocity plume-like features, which appear rooted in the lower mantle (figure 2). Hotspots are found in the vicinity of these deeper conduits, but not necessarily vertically aligned with them, and are separated from them by a region of the uppermost mantle where the dominant direction of flow is horizontal, as also evidenced from seismic anisotropy.

This suggests the presence of a dynamic interplay between plate-driven flow in the low-velocity zone, and active influx of low-rigidity material from deep mantle sources deflected horizontally beneath the moving top boundary layer.

Indeed, the observed low velocity fingers suggest some relation to a process observed in laboratory experiments, in which a low viscosity fluid is injected from below into a higher viscosity fluid placed between two rigid plates. The fluid forms fingers which expand radially between the plates from the point of injection. When the upper plate is moving, the fingers align with the direction of motion of the plates. The regular spacing of the fingers, on the other hand, is reminiscent of "Richter rolls," which represent secondary scale convection and are observed in the laboratory in iso-viscous fluid experiments, albeit at a somewhat different scale. Thus, these new tomographic results, combined with gravity data, may help constrain the viscosity structure of the upper mantle.

Because hotspots do not appear as the direct vertical termination of plume conduits, they may be the consequence of the smaller scale convection in the uppermost mantle. This may help reconcile the proponents of deep mantle plumes, and those that consider that hotspot volcanoes are the manifestation of shallow cracks or imperfections at the base of the lithosphere.

Science and Arms Control

by Raymond Jeanloz

For the past 8 years I have been privileged to lead a team at the National Academy of Sciences that offers unique technical and networking capabilities from the scientific community in addressing global dangers associated with modern technologies. Founded more than 30 years ago to provide a channel for communication between the US and USSR on matters related to nuclear weapons, the Committee on International Security and Arms Control (CISAC) has maintained dialogs with Russia, China, India and other nations on topics ranging from biological weapons and cyber security to countering terrorism and nuclear proliferation; nuclear arms control remains a focus [http://www.nas.edu/cisac].

International security is strongly influenced by science and technology, whether in the development of weapons or the means of controlling them. Nuclear weapons provide a notable example from the 20th Century: with their million-fold (or greater) explosive energy as compared to conventional explosives, these represent the only true "weapon of mass destruction." Modern technology is rapidly empowering individuals and small groups with exponentially increasing capabilities, which is a great boon for humanity yet also creates new threats.

The science and engineering communities can inform policy makers' and diplomats' discussions,

Meeting in Moscow.

and deliver core technologies addressing these threats. As described in a commentary earlier this year, there is strong overlap between the needs of the arms-control community and the capabilities of Earth and environmental sciences in monitoring our globe everywhere, all the time.[1] There are also significant

A visit to a village in Pakistan near the Line of Control with India.

privacy and security issues associated with the pervasive monitoring that is now possible.

CISAC provides technical advice to the US Government, based on its own expertise as well as its international dialogs. The dialogs, held behind closed doors, allow experts from different countries to develop new initiatives for mutual security and cooperation, going well beyond what governments may be able to discuss openly. In addition to members with expertise in science and engineering, the group includes former policy makers and senior military officers, and leading regional specialists.

Based in part on my experience with CISAC, I joined Stanford colleague Sidney Drell in providing technical advice to the initiative of George Shultz, Henry Kissinger, William Perry and Sam Nunn calling for a world free of nuclear weapons. Starting with an editorial in 2007, their "vision" describes what is now long-term US policy. There remain many political challenges as well as technical hurdles, but we have managed to describe a technically feasible scenario for a world without nuclear weapons.

Arms control is but one example of what is likely to become a prevalent concern in the future, of managing ever-more powerful technologies in a world with increasingly sophisticated and potentially fragile interconnections. Based on our knowledge, we in the research community have an opportunity to provide insight and leadership in these matters, hopefully with the wisdom to allow the benefits of scientific discovery to completely surpass the associated dangers.

1 R. Jeanloz, I. Fung, T. W. Bowyer and S. C. Wofsy, Beyond arms-control monitoring, Science 339, 761-2 (2013).

Commencement 2013

BACHELOR OF ARTS

ATMOSPHERIC SCIENCE
Alan C. Cai
Maria Monika Decker
Melissa Leela McDowell

ENVIRONMENTAL EARTH SCIENCE
Dylan McHenry Bland
Lydia Pan-Jen Chang
David Garcia
Theresa Lan Hoang
Ja-Kun "Michael" Koo
Lillian Karina Ledesma
Tsaiching "Kathleen" Lee
Dave Lindqvist
Sami Oueida
Rocio Pelayo
Tyner Ford Pesch
Earnest Salgado
Stephanie Taing
Jessica Bichvan Ton
Jennifer Lynn Wood
Aaron Yang

GEOLOGY
Curtis William Baden*†
Jessica Francis-Marie Banaszak*
James Castillo Dabalos
Max James Dieckmann
Bridget Marie Floyd*
Ryan William Hardenburger
Wing Yee Lee
Alexandra Morris
Melissa Vinette Robinson
Jason Allen Utas
Nicholas Ali Vadpey
Thomas Matthew Wylie

GEOPHYSICS
Ara Albert Alexanian
Jose Luis Avina, Jr.
William Steven Gange
Meredith Kira Goebel
Frances-Julianna Maria Leiva
Soi Chong Ma*
Juan Carlos Meza
Danny Ng
Rosa Nguyen
Jennifer Li-Ging Shih
James Ginhyun Silvey
Harjit Singh
Jenny Taing

MARINE SCIENCE
Emily Grace Bell
Asis Campos
Elsie Cecilia Prieto Carrillo
John William Exala Domingo
Megan Eileen Hayes
Alexis Candace Herb
Jessica Hernandez
Wallace Taylor Lowe
Zachary Lee
Ernesto Alonzo Martinez, Jr.*
Sa'adia Adiv Massarano
Sevag Mehterian
Sarah Yeahoon Paik
Rebecca Trinh
Hannah Weddle
Amelia Kirsten Weiss*

PLANETARY SCIENCE
Jeffrey Dam

* with honors
† departmental citation

MASTER OF ARTS

Anisa Ahmadzai
Geologic Applications to Petroleum Systems

Sophie Kolding
Paleosalinity and Paleoclimate of San Francisco Bay

Kristina Løfman
Anthropogenic Climate Change and Mitigation Strategies

Leah Redon
Geomorphology and Ecology of Streams

Brooke Rumley
Greenland's Melting Ice Sheet: Mining Potential and Impacts

MASTER OF SCIENCE

Ryan Turner
Time Dependent Slip on the Creeping Section of the San Andreas Fault

Student Activities

Jessica Hernandez, Marine Science: Interned at the Hawaii Wildlife Hawksbill Recovery Project, and completed summer research at Stanford University.

Rachel Horn, Environmental Earth Science and Addien Wray, Marine Science: Completed research on the island of Mo'orea, Tahiti, studying the Geomorphology of Tropical Islands.

Taken by a kind stranger in Yosemite. Back left: Andy Tholt, Ara Alexandria, Matt Hoffman, Tyler Seaman, Brooke Rumley, Tyner Pesch, Ellen Knappe, Alistair Boyce, Tom Ogawara, Juan Meza, Ramzi Jneid, Jess Anderson, Albert Soi Chong Ma, Rebecca Trihn, Julie Leiva, Jenn Rose.

Claire-Marie Kooi, Environmental Earth Science: research in Brazil at Istito Pequisa Ambiental de Amazonia.

Ernesto Marinez, Marine Science: Attended the Association for Science of Limnology and Oceanography Aquatic Sciences meeting in New Orleans.

Jennifer Wood, Environmental Earth Science: Studied Caribbean Ecosystems in Ajumal, Mexico.

Thomas Wylie, Geology: Produced a photo Documentary of Basin and Range Province Geology.

Aurora Smedly, Geophysics and Allison Swartz, Environmental Earth Science: Participated in an environmental restoration project in bahia de Caraquez, Ecuador.

Curtis Baden, Geology and Patrick Redford, Geology: Attended Cornell's ANdes Field Camp, mapping in the Central Andes.

Emily Wakamatsu, Marine Science: Attended the Summer Coral Reef Ecology Program with the Bermuda Institue of Ocean Sciences.

Soi Chong, Geophysics and Voon Hui Lai, Geophysics: Attended the SAGE summer camp on exploration geophysics in New Mexico.

Doctor of Philosophy

Holly Brown
Evaluating and Improving the ElarmS Earthquake Early Warning Algorithm

Sanne Cottaar
Heterogeneity and Flow in the Deep Earth

Joanne Emerson
Assembly of Deeply Sequenced Metagenomes Yields Insight into Viral and Microbial Ecology in Two Natural Systems

Jennifer Frederick
Numerical Investigations of the Fluid Flows at Deep Oceanic and Arctic Gas Hydrate Deposits

Waruntorn (Jane) Kanitpanyacharoen
Synchrotron X-ray Applications Toward an Understanding of Elastic Anisotropy

Robert William Porritt
Tracing the Farallon Plate Through Seismic Imaging with USArray

Maxwell Rudolph
Mechanical Controls on Eruptions

Undergraduate students (listed in alphbetical order): Ara Albert Alexanian, Jose Luis Avina, Jr., Curtis William Baden, Jessica Francis-Marie Banaszak, Emily Grace Bell, Dylan McHenry Bland, Alan C. Cai, Asis Campos, Elsie Cecilia Prieto Carrillo, Lydia Pan-Jen Chang, James Castillo Dabalos, Jeffrey Dam, Maria Monika Decker, Max James Dieckmann, John William Exala Domingo, Bridget Marie Floyd, William Steven Gange, David Garcia, Meredith Kira Goebel, Ryan William Hardenburger, Megan Eileen Hayes, Alexis Candace Herb, Jessica Hernandez, Theresa Lan Hoang, Ja-Kun "Michael" Koo, Lillian Karina Ledesma, Tsaiching "Kathleen" Lee, Wallace Taylor Lowe, Wing Yee Lee, Zachary Lee, Frances-Julianna Maria Leiva, Dave Lindqvist, Soi Chong Ma, Ernesto Alonzo Martinez, Jr., Sa'adia Adiv Massarano, Melissa Leela McDowell, Sevag Mehterian, Juan Carlos Meza, Alexandra Morris, Danny Ng, Rosa Nguyen, Sami Oueida, Sarah Yeahoon Paik, Rocio Pelayo, Tyner Ford Pesch, Melissa Vinette Robinson, Earnest Salgado, Jennifer Li-Ging Shih, James Ginhyun Silvey, Harjit Singh, Jenny Taing, Stephanie Taing, Jessica Bichvan Ton, Rebecca Trinh, Jason Allen Utas, Nicholas Ali Vadpey, Hannah Weddle, Amelia Kirsten Weiss, Jennifer Lynn Wood, Thomas Matthew Wylie, Aaron Yang

Masters students (L to R): Leah Redon, Kristina Løfman, Ryan Turner, Sophie Kolding, Brooke Rumley, Anisa Ahmadzai

PhD students (Front Row, L to R): Maxwell Rudolph, Joanne Emerson, Brooke Peterson, Holly Brown, Robert Porritt; (Back Row, L to R): Sanne Cottaar, Jennifer Frederick, Waruntorn (Jane) Kanitpanyacharoen

Alumni Notes

1953

Giles Maloof - BA Geophysics: I continue (age 81!) teaching at Boise State (Calculus, differential equations & statistics). In 1953, I thought Garniss Curtis was hardly older than I, and that Louderback (with cane and long white beard) was a thousand years old. Probably, he was younger than I am now.

1954

Warren I. Finch - M.A. Geology: I attended Berkeley Sept. 1949 - June 1950 and received a Masters Degree in Geology in 1954. This was after receiving my Bachelor of Science Degree in Geological Engineering from the South Dakota School of Mines and Technology in Rapid City in 1948.

I worked for the United States Geological Survey [USGS] from 1948 to July 1995 when I became Scientist Emeritus. I completely retired in 2007, a total of about 60 years service. I have had a fantastic worldwide USGS Uranium Geology and family career that is memorialized in my self/published book released in October 2007: **"MY MEMOIR - ALONE - MY GUARDIAN ANGEL - GUNGA DIN." WARREN I. FINCH.** A copy of the October 2007 press release describing the content of the Memoir is attached. Since 2007, I have written many new stories.

1967

Warren Buffler - P.h.D Geology: I live full time in Santa Fe, New Mexico, while Pat continues to work full time with the UC Berkeley School of Public Health but commutes regularly to Santa Fe.

1994

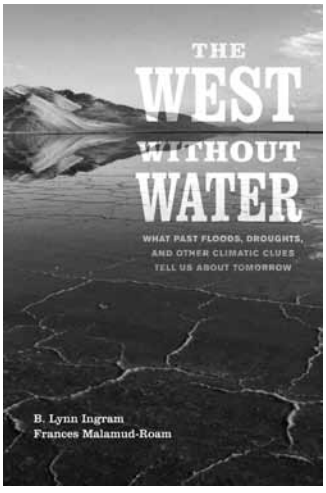
Ted Bohn - M.A. Geophysics Finally, here's an update on my own activities: I received my PhD in Civil and Environmental Engineering (Hydrology and Water Resources) earlier this year from University of Washington. Now I am working at Arizona State University as an NSF Post-doctoral Fellow, studying the effects of land-use change on moisture transport in the North American Monsoon. I'm still living in Seattle (due to family constraints) and telecommuting to Arizona.

2002

Kerry Nickols - B.A. Marine Science: I received my P.h.D. in Ecology (Marine Ecology emphasis) in 2012. I am currently a postdoctoral researcher at Stanford university's Hopkins Marine station (although I am still a Golden Bear!).

IN MEMORIAM

Arthur Clark - M.A. Geology 1948; Gerald L. Waltz - B.A. Geology 1934; William M. Adams - B.A. Geophysics 1953; Robert S. Creely - P.h.D. Geology 1955; William Nugent - B.A. Geology 1961; Millis Oakes (Bud) - B.A. Geology 1951 Eleanor Young Bright - B.A. Geology 1961;



The West without Water: What Past Floods, Droughts, and Other Climatic Clues Tell Us About Tomorrow

By Professor B. Lynn Ingram and Frances Malamud-Roam

An urgent issue facing California and the western United States is what the future holds for its climate and water resources. Understanding climatic patterns in the geologic past provide an important context for future predictions. In the sedimentary geochemistry laboratory in the Department of Earth and Planetary Science, we seek to evaluate the long-term history of climate change in the region using the stable isotopic compositions of fossils and sediments cored beneath lakes, estuaries, and the coastal ocean. Sediment cores from California allow us to place the climate of the past 150 years in a longer-term climatic perspective, extending the record hundreds to thousands of years.

We discuss our research results in our new book, *The West without Water*, published by University of California Press in 2013. The book places our data in a broader context of regional paleoclimate records, and the picture that has emerged shows that the climate of recent millennia is much more variable and potentially dangerous than anything we have experienced recently. In fact, the moderate weather of the past

[continued on page 11]

Donations to the Department

October 2012 through August 2013

PERRY BYERLY FELLOWSHIP FUND
Charlton, John
Finch, Warren
Gregor, Nicholas
Maloof, Giles W*
Plumb, Bob[3]

GARNISS CURTIS DISTINGUISHED PROFESSORSHIP
Chambers, Rose
Classen, William
Maloof, Giles W*
McBirney, AR
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Ohlmann, John
Schetter, William C
Sloan, Doris
Templeton, Denise
Thacher, Anson[3]

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[The West without Water, continued]

century and a half is somewhat anomalous. Records of prolonged droughts — some of which lasted decades to centuries — have occurred in California and the Southwest multiple times during the Holocene. The sedimentary and tree-ring records also suggest that these drier episodes occurred during periods of warmer climate, and the region experienced more frequent and intense wildfire. At the opposite extreme, floods as large or larger than the cataclysmic floods of 1861-62 on the heels of the gold rush occurred every one to two centuries. Climatologists predict that future climate change will bring even deeper droughts, and larger and more frequent floods. These extreme events will be superimposed upon the already variable climate of the past 10,000 years. Residents in the region continue to count on an unsustainable pattern of water use, and the population continues to expand into the floodplains, leaving society ever more vulnerable each year to flooding and drought.

Department Funds

Friends of Earth and Planetary Science Fund

Established in 2007 to solicit funds for emergency student aid, collegial activities in support of education and research as well as equipment and facilities upgrades; to help with costs for student activities such as field trips and the yearly Santa Barbara's Day event; to make a monetary award to the winner of the Departmental Citation; to support alumni outreach; to defray the costs of the weekly departmental Speaker's Program in which distinguished speakers from around the country are invited; and to assist in the acquisition of journals for the Earth Sciences Library and Map Collection.

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Memorial Funds

Perry Byerly Fellowship Fund: Established in 1978 to honor the memory of Perry Byerly with a graduate fellowship in seismology.

2012-2013 recipient: Avinash Nayak

Milton B. Smith Memorial Fund: Established in 2002 in honor of Professor Clyde Wahrhaftig by the estate of Dr. Milton B. Smith, B.A. 1936, Geology. The fund provides financial assistance to undergraduate students.

2012-2013 recipient: Weihan Liu

Esper S. Larsen, Jr. Research Fund

Formally established on October 31, 1989. The proceeds of an endowment left to the University by Eva A. Larsen are used to support new research in the fields of geology, mineralogy and petrology. 2012-2013 recipients were:

Richard Allen
Geophysical constraints on the Petrology of Plume Sources

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The Evolution of NaCl and CaSo Extremophile Habitats in the Atacama Desert of Chile and its Relationship to Mars

Roland Burgmann
Determining the Initiation and Timing of Slip along the San Jacinto Fault Zone, California

Paul Renne
High-resolution calibration of geomagnetic polarity spanning the Cretaceous-Paleogene Boundary

Steve Self
Studies on the Timing and Duration of Flood Basalt Eruptions

David Shuster
Production and diffusion of cosmogenic noble gases: Using open-system behavior to study surface processes

Nicholas Swanson-Hysell
Stratigraphic, paleomagnetic and petrographic study of the Dzabkhan Volcanics, southwestern Mongolia: Test-ing the hypothesis of rapid oscillatory true polar wander in the early Neoproterozoic

Faculty Retreat, August 2013: (Back row, L to R) Nicholas Swanson-Hysell, Paul Henshaw, William Dietrich, David Shuster, Raymond Jeanloz, Jill Banfield, Jim Bishop, Roland Bugmann, Doug Dreger, Stephen Self, Michael Manga, Bruce Buffett, Richard Allen; (Front row, (L to R): Burkhard Militzer, Barbara Romanowicz, David Romps, Inez Fung; Photo credit: Judith Coyote

2013 Department Barbeque

Photos by Margie Winn

BBQ party-goers mingling.

(L to R): Kristen Furia, David Romps and Jenn Frederick

Michael Manga and Donald DePaolo

Alan Cai and Zack Geballe

(L to R): John Li, Benjamin Paulus, Jessica Anderson and Patrick Redford

(L to R): Jake Edman, Marissa Tremblay, Courtney Sprain, Jake Seeley, Chris Johnson, Sean Wahl, Nick Knezek and Noah Randolph-Flagg

EPS116 field trip at Moss Beach, Spring 2013

EPS111 field trip to Rio Vista Gas Field, San Joaquin Delta

Cal Day 2013

Professor Burkhard Militzer uses liquid nitrogen to demonstrate the conditions on Jupiter's ice moon, Europa.