CAS DEPARTMENT OF GEOLOGICAL SCIENCES FEBRUARY **2014**

COLLEGE OF ARTS + SCIENCES

Do Mountains Behave Like Giant Sand Piles?

Josh Roering's research group is using space-based, airborne, and ground-based technologies to study landsliding

The heights of mountain ranges pose fundamental challenges to adventurers, adrenaline junkies, and geologists alike. What sets the elevation of peaks over geological timescales? And from a natural hazards perspective, can we observe these processes on human or historical timescales? At the simplest level, mountains evolve according to the balance between tectonic processes, such as plate convergence or isostasy, that tend to build relief, and erosive processes, such as landsliding, that tend to limit it. The plate tectonics revolution, and more recently, the discovery that asthenospheric flow contributes to surface uplift, has provided a solid framework for studying vertical motions that can exceed one centimeter per year in settings like New Zealand, Taiwan, and the Himalayas. In contrast, however, models for predicting the erosion of mountains have not significantly advanced beyond the concept of threshold slopes.

Conveniently, one can best demonstrate the concept of threshold hillslopes on a beach. If you and a companion excavate on either side of a mound of dry sand, you'll soon form two angle-of-repose slopes separated by a sharp ridge line that caps your miniature mountain range. Now, if both of you manage to double your pace of excavation, you will detect no change in the steepness of the slopes, but you will observe that sand cascading off the slopes inundates your trenches twice as quickly. In essence, the sand avalanches keep pace with your rate of excavation, whereas the slope angle and sandpile-to-trench height remain unchanged. On real hillslopes, the threshold-slope model implies that regardless of the pace of tectonic upheaval, landslides maintain constant slope angles and ridge heights, but documenting these dynamics has proven elusive.

Supported by research grants from the National Science Foundation and NASA, Professor **Josh Roering** and his research group are using space-based, airborne, and ground-based technologies to document and quantify how landsliding shapes the mountains of Northern California. Near Eureka, California, the Mendocino Triple Junction marks the location where the Cascadia subduction zone is overrun by the San Andreas transform margin. The northward migration of the Mendocino Triple Junction truncates the subducting Gorda Plate, leaving a "slab window" zone into which asthenospheric flow generates crustal thickening and surprisingly rapid vertical uplift that approaches one centimeter per year. Rivers draining this region convey vast quantities of sediment to the Pacific Ocean, implying that erosion rates have increased in order to keep pace with the localized rapid uplift. Erosion is dominated by slow-moving landsliding, or earth flows, which are even more common than illegal marijuana plantations in the region.

To document the regional pattern of landsliding for comparison with the zone of rapid uplift, newly arrived postdoctoral researcher **Georgie Bennett** is using space-based satellite imagery

continued on back page

Postdoctoral researcher Georgie Bennett (foreground) and PhD student Brian Penserini (paddle in hand) attempt to escape the 105-plus degree temperatures during fieldwork along the Eel River in Northern California in late summer 2013.

GEOL

Greetings From the Department Head Becky Dorsey and Alan Rempel are the new head and associate head of the Department of Geological Sciences.

Becky Dorsey

Alan and I had a busy 2013 fall term as we settled into our new roles. Big thanks to **Ray Weldon** and **Marli Miller** for three successful years in the hot seat! It's exciting to be part of many new developments in the department. We're delighted to welcome three young scientists to our faculty (see more on page 6). We have a new sixteen-workstation computer lab in 101 Cascade Hall that is uniquely designed for enhanced student research and instructional computing. The petrology lab in 143 Columbia Hall recently got a major upgrade with a fleet of brand-new Leica microscopes. We have a new web page (geology.uoregon.edu) that boasts a sharp new look with lots of dynamic links, images, and web resources. Major renovation is now complete on the second floor of Cascade Hall, where **Jim Watkins** oversaw the design and construction of the UO's only "Class 1000" clean lab for ultrapure mineral growth and sample prep. **Edward Davis** is supervising construction of a new vertebrate paleontology lab in 42–43 Columbia, and he's working with **Dave Blackwell** on much-needed renovation and upgrades to our thin-section and rock-saw lab in Pacific Hall. Students and faculty members presented more than forty talks and posters at the American Geophysical Union 2013 fall meeting, where we had another fantastic alumni reception thanks to **Diana Roman**, MS '01, PhD '04. We look forward to seeing everyone again at AGU next fall!

Alan Rempel

Thank You for your generous donations

During the past year, your donations supported a number of student scholarships and awards that recognize academic excellence.

The **Emeritus Faculty Fund** provided partial support to all UO students who attended our summer **Geology Field Camp**. The **James C. & Mary Douglas Stovall Field Camp Award** went to **Kelsey Taylor** who was one of the top performing students in our 2013 Geology Field Camp. **Stovall Scholarship Funds** supported undergraduate student **Brianna McHorse** in her study of functional morphology of horses and camels, which helped her win a prestigious **Goldwater Scholarship Award**. The **Baldwin Fund** supported a one-term graduate fellowship award to **Scott Maguffin** for excellence in environmental and biological geology. Scholarships supported by the **Condon**, **Thayer**, and **Staples** funds were awarded to **Nick Famoso**, **Scott Maguffin**, and **Robin Tuohy** to support their research in paleontology, environmental geology, and volcanology. **Thayer Scholarship Funds** helped graduate students **Corina Cerovski-Darriau** study landslide-driven sediment production in New Zealand, **Mindy Homan** in her research on sedimentation along the lower Colorado River, **Scott Maguffin** attend the **Goldschmidt Conference** in Florence, Italy, **Jill Marshall** conduct geomorphology fieldwork in Iceland, and **Win McLaughlin** attend the annual meeting of the **Vertebrate Paleontology Society**. **The Staples Fund** supported awards to **Hannah Dietterich** and **Dana Drew** for their research in petrology and volcanology, and made it possible for **Madison Meyers** to travel to the **IAVCEI** conference in Kagoshima, Japan. **The Johnston Fund** supported an award to **Jo Byrnes** for excellence in geophysics research. Finally, contributions to the **Geology Department Fund** allow the department to support undergraduate field trips (including the Colorado Plateau trip led by **Dave Blackwell** each year), graduate student attendance at meetings and field workshops, and our weekly department seminar series. This fund also supports a popular weekly seminar series for students that highlights career opportunities in Geological Sciences.

Finally, thanks to the generous efforts of alumnus **John Armentrout** '64, '65, MS '67, we are pleased to announce the creation of an endowed scholarship, in honor of former UO professor **Walter Youngquist**, that will support student research in sedimentary geology, paleontology, structural geology, and geomorphology.

Honor Roll of Donors

We'd like to offer special thanks to our Kimberlite class of donors, who have contributed $100 or more to the department during the past two years: **Kimberly** '83 and **Patrick Anderson** '81, **Evelyn** '64 and **John Armentrout** '64, **Phoebe Atwood** '45, **Melanie** '81 and **Calvin Barnes** '78, **Mary** and **Richard Bateman** '59, **Betty** '68 and **Theodore Bezzerides** '67, **Rita** and **Glenn Biasi** '94, **Sumiko** and **Sam Boggs**, **Louis Bortz**, **Laura** and **William Box Jr.** '67, **Hilda** and **Herbert Bradshaw** '64, **Deborah Cordell**, **Ann** and **David Cordero** '70, **Federica** '82 and **Arthur Curby**, **Timothy Dawson** '94, **Victoria DeRose**, **Colleen Donegan** '06, **Lucy Edwards** '72, **Carol** and **Clinton Flynn**, **Wynn** and **William Gandera** '73, **Ann** and **Arthur Green** '62, **Cydney** and **Sid Halsor** '78, **Sharon** and **Paul Hess** '65, **Carole Hickman** '68, **Sue** '58 and **James Houser** '61, **Carrie** and **John Howell Jr.** '81, **Dorothy** '69 and **M. Allan Kays**, **Hai** '68 and **Chong Kim** '68, **Carol** and **Wallace Kleck** '60, **Laura** and **Robert Kozarek** '78, **Ellen** '80 and **James Leavitt** '80, **Shirley** and **Robert Lent** '64, **Sandra Lilligren** '70, **Marilyn** '76 and **David Lindstrom** '76, **Helen** and **Robert Maclay** '49, **Leslie Magoon III** '64, **June** '70 and **Norman McAtee**, **McBirney Family Trust**, **Alexander McBirney**, **Jean** '74 and **David McClain** '74, **Edward Merewether** '51, **Gail** '68 and **Gregory Miles** '77, **Brooke Miller** '04, **Robert Murray** '82, **Eric Nelson**, **James Palandri** '87, **Jennifer Perez** '93, **Peter Pomeroy** '67, **Jacqueline** '65 and **Alan Ramer** '65, **Karen** and **Mark Reed**, **Lori** and **Kent Richter** '81, **Diana Roman** '01, **Hanae Saishu**, **Carole** and **William Schetter** '62, **Rebecca** and **Scott Sloan** '84, **Jason Spiller** '58, **Pilar** and **James Starr** '84, **Elizabeth Stearns**, Charles Stearns '62, **Sally** '58 and **George Thomas** '56, **James Tyburczy** '83, **Ray Wells** '75, **Karen** and **Robert Williams** '84. Corporate Support: **AltaRock Energy, Inc.**, **Anadarko Petroleum Corporation**, **Energy Development Corporation: Philippines**, **ExxonMobil Foundation**, **Flagg Diamond Corporation**, **Pacific Gas and Electric Company**.

Alumni News Please visit us and share your stories at geology.uoregon.edu/alumni

Ned Molder (BS, 2013) is working for a startup company called GroundMetrics in San Diego. The company performs electromagnetic surveys for oil, gas, mining, and geothermal exploration. Ned was hired as a field technician in August 2013, and was then asked to work full-time in San Diego. Ned really likes his job and is excited to be out in the professional work force.

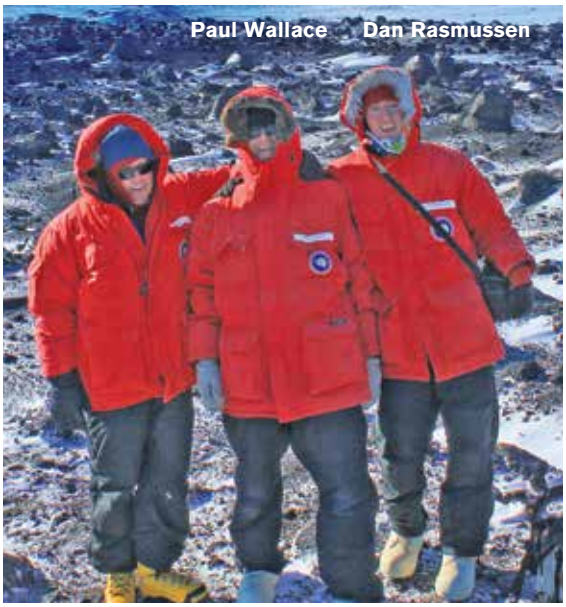

Lisa Netzel, left

Lisa Netzel (BS, 2013) recently moved to Louisiana to work for Schlumberger, a major oil field service company, as a field engineer on deep-water oil rigs in the Gulf of Mexico. Offshore mud loggers are transported by helicopter to the rig and remain on-site for twenty-five to thirty days working twelve-hour shifts. Working for Schlumberger offers Lisa opportunities for a career in different aspects of the company, including technical, maintenance, and management.


Brandon Schmandt

Brandon Schmandt, (PhD, 2011) is completing a busy first year as assistant professor at the University of New Mexico. He recently received AGU's prestigious Keiiti Aki Young Scientist Award for scientific accomplishments in seismology. His research is focused on studies of the North American lithosphere and underlying mantle, and evaluating the potential for seismic monitoring of rivers as a proxy for bed-load transport. He is currently working to test a hypothesis that a subducted slab remnant underlies the creeping section of the San Andreas Fault.

Varina Zinno (Smith) (BS, 2007) received a master's degree in 2010 at McGill University, where she studied the crystallography of vesuvianite. She now works as an exploration geologist for Alaska Earth Sciences in Anchorage. She enjoys consulting, which has helped her obtain a wide range of exciting work experiences throughout Canada, the Northwest United States, and Alaska.


Paul Wallace Dan Rasmussen


Varina Smith Zinno

Dan Rasmussen (BS, 2012) is pursuing a Masters degree in Geology at New Mexico Tech University. Last year he traveled for two months of field work in Antarctica, with his MS adviser Philip Kyle and UO undergraduate advisor **Paul Wallace**, where he collected samples for a study on the origins and evolution of Ross Island volcanoes. Dan is making good progress toward his MS degree and hopes to enter a Ph.D. program starting next fall.

Heather Wright, (PhD, 2006) received the International Association of Volcanology and Chemistry of the Earth's Interior's 2013 George Walker Award, which recognizes accomplishments of early career scientists. Heather spent three years at Monash University in Australia studying volcanoes in Argentina. Then, as a Mendenhall Postdoctoral Fellow, she studied Crater Lake volcanic deposits and obsidian domes at the Salton Buttes in California. She recently started a job with the USGS Volcano Disaster Assistance Program at the Cascades Volcano Observatory in Vancouver, Washington.


Heather Wright

Our research success is illustrated by external funding awards currently valued at more than $7 million, including the following recipients:

Ilya Bindeman (ACS) "Stable Isotope Investigation of Organic Carbon-Bearing Pre-Cambrian Shales"

Kathy Cashman (NSF) "Evolution of Lava Channel Networks"

Becky Dorsey (NSF) "Late Cenozoic Vertical Crustal Motions and Erosional Mass Transfer in the Southern San Andreas Fault Zone, Coachella Valley, California"

Sam Hopkins (NSF) "Integrating Fossil and Modern Evidence to Determine the Role of Diet in Mammalian Diversification"

Gene Humphreys (NSF) "Integration of USArray Mangetotelluric and Seismic Data in the Pacific"

Alan Rempel (DOE) "Hydrate Evolution in Response to Ongoing Environmental Shifts"

Josh Roering (NASA) "Geomorphic Change and Hazard Potential from Landslides in a Tectonically Active Landscape"

Dave Sutherland (NASA) "Physical Controls on Ocean-Terminating Glacier Variability in Central West Greenland"

Doug Toomey (NSF) "Structure and Dynamics of the Lithosphere-Asthenosphere System"

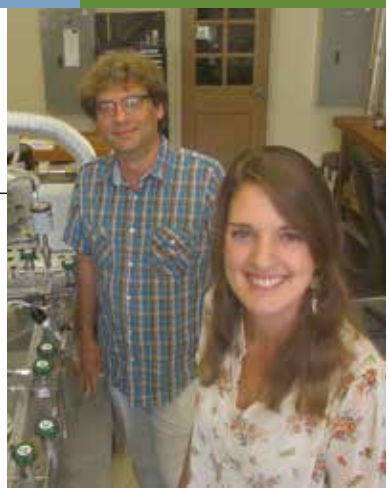
Paul Wallace (NSF) "Testing Models of Magma Generation in Warm-Slab Subduction Zones: A Case Study in Volatiles in the Cascades Arc"

Jim Watkins (NSF) "Chemical and Isotopic Gradients around Bubbles in Volcanic Feeder Systems"

Ray Weldon (USGS) "Extending the Earthquake Record on the Southern Santa Cruz Mountains Segment of the San Andreas Fault at the Hazel Dell–Simas Lake Depression"

Faculty News

Microanalysis of Supereruptions



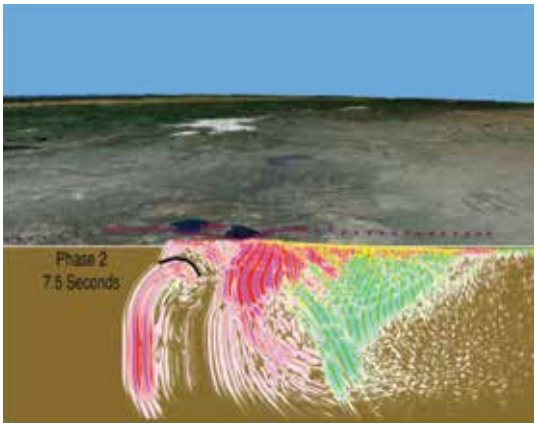
Ilya Bindeman and Dana Drew

Ilya Bindeman's group uses microanalytical techniques to measure isotopic variations in tiny crystals collected along the Yellowstone hotspot track. The Heise and Picabo volcanic fields of Idaho, studied by graduate students **Kathryn Watts** and **Dana Drew**, were active between 10.4 and 4.4 Ma, forming the two "complete" caldera cycles just before eruptions started at Yellowstone two million years ago. All three volcanic clusters experienced several violent caldera-forming eruptions. These followed a consistent pattern whereby eruptions began with "normal" rhyolite that was produced during two million years of interactions with the crust. Progressively erupting rhyolites display zircons with contrasting isotopic values that are diagnostic of remelted and recycled volcanic rocks. Yellowstone appears now to be on a dying trend, having erupted so much recycled material that the crust beneath is largely substituted by basalt and its melting potential is nearly exhausted. Wait a million years until the next supereruption in Montana. Read more at **bit.ly/19PXLlq** and **bit.ly/1g64Rq7**.

Probing the Newberry Magma Chamber

Emilie Hooft

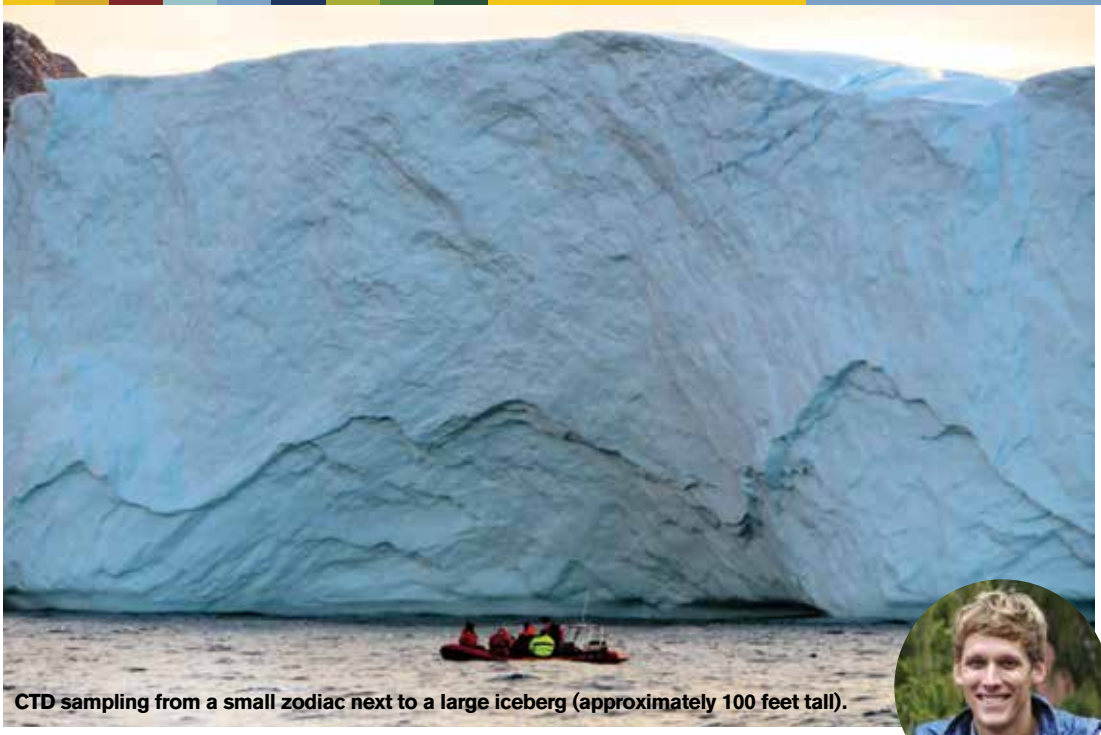
Emilie Hooft and master of science student **Matthew Beachly** have successfully imaged the magma chamber beneath Newberry Volcano in central Oregon. In 2008, a team of community members, undergraduate and graduate students, technicians, and scientists installed seismometers at short intervals (300 meters) along a 30-kilometer line across the volcano to record an explosion. The experiment recorded seismic waves passing around a magma chamber and later waves from energy that passed through the magma body. Matt and Emilie combined seismic first-arrival, travel-time tomography with waveform modeling of the secondary arrivals to constrain the size and melt volume of the magma chamber. Recently, Emilie and **Garron Hale** of CASIT (College of Arts and Sciences Information Technology Support Services) worked with two seniors majoring in digital arts, **Adam Paikowsky** and **Hayden Steinbock**, to generate a ten-minute documentary for the general public that can be found at **http://bit.ly/1dkJqSR**.



Microbes Methylating Arsenic

Qusheng Jin

Qusheng Jin and PhD student **Scott Maguffin** study the role of microbes in groundwater arsenic contamination—a health hazard to millions worldwide. Microbes interact closely with arsenic in the environment—for example, by oxidizing, reducing, and methylating inorganic arsenicals. While redox transformations are now accepted as controlling factors, biomethylation has largely been neglected in previous groundwater arsenic studies. Qusheng's team sampled the bedrock aquifer of the Willamette Basin and discovered that methylarsenicals are widespread, at concentrations that correlate linearly with arsenite—an inorganic form of arsenic with +3 redox state. This discovery led to a full suite of laboratory and field experiments on aquifer microbes to assess their potential for methylating arsenic. These experiments show that microbes methylate inorganic arsenic in the aquifer at rates comparable to those in surface water bodies. Methylarsenicals differ from inorganic arsenic in their physical, chemical, and physiological properties. Hence evaluations of groundwater arsenic contamination need to consider the activities of aquifer microbes more closely.



DUSTIN CARROLL

CTD sampling from a small zodiac next to a large iceberg (approximately 100 feet tall).

Dave Sutherland

Mixing Estuaries

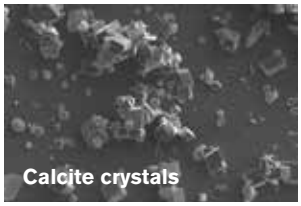
Sampling in Greenland's outlet glacier fjords never gets dull and this summer's fieldwork in the Uummannaq region of west Greenland was no exception. For twelve days in September 2013, **Dave Sutherland** and PhD student **Dustin Carroll** worked alongside colleagues from OSU to study fjord circulation and its impact on glacier dynamics. The trip was a success in large part due to the capable crew and ship (the research vessel Sanna), and provided an opportunity to get direct observations around a large iceberg from three measuring platforms simultaneously (pictured), to understand the contribution of this floating solid ice to ocean stratification. Master of science student **George Roth** is examining the circulation of these icebergs via remotely sensed GPS tracks. When not in Greenland, Dave's group works on other estuaries, including Coos Bay in southern Oregon. In Coos Bay, they are working to understand the seasonal transition from a well-mixed to partially-mixed water column and what biological ramifications that may have, from the movement and settlement of oyster larvae to dissolved oxygen levels in the estuary. This last subject garnered recognition for MS student **Molly O'Neill**, who won best poster at the 2013 Heceta Head Conference for her work connecting dissolved oxygen trends in Coos Bay to the observed circulation.

Jim Watkins

Clean Experimental Petrology

Assistant Professor **James "Jim" Watkins** arrived in January 2013. Jim is the new steward of the Experimental Petrology Laboratory and has been overseeing the design and construction of the campus's first and only Class 1000 clean room facility. Jim and his graduate student, **Evan Baker**, are growing crystals of inorganic calcium carbonate in the lab under known conditions to determine how environmental factors such as temperature, pH, and salinity affect the trace element and isotopic composition of carbonates. This information enables geologists to interpret the distribution of trace elements and isotopes in the rock record.

Jim and his group are also investigating the behavior of bubbles in magmas using custom-designed (by **Dana Johnston**) and custom-built (by the UO machine shop) rapid-quench, cold-seal pressure vessels housed in the lab. These apparatuses are well suited for simulating conditions of magmatic feeder systems.



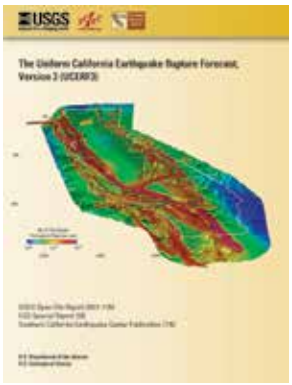
Calcite crystals

When you open a can of soda, bubbles grow as they rise toward the surface. For reasons that are truly fascinating, bubbles in magma may grow or shrink as they ascend to the surface. This leads to complex H_2O and CO_2 distributions around bubbles in fragments of natural volcanic glass. In our experiments, we oscillate temperature and pressure to simulate the dynamic behavior of volcanic conduits. The goal is to reproduce the H_2O and CO_2 distributions observed in nature, and then interpret these distributions in terms of active processes in the subsurface that are inaccessible to direct observation.

Faculty News Briefs

After twenty-eight years at the UO, including twelve years as Department Head and four as Associate Dean of Natural Sciences, **Dana Johnston** will retire on June 30, 2014. As one step in that direction, Dana recently submitted his last NSF Final Project Report! He plans to start his phased five-year retirement program by teaching GEOL 101 next fall.

Marli Miller is in the process of finishing her new book, *Roadside Geology of Oregon*, to be published by Mountain Press in Fall 2014. The book, which has been four years in the making, is full of beautiful maps, photos, and information about the fascinating geology of Oregon, and will replace the out-of-print book with the same title.



Ray Weldon and many colleagues recently completed UCERF3 (The Uniform California Earthquake Rupture Forecast, Version 3), a seismic source model that is the California portion of the new USGS National Seismic Hazard Map to be released in 2014. The model will be used to set earthquake insurance rates, national building codes, USGS research priorities, and federal seismic hazard mitigation resources. UCERF3 can be found at: http://pubs.usgs.gov/of/2013/1165/.

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Faculty News Briefs

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Greg Retallack recently gave the distinguished Birbal Sahni lecture in Lucknow, India, at the Birbal Sahni Institute of Paleobotany. He also did fieldwork in Himachal Pradesh, studying paleosols that record onset of the Himalayan monsoon between middle Eocene and early Oligocene time. This and other recent lectures reflect broad interest in Greg's controversial work on evidence for Precambrian life on land.

Gene Humphreys and postdoc **Max Bezada** continue their geophysical study of the western Mediterranean region, where remarkable processes have caused uplift of the Atlas Mountains and subsidence of continental crust below sea level. These vertical motions are driven by ocean-slab rollback and foundering of the lower lithosphere. The work involves collaboration with Moroccan and Spanish seismologists, and deployment of a few hundred seismometers!

Mark Reed is investigating how veins form in the crust where overpressured magmatic fluids hydro-frack overlying rock then cool, decompress, and react on their way up the fractures. Mark and his students use SEM, EPMA, and a heating-freezing stage to measure titanium concentration of fluid inclusions. Thermodynamic modeling of chemical reactions provides additional insights into these complex processes.

Welcome, New Faculty Members

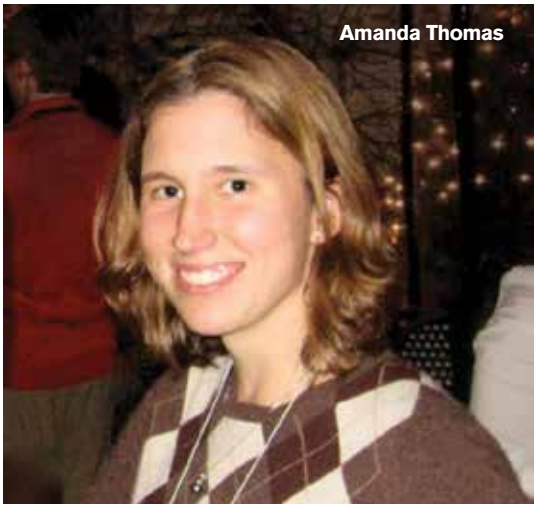
We are delighted to welcome three new tenure-track assistant professors to the department. They were hired in spring 2013 and bring new expertise and energy in the disciplines of vertebrate paleontology, numerical modeling, and earthquake seismology.


Edward Davis

Edward Davis is a vertebrate paleontologist who studies conservation paleobiology (the study of biological questions using paleontological resources), evolution of headgear in ungulates, and changes in macroecology over time. Edward has a half-time appointment in geological sciences and works the rest of his time as Curator of the Condon Collection at the UO Museum of Natural and Cultural History. He also keeps a blog, Fourth-Dimensional Biology: Biology across Space and Deep Time, at blogs.uoregon.edu/4dbio. Edward plans to bring some exciting new ideas to the teaching of GEOL 103, The Evolving Earth, in spring term 2014.

Leif Karlstrom earned his PhD at the University of California at Berkeley with former UO professor Michael Manga, and is currently on leave working on his postdoc at Stanford University. Leif studies the mechanics of fluid-solid interactions in magmatic and earth-surface systems at time scales ranging from seconds to millions of years. His research combines analytic and numerical mathematical models, laboratory experiments, and fieldwork to explore the processes by which landscapes are built, modified by tectonic forces and material transport, and sculpted by erosion. His fieldwork has taken him from ice fields in Alaska to geysers at Yellowstone National Park to the Hopi Buttes maar field in Arizona.


Leif Karlstrom


Amanda Thomas

Amanda Thomas also got her PhD at Berkeley and is currently working on a postdoc at Stanford. Her research combines knowledge and techniques from the fields of seismology, fault mechanics, structural geology, and geophysics to better understand the deformation of the Earth's surface. Amanda is interested in the mechanics of earthquakes and faulting, static and dynamic triggering, mechanics of deep fault zones, the earthquake source, and how it relates to the physical properties of faults. She is studying low-frequency earthquakes on the San Andreas Fault and Cascadia subduction zone to understand key processes of fault rheology and plate boundary deformation.

"Nothing can top a firsthand experience."

Economic Geology of Namibia

UO students joined with their OSU counterparts to plan and execute a two-week tour of mines and exploration sites in Namibia in September 2013. This followed a spring 2013 seminar course, held at OSU, that culminated with each student writing a professional-style report on an ore deposit or important geological area of Namibia. These reports became part of the trip's field manual on the tour lead by Namibian native Roy Miller, who shared his encyclopedic knowledge and even signed personal copies of his three-volume textbook devoted to the geology of Namibia. Industry participation, departmental foundation accounts, and funding from the Society of Exploration Geophysicists student chapter kept costs down to just $1,000 per participant. Well worth the investment according to trip participant Jackie Kennicott, who notes, "Nothing can top a firsthand experience … it truly is the best thing I've ever been a part of."

Geology Club Spring Break Field Trips

The Geology Club, led by **Dave Blackwell**, has been taking spring break trips to the Colorado Plateau for the last five years, and they are currently planning their sixth trip. Former trips have been to Zion National Park (2008), Grand Canyon National Park (2009), Arches National Park (2010), Grand Staircase–Escalante National Monument (2011), and the Needles District of Canyonlands National Park (2012). These trips are organized and planned by the students. The decision for the trip destination is generally voted on during fall term. Winter term is spent researching the area, deciding on hikes and backpacking trips, and acquiring backpacking permits and campsite reservations. During winter term, Dave teaches a course on the geology of the Colorado Plateau for those interested in expanding their knowledge of the region. The group leaves early on the Saturday morning after final exams. The two-day road trip to the plateau involves short excursions and day hikes on the way to campsites. Once arriving at their destination, a base camp is established and students take part in either day hikes or backpacking trips. This year's trip will return to Zion National Park with an option for backpacking in the Kolob Canyon section of the park. It is always a fun and educational trip for everyone.

The two-day road trip to the plateau involves short excursions and day hikes on the way to campsites.

Graduate Degrees 2013

Lauren Austen (MS)—"Evolution of Regional Stress State Based on Faulting and Folding Near the Pit River, Shasta County, California"
Samuel Castonguay (MS)—"Structural Evolution of the Virgin Spring Phase of the Amargosa Chaos, Death Valley, California"
Dana Drew (MS)—"An Isotopic, Geochemical, and Volatile Investigation of Rhyolite Generation at the Picabo Volcanic Field of the Yellowstone Hotspot Track"
Nicholas Famoso (MS)—"The Evolution of Occlusal Enamel Complexity in Middle Miocene to Recent Equids (Mammalia: Perissodactyla) of North America"
Kristen MacKenzie (MS)—"The Geology and Paleontology of Coglan Buttes, Oregon"
James McNabb (MS)—"Stratigraphic Record of Pliocene-Pleistocene Basin Evolution and Deformation along the San Andreas Fault, Mecca Hills, California"
Katie Paulson (MS)—"Along Strike Variation and the Role of Fault Propagation Folding in Generation of Structural Relief in the Kochkor Valley, Tien Shan, Kyrgyzstan"
Kelley Rabjohns (MS)—"Impact of Aquifer Heterogeneity on Geomicrobial Kinetics"
Robin Tuohy (MS)—"New Insights into Kilauea's 1960 Kapoho Eruption from Olivine-Hosted Melt Inclusions"
Circe Verba (PhD)—"Potential Impacts of Formation Waters on the Integrity of Class H Cement and Reservoir Rock in Carbon (Co-)Sequestration Settings"

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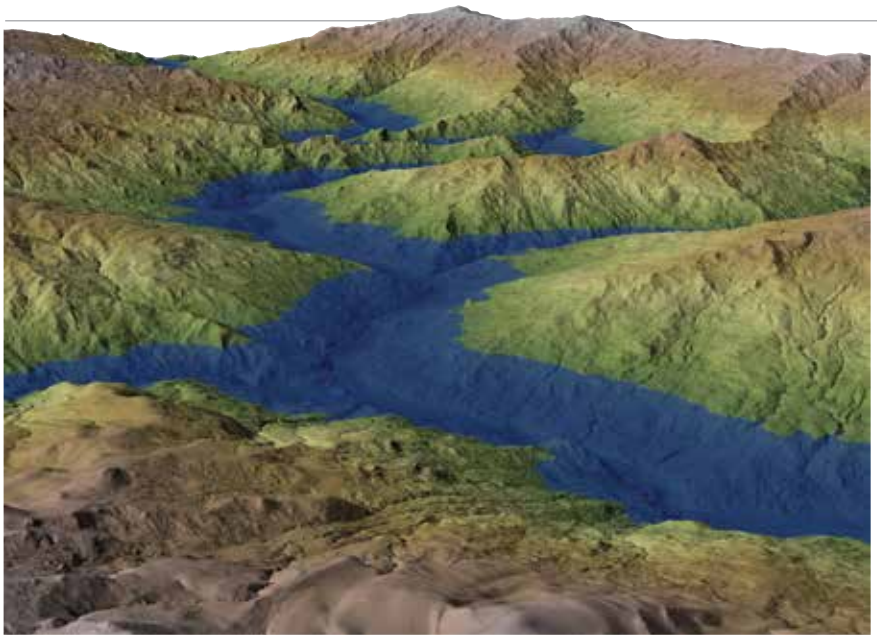

Shaded relief lidar image of reconstructed paleo-lake (Mackey et al., 2011, PNAS) that dammed the Eel River just above Alder Point approximately 22,500 years ago. The fifty-kilometer-long lake was more than 130 meters deep and would have generated an outburst flood of 8.5 x 10^5 m^3/sec, about 20 percent of a Missoula Flood event.

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to study landslide-related ground deformation between successive images. These automated analyses will enable her to document landslide properties and determine how landslides adjust their geometry and velocity in response to changes in the rate of tectonic upheaval in northern California. Bennett brings considerable expertise from her PhD work at Eidgenössische Technische Hochschule (ETH) in Zurich, Switzerland, where she studied historical and real-time erosion of steep lands in the Swiss Alps. During her first visit to the Eel River, the primary river draining the study area, Georgie braved temperatures exceeding 105 degrees Fahrenheit, far exceeding the typical extremes of her native England. Graduate student **Alex Handwerger** is also using satellite imagery to study landsliding in the Eel River. Alex relies on satellite interferometry data to document the seasonal dynamics of these slow-moving landslides in response to rainfall events. Curiously, these landslides rarely fail in a catastrophic fashion and Alex hopes to use his data to test models that combine the hydrologic triggering and mechanical deformation of these features.

Ben Mackey, PhD '09, used historical air photos to demonstrate that a catastrophic landslide dammed the Eel River about 22,000 years ago.

UO-based research in the region began with the work of **Ben Mackey**, PhD '09, who used historical air photos to study slow-moving landslide properties and airborne lidar topography to demonstrate that a catastrophic landslide dammed the Eel River about 22,000 years ago. The damming landslide material came from a prominent peak composed of highly resistant greenstone bedrock. The mélange units of the Franciscan Complex that underlies much of Northern California are permeated with these resistant blocks (much like the chunky bits in your father's favorite fruitcake). Although these blocks make up a relatively small percentage (less than 10 percent) of the geologic substrate, it's likely that some of the large ones (those more than half a kilometer wide) spawned river-damming slides in the past. The landslide-dammed lake that Mackey documented likely persisted for tens to hundreds of years. Its impact persists in the genetics of modern steelhead trout in the Eel River and is also recorded by the paucity of Eel-derived sediments in the Pacific Ocean during that time. Recent PhD student (and now Portland State University professor) **Adam Booth**, as well as current graduate students **Corina Cerovski-Darriau** and **Brian Penserini**, have also been drawn to the region to study how tectonics and landslides coevolve to shape mountain ranges. The combination of geologic complexity and proximity (as well as the generosity of local ranchers) ensure that this region will continue to be a fruitful laboratory for years to come.