OSU Geoscientists focus on Three Sisters Volcanoes

The Three Sisters have been in the news recently because of satellite-based observations of an area to the west that is uplifting at a rate of 2 centimeters per year. The concern is that the uplift is due to magma rising toward the surface, possibly toward an eruption.

This part of the Oregon Cascades has been mapped by Ed Taylor and his students over several decades, so this is clearly Beaver country. Major contributions were made by Ed’s PhD students Brittain Hill and Scott Hughes and by MS student Rick Conrey, who continued working there after moving to Washington State University for his PhD.

The tradition continues with Mariek Schmidt, a PhD student working with Professor Anita Grunder. Mariek and Anita are focusing on the North Sister to understand deep crustal magmatic processes in a subduction zone. Their project is in collaboration with Dana Johnston (University of Oregon), who will subject samples collected from North Sister to pressures and temperatures expected at the base of the crust 35 km down.

Ed Taylor has characterized North Sister as “the most monotonous stack of lavas you’ll ever see.” Mariek’s analytical work has confirmed Ed’s description, and when combined with argon isotopic ages, it shows that this composition persisted for several hundred thousand years. North Sister is 500,000 to 200,000 years old, in contrast to Middle and South Sister that are no more than a few tens of thousands of years old.

Mariek has mapped North Sister with the help of Anita Grunder and several undergraduate and graduate students, accompanied by her field assistant, Blackberry, a black Labrador retriever. Field mapping has revealed that North Sister is actually a composite of at least two different cones. The first, exposed in the deeply-eroded north side of the volcano, is made up mainly of thin falls of scoria that alternate between red oxidized layers and bright yellow palagonitized (altered) layers. This earlier and more explosive cone erupted partially through ice, as indicated by the palagonite and by the occurrence of pillowed lava fragments. The pyroclastic (explosively fragmental) older

Mariek Schmidt (foreground) and Anita Grunder at North Sister, with Mount Washington on the skyline.
North Sister cone is overlain by the younger cone, a thick pile of thin agglutinated lavas, the lowest of which is glassy and pillow-lowed at its margins, indicating that it banked against a glacier.

Abundant radial dikes lace the whole edifice. Finally, magma rose along an 8-kilometer-long dike system beginning at North Sister and propagating northward to produce the Matthieu Lakes Fissure, which is about 15,000 years old and is a series of cinder cones and agglutinated lavas. These volcanic rocks are chemically related to North Sister despite being much younger.

An undergraduate, Andy Uhrig, will do a senior thesis on the petrography of rocks from North Sister, and two graduate students, Anders Carlson and Mehgan Blair, are studying the glacial history as part of a class project for Professor Peter Clark.

Cascade volcanoes provide a window into the underlying mantle, and this will be the subject of work by PhD student Mike Rowe with Assistant Professor Adam Kent and Geosciences Chair Roger Nielsen, building on earlier work by Rick Conrey. The trick is to analyze microscopic inclusions of frozen magma inside olivine crystals; these serve as miniature time capsules of magmatic history. Analyses are done using laser-probing technology and inductively coupled plasma mass spectrometry at OSU. In addition, they will be analyzing water and carbon dioxide concentrations in these tiny inclusions in collaboration with Paul Wallace at the University of Oregon.

Meanwhile, the uplift west of South Sister continues to grow. Justin Iverson did a senior thesis on waters in the Sisters area that revealed a geochemical anomaly associated with the uplift. He was coauthor of a report on this work published in 2002 in Geophysical Research Letters (v. 29, p. 1-4). Mariek Schmidt continues to monitor springs in the McKenzie River drainage; she is coauthor of a paper in press in Geology. In addition, Anne Jefferson, a PhD student working with Courtesy Professor Gordon Grant, is trying to figure out how water flows in the subsurface of the volcanic landscape of the Sisters area.
From the Department Chair

As many of you know, these are troubled times in higher education nationwide, as we struggle to respond to budget cuts. The OSU administration has responded with a series of changes, encapsulated in a strategic plan presented by our new president, Ed Ray. This plan is based on a vision of focused excellence and priorities on specific themes. These themes, on which the university will concentrate its resources, were selected in order to best use our current talent and future resources.

The Earth Sciences are prominently placed as one of five focal areas for the university (the others are Natural Resources, Engineering and Business, Arts and Sciences, and Biosciences and Public Health). Although the next few years promise to be difficult, I am confident that we have the talented people in place in the department and the mandate from the university leadership to do great things in the years ahead.

This fall, we admitted over 40 new graduate students, bringing our graduate student population to almost 100, and making us the largest graduate program in the OSU College of Science. To encourage students to communicate what they are working on to the department community, we will begin a new tradition in the spring in which graduate students present their research in a conference format. This Graduate Student Conference will take place on May 14, 2004, and will be open to the public. We urge our alumni and friends to attend and to meet our newest graduate students.

Our graduate program continues to excel in quality as well as quantity. We had several students win national awards this past year, and OSU was ranked 21st nationally in the May 2003 Geotimes in terms of the production of geoscientists in academia.

Our undergraduate programs are also healthy, with over 150 majors in the four disciplines we supervise in our department (Geology, Geography, Natural Resources, and General Science with an Earth Science option). Furthermore, our new Earth Sciences major (designed to replace the General Science, Earth Science option) was approved this year. This promises to be an attractive degree for many students who choose careers in elementary and secondary education, the military, and science interpretation.

We sponsored new events for alumni in the past year. The largest of these was a reunion in June of the alumni of the Geology Field Camp. As many of you know, we have run a field station near Mitchell, Oregon, for the past 70 years. Literally hundreds of students have received an education in basic field geology in eastern Oregon at our field camp. The reunion was a great success, and a report is provided elsewhere in this Newsletter and on the department website, www.geo.oregonstate.edu.

We also sponsored alumni events at national meetings, and will continue to inform you of developments in the department. Toward that end, we request email addresses from all of you so that we can distribute our newsletter electronically. This will allow us to keep you informed at reduced cost, and give you a conduit for providing us immediate feedback. One note of assurance: we do not share our addresses—mail or email—with anyone.

A quick scan of the list of faculty on the facing page will show you how much the department has changed in a short time. In the past 3 years, we have added 6 new tenure-track and research faculty, representing approximately 1/3 of the department. I include myself in that total because I joined the department full time as of last July, after having had a split position with Oceanography for the previous 15 years. Given the number of changes in the faculty, it is the department’s challenge in the next few years to integrate a new vision for the department including both the new and veteran faculty. We must take the opportunities provided to us without sacrificing the strengths that we are known for. This will only be possible with your continued help. The funds contributed by our friends and alumni have been critical in our ability to fill in the gaps, particularly with respect to resources for students.

Thanks to all of you for your continued interest and support for the department. We hope to hear from you soon.

Roger Nielsen
Reflections on a Career Transition

Entrepreneurs are a people set apart from the masses by their ability to discern opportunities, their willingness to assume risks in the pursuit of business ventures, and the satisfaction they derive from practicing the art of “the deal”. Although financial success may result from their efforts, entrepreneurial alumni tell me their real joy is found in the meeting of the challenges presented by new opportunities, not in the accumulation of wealth. Although my career as a university professor will never be confused with that of a business entrepreneur, my transition toward retirement allows me a certain space to reflect on some of the challenges I’ve enjoyed in the 42 years since I enrolled in my first class as a university freshman.

I entered the university as a scared first-generation college student whose older siblings had moved into the working world without a 4-year detour into the strange world of academia. My first challenge was to grasp the opportunity to learn rather than to hate the task of studying. Opportunities to learn were everywhere. In the dormitory elevator, I encountered my first international student, and that encounter was the genesis of my life-long passion for African studies. It was a class in physiography that allowed me to see the familiar Midwestern landscape as an artifact of past glaciation and redirected my career path toward the study of geography. The challenge of studying was transformed into a desire for lifelong learning. I’ve never tired of watching this transformation in subsequent generations of students.

My geography PhD cohort in 1975 included only 4% women. In all of my years of study, only once did I encounter a woman professor (she was a sociologist). For me, the challenge was to understand what I had missed as a result of this experience. I have a deep sense of gratitude to the many women students who cared enough to point out the shortcomings in my masculine perspectives on a wide variety of issues. As my worldviews shifted, so has the gender mix of my academic colleagues. Our students are well served by this transition.

A retired academic administrator once told me that he lived during the “pinnacle of disciplinary ascendancy in academia”. Departments built walls about themselves, corralled students within those walls, and pretended that their discipline had a stranglehold on some version of the truth. If only the world were so simple! The Geosciences Department has 13 years of experience in fuzzing the boundaries of disciplines. This has been a challenge, but it has been extremely rewarding.

Students and faculty have rich collaborations within the department and across much of the university. Faculty in our department have academic appointments in the Colleges of Agriculture, Engineering, Forestry, Liberal Arts, and Oceanography. Likewise, we draw on the expertise of collaborators from colleges, government research laboratories, the private sector, and some very active emeritus professors. Moving into the ranks of the emeritus professors is my next challenge.

Gordon Matzke

Our New Website

Computer Science graduate student Kris Anumolu and Gordon Matzke have designed a new website for the department, and it has a new address. Check it out at

http://www.geo.oregonstate.edu
Larry Becker arrived as a new assistant professor of Geography in September 2002. Now, in the halls of the Department of Geosciences, it is not uncommon to hear a West African language being spoken. Larry’s PhD is from the University of London, and he and his wife Laurie lived in Mali for 9 months and in Ivory Coast for 2 years. He is interested in how peasant farmers feed their families through a combination of subsistence farming and income generation, and how their land-management practices cope with national laws that are influenced by the practices of the former colonial powers, France, Portugal, and Great Britain. How do local rice farmers compete with massive imports of cheap, government-subsidized rice from Southeast Asia and the United States? Answer: They don’t, without state intervention. The recent criticisms of the International Monetary Fund and the World Bank publicized in the media are a reflection of the difficulties facing small-holder West African farmers.

Larry recently spent 6 months in Ivory Coast under a National Science Foundation grant studying rice growing systems there. He continues a long Geosciences tradition of working in Africa begun by Gordon Matzke, recently retired Professor of Geography and a fluent Swahili speaker.

Larry loves to teach, and he has taken over three large-volume courses, Geography of the Western World, Geography of the Non-Western World, and Human Geography, which enrolled 1,700 students the first year he was in the department. The large number of students who have taken his courses gave him instant celebrity status: he is recognized in the Corvallis Farmers Market as well as on the Tam-McArthur Rim Trail east of the Three Sisters.

Before coming to Oregon, Larry was chair of the Department of Geography at the University of Nebraska at Kearney. Laurie’s background is in Land Resources, and she teaches an introductory course in Geographic Information Systems. They have two children.

Adam Kent, one of the newest members of the Department of Geosciences, was hired in September 2002 as part of a dual package with his wife Dr. Dorthe Wildenschild (stay tuned for news about Dorthe in an upcoming newsletter). Adam received a PhD in Economic Geology and Geochemistry in 1995 from the Australian National University in Canberra and arrived in Corvallis from Copenhagen, after spending time at the Danish Lithosphere Centre. Prior to this he had postdoctoral research appointments in California at Caltech and Lawrence Livermore National Laboratory. Adam and Dorthe are celebrating the recent birth of their son—Mads (rhymes with “bass”) Christian Wildenschild Kent.

Adam’s research interests center around the development and application of analytical tech-
niques for small-scale (really, really tiny) geochemical analyses of materials such as rocks, glasses, minerals, shells, and otoliths (fish ear bones). Using equipment such as the electron microprobe, ion microprobe, and laser-ablation ICP-MS, the chemical and isotopic composition of these materials may be characterized at scales of just a few micrometers. OSU, through the Department of Geosciences and the Keck Collaboratory for Plasma Spectrometry in the College of Oceanic and Atmospheric Sciences, is a national leader in the development of such techniques and has a unique array of analytical facilities available. And the list continues to grow—Adam and Roger Nielsen, together with Portland State’s Martin Streck (OSU PhD 1994), have recently been successful in obtaining funding from the NSF and Hewlett-Packard for a brand new state-of-the-art electron probe.

One application of all this involves a substance of interest to several other folks in the Department of Geosciences—water. Water plays a critical role in forming the magmas that erupt at continental-margin volcanoes like those of the Cascades. Knowledge of the water content of these magmas helps to constrain processes of magma generation and provides a key to understanding what types of eruptions may occur at a given volcano. Until recently, however, it was not possible to directly measure the water content in magmas, as most water is released as vapor before it reaches the Earth’s surface. The key is to look for tiny blebs of magma trapped within crystals. These blebs trap water and other gases, providing “fossil” samples of magma, but they are prohibitively small for conventional analysis. Now, by using different microanalytical tools we can measure the water content of these blebs, as well as the concentration of a wide range of other important chemical elements.

Two projects underway are one in the Cascades to survey the water abundances in different magma types at the Three Sisters and Newberry Volcano (see the article on page 1). The other is currently going on in the Izu Islands, a volcanic chain extending south from Mt. Fuji. This work, funded by the NSF MARGINS program, is aimed at understanding how elements such as water are transferred between the crust and mantle during subduction. Recent fieldwork by Adam and OSU graduate student Mike Rowe with Jun-Ichi Kimura (Shimane University) bought back over 100 lava samples from this island chain. The work also was a unique cultural experience, as Adam and Mike stayed in remote traditional Japanese inns, and they returned to Oregon seriously addicted to sushi.

Anne Nolin was hired in December 2002 as an assistant professor in the Department of Geosciences. Her route to a degree in geography was circuitous, involving a BA in anthropology (1980) from the University of Arizona, followed by a stint as an archaeologist in New Mexico and Arizona. She received an MS degree from the Department of Soils, Water, and Engineering at UA in 1987. Her PhD (1993) was from the Department of Geography at the University of California, Santa Barbara, where she studied snow hydrology and remote sensing. During her time at UCSB, Anne was a post-graduate fellow at NASA’s Jet Propulsion Laboratory. Following graduate school, Dr. Nolin worked as a postdoctoral fellow at the Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado and was then hired as a Research Scientist at the National Snow and Ice Data Center, part of CIRES, where she worked until coming to OSU.

Anne’s research focuses on what she refers to as “snow hydroclimatology”, which involves integrative research in snow hydrology, climatology, modeling, and remote sensing to
address questions in global and regional water resources and climate change. Toward this end, she uses satellite remote sensing for mapping and monitoring snow and ice in the climate system. She has spent several field seasons drilling ice cores and measuring snow albedo on the Greenland Ice Sheet and more recently has been performing fieldwork in the California Sierra Nevada and the Colorado Rocky Mountains. In February 2000, she was named as a Science Team Member of NASA’s Multiangle Imaging SpectroRadiometer (MISR) team, and in January 2002 received a NASA Group Achievement Award as part of the MISR team.

Dr. Nolin’s teaching role in the department includes updating existing courses in Remote Sensing of the Environment, Digital Image Processing, and developing new courses in Snow Hydrology and Advanced Remote Sensing. She is organizing a Geosciences seminar entitled *Formulating Policy for an Uncertain Earth* for the winter term of 2004. This seminar series will examine how geospatial information is linked to policy development and decision-making, the role of scientific prediction for policy purposes, and the concept of balancing natural hazards and risk management.

Dr. Nolin is a member of the Association of American Geographers, the American Meteorological Society, the International Glaciological Society, and the American Geophysical Union.

On the personal side, Anne is married to Steve Drake, a software engineer at OSU. On May 27th, they became the proud parents of Seth Nolin Drake. In addition to being a busy new mom and professor, she still enjoys whitewater kayaking, rock climbing, hiking, and telemark skiing.

Profiles of Alumni Stars

Richard A. Marston (OSU MS 1976, PhD 1980, under the direction of Chuck Rosenfeld) is the 2003 recipient of the Ronald F. Abler Distinguished Service Honors Award from the Association of American Geographers. After teaching at the University of Wyoming, the University of Alaska Southeast, and the University of Texas El Paso, he accepted a position in 1999 as Professor and Sun Chair in the School of Geology at another OSU—Oklahoma State University in Stillwater.

Dick Marston has conducted research in France, Brazil, Mexico, the Himalaya, and the western United States, plus six summers on the Juneau Icefield in southeast Alaska. On the Icefield, he conducted research on streams that meander across the top of the glacier. Such streams meander as much in a single day as an alluvial river like the Willamette River would do in a decade. Dick describes these extraordinary field experiences as a chance to “…work with some of the most talented, motivated, and high-spirited students in the world.”

Dick is a Certified Professional Hydrologist, and he is Coeditor-in-Chief of the Elsevier journal...
George Sharp (BS 1967, MS 1969), recently retired after 25 years with Weyerhaeuser Company, is a new member of the Department of Geosciences Board of Advisors. George is also a Trustee of the GSA Foundation and an Associate Trustee of the AAPG Foundation.

He was born and raised in Portland and received BS degrees in geology in 1967 and in mathematics in 1968 at OSU. He attended the OSU Field Camp in Mitchell when it was taught by Doc Wilkinson and Keith Oles. Planetable work had to be completed by 10 a.m., before the heat waves got too intense, and lunch consisted of the traditional peanut butter sandwiches and oranges.

George decided to go into the oil and gas industry and selected an MS thesis project in the Montana Disturbed Belt under the direction of Professor Dave Bostwick. He married just before starting fieldwork, and he and his new wife, Danielle, started married life camped along Birch Creek, several hours from the nearest town. He finished his MS at OSU in 1969.

After several years as an exploration geologist with Shell Oil Company and Division Geologist with Tenneco, George became Geological Manager for Weyerhaeuser Company at their corporate headquarters in Federal Way, Washington, near Tacoma. At that time, Weyerhaeuser had not systematically inventoried its mineral holdings, nor had the company approached its mineral resources as a separate business unit. George became Director of Mineral Resources and managed all of Weyerhaeuser’s mineral holdings in the United States and Canada. Along the way he built a staff of up to 21 geologists, engineers, landmen, and accountants, and established oil and gas production in the Arkoma Basin, Black Warrior Basin, Mississippi Salt Basin, and the Gulf Coast, as well as mines in eight states and Vancouver Island. Because a large portion of Weyerhaeuser’s mineral holdings are in Washington and Oregon, George was able to obtain thesis and research support for several OSU students working on MS projects including Chuck Payne, Derik Kleibacker, and Mark McCutcheon under Alan Niem in southwest Washington, and PhD projects including Mike McCulla under Cy Field in the Washington Cascades and In-Chang Ryu under Alan Niem in the Tyee Basin.

George and Danielle have taken to the road since retirement, including a trip to southern Patagonia, where the photo was taken. Their son, Justin, works in Denver, and their daughter, Audrey, is a graduate student in Olympia.
Geology Field Camp Reunion

Well, those of you who weren’t there, you missed a great time. Our first reunion of OSU geology field camp alumni met in Prineville and Mitchell the weekend of June 27-29, 2003. Part of the alumni group met in Corvallis on Friday morning and got a tour of the department’s current facilities in Wilkinson Hall. The full group then met in Prineville on Friday evening for a reception and dinner (a cozy affair for 52), where we shared photos and stories.

Roger Nielsen made a short presentation on the current state of the department, which is good—over 20 faculty members, 150 undergraduate majors, almost 100 graduate students—and has a strong commitment to a balance between field and laboratory science. John Dilles spoke on the current state of the field camp, which is also good. The 2003 camp had 35 students and is financially stable. As in past years, the students engaged in 6 weeks of field exercises focusing on geologic mapping. They learned using traditional pencil and paper mapping methods, and we have also tried new computer techniques of “digital mapping”. Although we need a constant input of new funds for the regular replacement of hardware, the new higher technologies that are coming on line will require substantial funding to implement.

Ed Taylor gave a presentation on the 70-year history of field-techniques education at OSU. Most interesting was his explanation for why the students now work in our industry- and alumni-supported air-conditioned field station rather than in tents with war-surplus cookstoves. The alumni displayed their initial reaction with a heartfelt round of derisive hoots. However, Ed was very convincing in making the point that the education program has benefited greatly from being able to focus fully on the teaching. But today’s students do differ from the old in that they choose to sleep in their own small tents under the trees along bubbling Keyes Creek.

Following Ed’s excursion into the past, many of the attendees shared stories of their favorite memories of people, places, and peanut butter sandwiches.

On Saturday, we all gathered in Mitchell for a trip down memory lane beginning on the Mitchell Fault led by Ed Taylor and Alan Niem. The fieldtrip continued to the Painted Hills, followed by lunch, and then it split into two groups. Many of the alumni chose to try to chase down the students in rugged Myers Canyon with varying success. The remainder went with Alan Niem on a series of geologic stops around Mitchell.
In the evening, we all got together for a BBQ dinner with the current field camp students, making a total of almost 90 for supper. Dale Reynolds, the camp cook, managed to pull it off with amazing efficiency with the help of Nicole Armstrong, a 2003 alumna, who had helped to organize the whole event.

Ed Taylor has constructed a new webpage for the field camp that contains photos from this year’s reunion plus year-by-year photos from camps as far back as the 1930s. To view the pictures go to our new website at http://www.geo.oregonstate.edu. Then at “Alumni and Philanthropy”, click on “Events”. Finally, click on “Geology Field Camp Memories” to open Ed’s page. If you have additional photos from past camps, please send them to Ed in care of the department, so they may be added to the website.

Spring Break Geosciences Student Trip to South Africa

Geology and Geography students of the department’s Geo club are launching our first-ever international fieldtrip. A seminar during Winter Term on the geology, geography, and history of South Africa will be followed by a faculty-led 2-week trip. You are invited to donate to our efforts. Enmark funds to Geo Fieldtrip, OSU Foundation. Some alumni may be able to join the trip, and the faculty contacts are Anita Grunder and John Dilles.


Geography
Boright, Jonathan W., MS 03
Chastain, Kurt J., BS 03
Dale, Becci, MS 02
Easter, David A., MS 03
Fields Jr., Ryan B., BS 03
Friedman-Sowder, Zeph W., BS 03
Graves, Matt W., BS 03
Hoffbuhr, Tyler J., BS 03
Laufer, Eric A., BS 03
Lindeman, Dale R., MS 03
Lovelady, Suzanne M., BS 03
Lumban-Tobing, Pago L., PhD 03
Mater, Josh R., BA 03
Matsumoto, Kyoko, MS 03
McDougle, Sean P., BS 03
Nicolello, Jon G., MS 03
O’Donnell, Melinda J., BS 03
Odom, Mark R., BS 03
Oetter, Douglas R., PhD 03
Quillin, David C., MS 03
Riech, Sarah L., HBS 03
Rinterknecht, Vincent R., PhD 03
Sullivan, Lawrence J., MS 03
Taddesse, Michael W., BS 03
Taddie, Marissa C., MS 03
Theirl, David M., MS 03
Wood, Nathan J., PhD 03
Young, Stephen L., MS 03
Zamora-Arroyo, Jose, PhD 03

Geology
Armstrong, Nicole D., BS 03
Davis, Kelsay M., BS 02
Dickerson, Eric B., BS 03
Essman, James E., MS 03
Gray, Brian T., BS 03
Gordo, Kimberly R., BS 03
Horstman, Sheryl L., BS 03
Krugh, William C., MS 03
Marcott, Shaun A., BS 02
Morehead, Seth R., BS 02
Osterbur, Allison K., BS 03
Pritchett, Lynnette K., BS 03
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