Geological Hazards: New Challenges for the Department of Geosciences

In an earlier era, earth science departments focused on educating the people who would discover and manage natural resources: petroleum, mineral deposits, water, sand and gravel. With the current high prices of oil and of many metals, this is still true, but the Department of Geosciences now has a new role: graduating geologists and geographers to manage and recognize environmental hazards. It turns out that the strong emphasis on basic sciences...
and field geology has already allowed many Geosciences alumni to move from resource development to environmental geosciences.

Oregon is one of the most beautiful states in the U.S., but its beauty comes with a price. Portland’s signature volcano, Mount Hood, has the potential for mud flows and debris flows down its flanks. The Portland Hills are elevated along the Portland Hills fault, which, if it is active, is a threat to the most expensive real estate in Oregon.

The coastal zone is of vital importance to our economic well-being, security, and quality of life. Recent natural disasters such as Hurricane Katrina and the Indian Ocean tsunami have focused public awareness on the catastrophic consequences of coastal hazards. The magnitude of these events (costing hundreds of millions of dollars per year in the U.S alone), and the scale of human suffering associated with them, suggest an urgent need to re-evaluate current vulnerability and risk assessment procedures to ensure the safety of coastal populations and infrastructure. Further, understanding how changes in the Earth’s climate may affect or mitigate coastal processes is critical if resource, land-use and emergency managers are to understand the potential for coastal hazards and societal vulnerability to these hazards.

Landslides pose a threat to development encroaching into the hills around major cities. One expensive home compromised by an unexpected landslide was located in the annual Portland Street of Dreams. Sixty homes in Kelso, Washington, north of Portland, were destroyed by a landslide. Landslides that should have been recognized ahead of time along the realignment of U.S. Highway 20 between Corvallis and Newport may become the most costly in the history of Oregon, producing construction delays lasting up to two years.

The largest cities in Oregon lie next to the Willamette River, which floods every few years. The Columbia River formerly flooded, but since the construction of large dams for hydroelectric power, the problem has shifted to the impact of these dams on the environment, especially salmon runs.

In response to environmental threats, consulting firms, including CH2M Hill, founded by three OSU engineering professors, have become more involved with geological hazards. Many of these firms employ mainly engineers, and some of our graduates have sought separate degrees in civil engineering to enter this field. However, the more enlightened firms, including CH2M Hill, employ an increasing number of geologists to work on teams with geotechnical engineers. Enough geologists are employed that licensing is required in all three West Coast states. However, there is an ongoing turf problem between licensing boards in determining what constitutes geology and what constitutes geotechnical engineering.

Geography graduates find themselves working for city and county planning departments, and they must deal with ordinances that do not take into consideration environmental hazards. In addition to their technical role in land-use planning, they must educate the officials for whom they work to enact ordinances that protect the public. In their role as planners, they must be the ones who warn about an unruly Earth and prevent development on unstable ground. As population in the Northwest increases, the financial pressure from realtors and developers makes the task of planners a challenging one.

It has only been in the past 25 years that Oregon has been recognized as earthquake country. This paradigm shift received an unwelcome boost with two damaging earthquakes in 1993 at Klamath Falls and at Scotts Mills, east of Salem. Bob Yeats and his graduate students studied active earthquake faults in California, the Willamette and Tualatin valleys of Oregon, the central Oregon offshore region, New Zealand, Japan, and the Himalaya of Pakistan and India. A textbook, The Geology of Earthquakes, was published by Oxford Press in 1997, and two outreach books, one on California and one on the Pacific Northwest, were published by the OSU Press shortly afterwards. The outreach books are being translated into Japanese. A video, Cascadia: The Hidden Fire, featuring OSU geoscientists, has been presented several times on PBS by Global Net Productions.

Chris Goldfinger, one of Bob’s PhD’s, joined the College of Oceanic and Atmospheric Sciences (COAS) faculty and continued active-fault research through his own Active Tectonics Lab, mapping the region between the coastline and subduction zone of both Oregon and Washington and identifying 18 subduction-zone earthquakes in the Cascadia Subduction Zone since the end of the Pleistocene, using turbidite paleoseismology. He is now working on this same problem off the coast of Sumatra, looking for great earthquakes prior to the magnitude 9.3 earthquake and tsunami in 2004 in which hundreds of thousands lost their lives.

Andrew Meigs and his students work on earthquake geology and active tectonics projects at the interface between geomorphology, structural geology, and geophysics. This is a means for understanding the structure of orogenic belts, the feedbacks between uplift, erosion, and topography, and short-term deformation rates and fault structure. Their projects are in California, eastern Oregon, Alaska, Pakistan, and the Andes of Argentina.

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From the Department Chair

Another frantic year has gone by very quickly. This marks my final year as Department Chair - and I find it hard to believe that it has been over 7 years since I took over as Geology Program Head and over 5 since being named Department Chair. As I approach the end of my tenure, let me reflect on how far we have come in the past few years.

We are currently assessing our progress in achieving goals stated in our Department’s long range plan, written in 2003-4. In spite of the challenging state-funding climate, we have been able to meet some of the important goals set in that plan. Our graduate programs are healthy, with almost 90 graduate students, and GRE scores well above the average of only 5 years ago. Our external funding (grants and contracts) has increased by over 50% and is reflected in the 6th place ranking of Geosciences and COAS together on the list of “most cited” Geosciences programs in the country (published by Science Watch).

On the educational side, our distance-education program is the second largest such program at OSU, and is one of the largest Geosciences distance programs in the country, with over 25 courses offered on line. This new program has allowed us to sustain graduate-student positions and colleagues that would otherwise not be possible. In addition, we can reach a student body that otherwise would not come to the OSU campus; students whose work schedule or personal situation precludes their living in Corvallis.

One area that some of you have helped with as alumni is in private fundraising. Over the past 5 years, our departmental endowment has increased by over 150%, allowing us to support more student fellowships, research facilities, hiring costs and many other things we would not otherwise be able to support. This effort represents the Geosciences part of a major OSU fund-raising initiative, launched in October of this year.

Speaking of hiring: perhaps the biggest change in the years I have been chair, has been the number of new people we have been able to bring on board. As of this Fall, approximately 40% of our professorial faculty have arrived in the past 5 years. A great bonus is the fact that many of those faculty who have gone on to greener pastures (or swifter trout streams) still remain as important contributors to the department. (I don’t mention that just because Bob Yeats is editing this article.) Another big change in the department last year was the retirement of Joanne Van Geest, who served generations of our students and was often the first person students encountered when they entered the department, and the last person they said goodbye to as they graduated. We will miss Joanne! Stacey Schulte joined us in August to try to fill that void; she will often be the person you talk to when you call the Department.

In the end, it is all about the students - and we have been lucky to have a steady supply of excellent students who are interested in all aspects of the Geosciences. This helps to sustain and renew all of us - the students and their enthusiasm are inexhaustible if you feed their sense of wonder of how the world works. That sense of wonder and inexhaustible enthusiasm and curiosity were never embodied by anyone better than by our friend and colleague, George Moore, who many of you knew as a USGS geologist, and then a Courtesy Professor at OSU after his retirement. In addition to his scientific pursuits, George helped the Department in the publication of this newsletter for many years. In early October, George was killed in a tragic car crash while returning from the Eugene airport. A memorial appears elsewhere in this newsletter. George will be greatly missed as someone who embodied the best of what it means to be a colleague: both generous and demanding.

As I contemplate where the department is, where it has been, and what it can become, I am confident that the excellent people we have added, both faculty and students, will ensure that the future – if always interesting and challenging – will have a prominent place for OSU Geosciences.

Roger Nielsen

Geosciences Board of Advisors
November 2007 Update

By Brian Butler, Chair

The Department of Geosciences Board of Advisors is in our 7th year in support of the Department. The advisors are alumni and friends who volunteer their time and energy to assist the department in a visiting advisor role. We assemble twice a year at the Department in Corvallis and bring our diverse professional and business experience (industry, government, consulting, non-profit, and academic) in an outside review and sounding-board and capacity. Our underlying goal is to support the
efforts of the faculty and provide exposure to related professional opportunities for the students.

We thank two members for recently completed service to the Geosciences Department and the BoA. Richard Bastasch (MS Geography 1984) served as a founding member of the BoA. We thank him for his participation from 2001-2006, and his insight and contribution to BoA discussions and recommendations. Dru Hobbs Butler, served as the BoA Chair from 2005-2007. We recognize Dru as a founding member of the BoA, and for her efforts to engage students and faculty in BoA activities, and for the important behind-the-scenes work necessary to plan and run our meetings.

Our current members are: Steven Anderson (Owner, operator and founder of Cascade Planning Association, Mosier, OR); Xan Augerot, (Co-Director, State of the Salmon Consortium, Portland, OR); Ken Barrow (President, T-Bar-X, LP, Houston, TX); John Bubb (Retired, Exxon Mobile Corp., Houston, TX); Dru Hobbs Butler (Richland, WA); Brian Butler (Consulting Geologist, Landau Associates, Seattle, WA); Janine Castro, (Geomorphologist, U.S. Fish & Wildlife Service, Portland, OR); Steven Dole (Environmental Scientist, Felsburg, Holt & Ullevig, Centennial, CO); Mike Gerstenberger (General Manager, Tiger Deck, Spirit Lake, ID); Britt Hill (Sr. Technical Advisor for Repository Science, NMSS/DHL WRS, U.S, Washington, DC); Sharon Kelly (Transportation Project Manager, Portland, OR); Tim Lauer (Retired, Managing Director of Unocal of Indonesia, Houston, TX); Dick Marston (Professor & Department Head, Manhattan, KS); George Sharp (Retired, Weyerhauser, Lakewood, WA); and Denny Tower (Black Butte Ranch, OR).

At our meetings we have the privilege to learn about the world-class research and initiatives being pursued by the Department’s remarkably talented faculty, we have conversations with the graduate and undergraduate students, and we learn how the Department meets the challenges of education and funding in the 21st Century.

This year, the Board of Advisors will expand our outreach efforts to department alumni. We would like to re-connect with former students, learn where your OSU education has taken you, what kinds of career opportunities you have had, and what career choices you have made. We would also like to encourage your insight and feedback on how the OSU Geosciences program can improve programs for current students and better serve previous graduates. Your opinions and contributions are valuable in shaping the future of the Department. We would also like to encourage you to participate in the recently announced OSU capital campaign. If you have ideas and questions, we invite and encourage you to contact me, other Board of Advisors members, or Roger Nielsen, Department Chair.

This September several Board of Advisors members were fortunate to have the opportunity to participate in the first (we hope to be annual) Board of Advisors Field trip; a three day event that showcased exciting research, led by Anita Grunder, Peter Clark, John Dilles, and Mark Meyers. Board members heard about student and faculty research projects from the summits of Hampton Butte and Steens Mountains, and at numerous outcrops in the High Lava Plains. As you can imagine the scenery and conversations were exceptional.

Please contact us! We want to know that you received this, if you are interested in other information regarding Department activities, and what you are doing today.

**Geological Hazards continued from page 2**

Andrew and his students have been working for the past 7 years in collaboration with researchers from San Diego State University and the Universities of San Luis and Buenos Aires (Argentina) to better understand seismic hazards in the Sierras Pampeanas in western Argentina. Several historical earthquakes have damaged or destroyed the cities of Mendoza and San Juan along a ~250-km-long segment of the Andean thrust front. A centerpiece of this project has been the discovery of two previously-unknown crustal-scale blind thrust faults. One of the faults west of San Juan, the likely source of the devastating 1944 San Juan earthquake, is responsible for near surface folding of fluvial terraces and coseismic slip on flexural slip faults and associated folds. Discovery of this fault allowed the development of paleoseismic records developed from secondary faults to be tied directly to the seismic source fault. OSU students working in Argentina include M.S. students Chris Krugh, Emily Schultz, and Celia Schiffman and undergraduate Della Fawcett.

Considerable evidence from Nepal and India now indicates that prehistoric great earthquakes that result in large coseismic displacements have occurred on the plate boundary fault of the Himalaya in India and Nepal. In contrast, knowledge of the earthquake potential of the plate boundary thrust fault in Pakistan is virtually absent. Moreover, the 2005 Kashmir, Pakistan, earthquake fault (Figure 1) ruptured the surface, a first for any historical earthquake in the Himalaya. In response to these unusual characteristics of the Pakistan Himalaya, Andrew Meigs and Bob Yeats revived the long-term OSU-Pakistan connection to identify and
characterize earthquake sources that threaten major population centers of northern Pakistan. The project is a collaborative effort between OSU, California State University, Northridge, and the Geological Survey of Pakistan, Quaid-i-Azam University, Peshawar University, and Azad Jammu and Kashmir University. The project will include an active tectonics field school, in which participants will learn how to identify, map, and conduct paleoseismic excavations on active faults. Chris Madden, a new graduate student from the consulting world, will take on this project for his PhD dissertation.

Bob Yeats and an Indian colleague, building on early work by Bob Lillie and his students, have found a new fault zone in the plains south of the Himalayan Front fault in Pakistan, India, and Nepal. In addition, Bob and Pakistani colleagues, Ahmad Hussain and MonaLisa, have found a possible blind fault that may pose a threat to Tarbela Dam and the Islamabad-Rawalpindi metropolitan area. Chris Madden will conduct a tectonic geomorphic analysis of the surface expression of this fault.

Seismic hazards are always at the forefront in California, and Andrew, as a member of the Southern California Earthquake Center (SCEC), continues to work on projects characterizing seismic sources in the greater Los Angeles metropolitan area. He has been collaborating with Michele Cooke of the University of Massachusetts on a project focused on the 3-D model geometry of faults that underlie Los Angeles, produced by SCEC. Andrew and Michele’s project focuses on model validation, the nature of interaction between intersecting faults, and the evolution of the fault system in time. Undergraduate Della Fawcett was awarded a SCEC Summer Internship in 2006 to work on this project. Results of this work have implications for regional fault shapes and slip rates, both of which play a primary role in the type and size of earthquakes that the fault systems are capable of generating in metropolitan Los Angeles.

Additional research on earthquake hazards is conducted in several other colleges at OSU. The College of Engineering has Steve Dickenson in geotechnical engineering and Tom Miller in structural engineering, and the College has constructed the world’s largest tsunami wave tank. COAS has John Nabelek and Anne Tréhu in seismology and Paul Vincent in InSAR satellite interferometry. With this diverse group, OSU has one of the most versatile collections of scientists in the country to address earthquake hazards.

The VIPER group (discussed elsewhere) applies volcanology, petrology, and geochemistry to assess volcanic hazards. Several VIPER studies are on active volcanic systems in the Cascades. Adam Kent and Frank Tepley, working with the USGS Cascade Volcano Observatory, are conducting studies on Mount Hood and Mount St Helens to better understand the evolution of these systems. Adam works with lithium at Mount St Helens as a tracer of explosive volcanic activity, and he and graduate student Cris Darr developed models of magma evolution at Mount Hood. Frank Tepley and new graduate student Erin Lieuallen are working to unravel the early magmatic history at Mount St Helens. Work at Three Sisters has waned with the departure of Mariek Schmidt, but indirect monitoring of the Oregon Cascades will result from the High Lava Plains Experiment being established by Anita Grunder, Andrew Meigs, and others.

In the Andes of South America, Shan de Silva and his students are assessing potential impacts of "super-eruptions". El Misti volcano, looming over Peru’s second largest city, Arequipa (Figure 2), is the focus of collaboration with Guido Salas from the Universidad de San Agustín in Arequipa and the USAID/USGS Volcanic Disaster Assistance Program (VDAP). Chris Harpel’s PhD research deals with the hazard to Arequipa from lahars, while Frank Tepley is leading an effort to understand the petrological evolution of El Misti to understand its periodic activity. Work on the spectacular 1600 A.D. eruption of Huaynaputina in Peru continues with students Hannah Dietterich and Kaitlin McCann working on atmospheric input from that eruption and the control on explosive to effusive eruption styles, respectively. Farther south near the mutual borders of Argentina,
Bolivia, and Chile, Morgan Salisbury is unravelling the periodicity and mechanisms behind large ignimbrite flare-ups and the super-eruptions for his PhD, a study paralleled by that of Chris Folkes working farther south in Argentina, with Chris jointly advised between Monash University, Australia and OSU. Anita Grunder continues her work at the long-lived Aucanquilcha volcano in northern Chile, where B.J. Walker will attempt to understand that system through zircon geochronometry, and Denise Giles will map the petrological development of the magmatic system. Geosciences faculty are joined in these efforts by geochemists David Graham and Robert Duncan in COAS.

Peter Ruggiero is currently developing probabilistic approaches to coastal vulnerability analyses that include the impact of climate change and variability on future coastal hazards. He is developing tools to improve our ability to manage coastal resources in light of coastal hazards at multiple time and space scales. He is the principal investigator, collaborating with the USGS and Oregon and Washington state agencies, of a decade-long beach morphology monitoring program that has for the first time comprehensively and systematically quantified the short- to medium-term variability of the 165 km-long Columbia River littoral cell. The sampling scheme resolves the seasonal and inter-annual cycles of beach loss and recovery as well as the anomalous beach response to the El Niño and La Niña events of 1997 – 1999. He has also recently applied a probabilistic shoreline change model, confirming that decadal-scale shoreline evolution along a littoral cell at Long Beach Peninsula, WA, is highly dependent on wave and climate variability, in particular major El Niño events in which incident wave angles are anomalous (Figure 3). He is also co-PI on a large-scale physical model study of dune erosion that was recently performed at Oregon State University's O.H. Hinsdale Wave Research Laboratory, collaborating with other coastal scientists at COAS to produce a comprehensive, near prototype-scale data set of hydrodynamics, sediment transport, and morphological evolution during extreme dune erosion events. He is also planning a return to Sumatra, where he is investigating the erosion and subsequent coastal erosion caused by the 2004 Indian Ocean earthquake and tsunami.

The goals of Peter’s investigations reflect the need for an improved understanding of coastal processes, and in particular the responses of West Coast beaches and ocean-front properties to multiple coastal hazards. His work should greatly improve our ability to project the expected future impacts of Earth’s changing climate on the erosion of west coast beaches and shorefront properties and support local and state practitioners in their efforts to manage resources in this dynamic zone.

Julia Jones is conducting research on factors contributing to extreme regional floods, especially the role of snowpack during rain-on-snow events, which produce extreme floods in the Pacific Northwest. Julia’s research takes advantage of long-term climate and streamflow records from the H.J. Andrews Forest, as well as USGS streamflow records. The analyses show that melting of high elevation snowpack appears to synchronize the timing of otherwise desynchronized watersheds, producing very high flood peaks. Forest openings created by clear-cutting in the mountains of Oregon appear to add 10-20% to extreme flood peaks measured in Corvallis, Salem, and Portland.
The global community is paying greater attention to relief efforts following natural disasters. As the Earth’s population increases, more people occupy marginal lands, many of which are hazard-prone. Consequently, disaster studies are gathering greater attention and resources world-wide. Wiley Thompson (MS Geography, 1999) is using his recent experience in the 2005 Kashmir earthquake relief effort in conjunction with faculty advising to guide his PhD research.

The first research focus is on pre-disaster preparedness. An effective community disaster relief plan provides shelter and services to a population following the onset of a hazard and is a key component of emergency preparedness and disaster recovery. Wiley is exploring community needs and resources by employing a practical method whereby a community-wide relief plan can be based on school buildings. He has worked out the desired characteristics of a relief center and the methodology of selecting a relief center, and he has developed recommendations for the implementation of a community relief center plan. His findings have been shared with Benton County Emergency Management personnel as part of community outreach. The use of GIS is central to both the examination of the problem and the method of selection of a relief center site.

The modern cast of disaster relief actors includes host nations, non-governmental organizations, private-volunteer organizations, and military organizations. Each group brings different skills and experiences to disaster relief problems. The ever-increasing complex humanitarian environment creates conditions in which relationships between these actors are often tenuous at best. In the October 2005 Kashmir earthquake disaster relief effort, members of the United States military worked with civilian and other national military organizations to lend their unique capabilities to the relief effort. Research into this area has focused on determining why this effort worked in Kashmir, and how similar efforts can succeed in future disasters. This has led to the Kashmir Model of integration, coordination, and transparency in civil-military operations.

Research by GIScientists and rapidly-maturing technologies have made available tools useful in real-time need assessment following a disaster so that resources can efficiently be applied to minimize suffering and destruction. Relief effort leaders also benefit from spatial analysis capabilities as the decisions they make early on in a disaster relief effort can set the conditions for recovery. However, there is a gap between GIS capabilities, proliferation, and access and its use in relief operations. By examining the 2005 Kashmir earthquake experience, Wiley is identifying the barriers to GIS use and will propose both short- and long-term solutions and implementation strategies. The desired outcome of this research is a series of GIS-specific recommendations which will enable more timely decision making and more efficient use of relief resources.

Finally, the EarthScope National Office is working with most of these groups to educate the general public about earth hazards (see related article).

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**Geosciences Club Field Trip to the Pyrenees**

By Ajeet Johnson

In the Fall of 2006, an idea was presented to the Geosciences Club: a trip to the Pyrenees the following June. There we would learn about the geologic history of the Pyrenees and examine key features of a continent-continent collision with Dr. Andrew Meigs, who had conducted his PhD study on the structure and formation of the Pyrenees fold-and-thrust belt. As a new member of the club, I thought that this would be an ambitious and costly undertaking. The cost, however, did not dim the dream, and it sparked an incredible ambition in the club to make it happen. The club undertook a tremendous fundraising campaign, with a donation of time from all members and garage-sale items from the entire department. All who wanted to go made the commitment in January, and it was decided: we were indeed going.

During spring term, 2007, those who were going participated in a seminar on the geology of the Pyrenees, led by Andrew Meigs and Dr. Anita Grunder. There were research papers to read, and each of us presented some aspect of the structure, petrology, or culture of Catalonia, the autonomous community encompassing that part of Spain we were to visit.

After eight very long and challenging months, twenty-three of us took off from the Portland airport bound for Barcelona, Spain! The trip over the Atlantic went smoothly, and after roughly 17 hours of travel and several dry airplane meals, we landed in Barcelona. Our first adventure into the heart of the city to find our hostel was an entertaining one, since no one knew how to get there. One of the more memorable moments was watching Andrew walk up to a group of very stern looking officers to ask directions for our caravan parked illegally on the side of a busy street. On reaching the hostel, we spread out to explore the city for the next two days.
Barcelona is a beautiful and lively city with a rich culture and its own language: Catalan. The friendly people (who never seemed to mind that I didn’t speak Catalan or Spanish), incredible food, and ancient architecture were just a few highlights here. I think many of us fell in love with the pan con tomate and jamón serrano, and a few of us tasted the wine and clara (beer with lemonade). I found it amazing just to walk down the European streets and see an ancient cathedral in the middle of a thriving neighborhood. It is so rare to see buildings here in the U.S. that are centuries old, let alone thousands of years old, and still being maintained.

After we were joined by Dr. Jaume Vergés of the University of Barcelona, a professional colleague of Andrew’s and a most gracious and knowledgeable guest leader on our trip, and his son Damia, we left Barcelona for the Catalan Coastal Range and the monastery at Montserrat, armed with a field-trip guide we had put together ourselves that included maps and digital elevation models provided by Mark Meyers of the Terra Cognita lab. Here a group of Catalonian monks had built a monastery perched on the edge of a large outcrop of limestone conglomerate, a fan derived from the Catalan Range to the southeast. For many people, this is a pilgrimage destination to see and touch the Black Madonna. The renowned boys’ choir and cathedral were amazing, though more difficult to enjoy with the hundreds of other people crammed in like sardines. After spending several hours here, we headed out across the Ebro Basin, with a few stops along the way to take in the Cardona anticline and the Vallfogona thrust. We ended the first day of travel at St. Llorenç de Morunys, a ski resort in the southern foothills of the Pyrenees and a classic area for the study of growth structures commonly visited by oil-company geologists. From here, the higher peaks of the Pyrenees were smiling from the distant horizon, giving us a peek at the days ahead.

Hiking and mapping a bit of the St. Llorenç growth structure truly gave a glimpse of just how incredibly deformed the strata became during the formation of this fold-and-thrust region…and this was only the beginning. Next came one of the most unforgettable days of road travel I have experienced, over the pass to Peramola. I’m not sure where Andrew and Jaume found this route, but I doubt that most Spaniards even knows it exists. Though long, this day brought us to some incredible geological wonders such as the Pedraforca, an amazing fork of jagged rock thrust into the air, followed by winding switchbacks down into the beautiful Oliana anticline.

Here we stayed in one of our favorite villages, Peramola. Everything about Peramola was idyllically Spain; the abundant food, the overly friendly people, the small quiet village and, of course, wine served at breakfast! The following day was spent hiking around one of the eroded flanks of the Oliana anticline, learning from Andrew and Jaume about the growth of thrust structures with the evidence preserved in sedimentary rocks around the anticline. We spent a couple of days in this beautiful area before moving on to Tremp.

The drive to Tremp covered many geologic fold-and-thrust belt features, but the most impressive to me was the Montsec thrust. Seeing this enormous ridge thrust over an underlying wedge of land of the same age was a feat of the mind to comprehend and equally as beautiful to behold in person. Thinking back, it is truly amazing how many geologic and historic wonders we saw in such a short time. In the two days we spent checking out the Montsec and Boixols thrust regions, we saw many sights, including a nearly abandoned and beautiful village built virtually underneath the Montsec fault, where the locals collect dinosaur bones in their basement (thanks to Bre who so desperately needed to use a restroom that she asked the right people). Not far from here, another highlight of the area was the Parc Cretaci, featuring the ghostly footprints of an ancient troop of dinosaurs. This scene recorded an event only minutes away from the “end of the line” for their existence…the “KT” boundary. At the top of the Montsec thrust ridge, we saw a few daredevils who seemed all too anxious to join those dinosaurs, a group of paragliders gliding through the air, thousands of feet above the valley below. These
OSU undergraduate Bre Craig is taking a picture looking to the west at growth strata formed on the flank of a growing fold near Sant Llorenç de Morunys in the southern Pyrenees. This was where Oriel Riba, a professor of sedimentology from the University of Barcelona, first described growth strata, and it has been the topic of numerous papers arguing for the relative importance of limb rotation during fold growth. With Bre’s bandana as a frame of reference, moderately south-tilted conglomerates along the skyline unconformably overlie steep to overturned conglomerates just above and to the right of her head. An unconformity marks the contact between the packages of strata, which, as you follow it to the left (to the south) becomes a conformable contact. Our guide, Jaume Vergés, brings groups of oil company geologists and geophysicists to this site to conduct workshops on syntectonic sedimentation because the scale of the outcrops and the vertical relief (~500 m) are comparable to the scale of reflections as seen on seismic lines. Melody Rogerson is to Bre’s left, and Ajeet Johnson and Casey Varnum are to her right.

Nacional Aigüestortes y Lago de San Mauricio and walked up the Riu Escrita into the high peaks for one of the most spectacular mountain hikes I have had the pleasure to go on. The entire day was spent exploring the high peaks, carved into the Hercynian (late Paleozoic) Maladeta granodiorite by glaciers into valleys and lakes that appeared around every bend in the trail, including Estany de Sant Maurici (Lago de San Mauricio), where we had lunch, to Estany de Ratera, farther upstream. This was one of those places that is so incredible there are no words to describe it, and I think we all felt very lucky to be there experiencing it. We even briefly encountered another lucky Beaver alumnus along the trail that day.

As we crossed over the high peaks toward France, with a glimpse of Pico de Aneto, at 3408 m, the highest point in the Pyrenees, we learned from our fellow graduate students, Luca and Jeff, about the glaciers that once occupied the deeply eroded valleys we were traveling in. I think one of the highlights, however, was a riotous session of Monkey In the Middle during our lunch stop in a high meadow (for those who don’t know, this is a Frisbee game that strands 1 or 2 unfortunate people in the middle of the tossing circle, much fun!).

Finally, we crossed into France and landed in one of our most luxurious (and, ironically, least expensive) accommodations in Bagneres-de-Luchon, a famous spot for Tour de France fans, nestled on the north slope of the high Pyrenees.

On our way out of the high mountains, we stopped for a quick jaunt up a hill for Anita Grunder to show us true mantle rock, lherzolite, an incredible concept to grasp. Being the avid bicyclist that he is, Dr. Meigs drove us down a small piece of the Tour de France route, giving us an even greater appreciation for the endurance of those who ride in the race! This day ended just outside the city of Carcassonne, which seemed to be the highlight of the trip for a few, including Anita’s daughter, Zoe, who I think could have spent the entire time checking out the ancient walled city. Again, it was amazing to see a society where their heritage is revered by preserving the ancient architecture. The walled city of Carcassonne was an unbelievable sight and experience.

Finally, we headed back down to the Mediterranean coast and landed in Blanes, Spain, where we were greeted by a very happy and relaxed Haggerty family. Roy and his wife Marilyn had slaved all day over the single greatest meal of the entire trip, the paella! This was the single greatest evening I experienced on the trip; hearing about the area from Roy and Marilyn, enjoying the gorgeous view and sea breeze from the roof of our oceanfront hostel, and just enjoying the last days of a life-changing trip with friends.

Of course, the adventure did not end there. The day of our departure back to Corvallis, was a blast of
adventure as we got trapped in one of the biggest traffic jams I think any of us had ever experienced. Leaving Blanes with four hours to get to the airport in Barcelona should have been plenty of time until we were caught on the freeway and then the streets of downtown in bumper to bumper traffic. It was sheer chaos. There was a relay of us dashing from van to van at every stop, formulating ideas of how to not miss our flight home. With the insane drivers over there, I’m surprised there weren’t any Moped maniac casualties. Somehow, we broke free of the tight grasp of Barcelona and made it to the airport with all of 45 minutes until take-off. Our flight was already boarding! I’ve never seen our group move so quickly, especially after hearing that the pilots could not hold the flight, so we had to make it before the gate closed or not at all. After a heart-pounding dash across the Barcelona International Airport and a few kind souls at the security gate (the line was at least 25 minutes long), we collapsed into our seats and realized (after a few deep breaths) that we all made it before the door closed, and we were on our way home.

All in all, each and every day in Spain was an amazing and unforgettable experience. I think it was said quite accurately when a co-traveler said, “this feels like the beginning to the rest of my life”. A massive thank you to every one of you who helped make this trip possible, especially those who donated financially. We’ll always remember it as a high point of our time at OSU.

EarthScope National Office Established at Oregon State University

The National Science Foundation (NSF) has awarded 1.6 million dollars to Oregon State University to establish and manage the EarthScope National Office (ESNO). EarthScope is a national program to explore the structure and evolution of the North American continent and to understand processes that cause earthquakes and volcanic eruptions. Anne Tréhu, in the College of Oceanic and Atmospheric Sciences (COAS), is Director of ESNO, and Bob Lillie in Geosciences is the EarthScope Education and Outreach Manager. Tréhu and Lillie’s NSF proposal highlighted ongoing EarthScope-related projects undertaken by several Geoscience Department faculty, including Bob Yeats, Andrew Meigs, Anita Grunder, and Shan de Silva, in addition to many scientists in COAS. "OSU is a particularly attractive site for the EarthScope National Office because of its breadth and depth of geoscience research, education, and public outreach," according to Kaye Shedlock, EarthScope program manager at NSF. ESNO’s education and outreach will train interpretive professionals in parks and museums to engage the public in how EarthScope projects help us understand geological hazards and landscape formation. "EarthScope presents an outstanding opportunity to instill appreciation for a dynamic Earth in visitors to national parks and other places where geological forces are so apparent", said Lillie.

EarthScope (www.earthscope.org) consists of numerous research projects proposed and executed by individuals or teams of scientists around the country using EarthScope facilities. Tréhu notes that "Over the next decade, EarthScope will acquire data from thousands of new seismometers, strainmeters, and Global Position System (GPS) instruments, which will allow us to observe the inner workings of the continent, much as a doctor might use a stethoscope to listen to a patient’s heartbeat and assess other vital signs." Many of the instruments
are permanently based in the western U.S. as part of EarthScope’s Plate Boundary Observatory (PBO), to investigate the geologically-active boundary between the Pacific, Juan de Fuca, and North America plates. Another part of EarthScope, called USArray, consists of 400 seismometers that are leap-frogging across the U.S. to investigate the structure and ongoing deformation of the crust and mantle beneath North America. These projects are providing clues as to how North America has evolved and continues to deform, enabling scientists, students, and the public to appreciate how the continent changes in ways that affect our lives. A third EarthScope component, known as the San Andreas Fault at Depth (SAFOD) drilled a hole downward and then laterally right through California’s most famous fault. Rock samples and geophysical instruments placed in the hole are being used to investigate physical properties within the actual earthquake zone.

EarthScope provides a foundation for fundamental and applied research throughout the United States to understand the dynamic Earth. Knowledge obtained from this research contributes to the mitigation of geological hazards and to the development of natural resources. Over the next 3 years, the EarthScope National Office at OSU will coordinate these scientific efforts and train teachers and other outreach professionals to communicate results to students and the public at all levels.

VIPER: A new research focus at Oregon State University

VIPER stands for Volcanology and Igneous Petrology and Economic Research. The VIPERs study many topics related to igneous rocks, including the formation and eruption of magmas in diverse tectonic settings, and associated mineral deposits.

Volcanologists - Igneous Petrologists (VIPs) in the group are Shan de Silva, and Anita Grunder in Geosciences and Frank Tepley, who also runs the electron microprobe housed in the College of Oceanic and Atmospheric Sciences (COAS). Shan is working on supervolcanoes in the Altiplano and Puna regions of Chile, Bolivia and Argentina, and Frank and Anita, together with their students, are studying a group of about 20 volcanoes in northern Chile. Shan, through his planetary volcanology interests, is involved in Space Grant; he even gave a talk at a fashion conference on space suits! Roger Nielsen, our department chair until the end of this academic year, is an igneous petrologist (IP) who will take a sabbatical leave in Tasmania. Sherm Bloomer, although largely occupied by the duties of Dean of the College of Science, is also an IP member of VIPER, studying western Pacific subduction zones. Randy Keller, an IP with research interests in seamount volcanism in the North Pacific and the Antarctic, also teaches e-courses in oceanography and volcanic hazards. Adam Kent and his students have projects ranging from Cascade volcanoes to mid-ocean ridges (with Roger Nielsen), western Pacific subduction zones, and komatiites from Zimbabwe and elsewhere. He is working on rocks as old as 3.4 billion years and as young as dacites erupted a few months ago from Mount St. Helens. Adam also runs the laser ablation microanalysis facility in COAS. John Dilles is working on hydrothermal ore deposits and related igneous rocks along the western margin of the Americas, including the gold and copper deposits of the Andes. A field trip to see the volcanoes, plutons, ore deposits, and structures of the central Andes is brewing.

The Oregon Department of Geology and Mineral Industries (DOGAMI) has a 6-year project in which the best geological mapping of Oregon is being compiled in a digital, network-available format. Geology emeritus IP’s Bill Taubenbек and Ed Taylor have contributed to the northeastern section (Bill) and the Cascade-central Oregon sections (Ed). These maps are now available on the DOGAMI web site.

Bob Duncan, an associate dean in COAS, is head of the argon geochronology lab. Bob and Anita are part of a large Continental Dynamics project to understand the structure of the crust and mantle in southeastern Oregon, which, together with a tectonics and structure project involving Andrew Meigs, addresses volcanism and faulting where the Basin and Range meets the High Lava Plains and Brothers Fault Zone. A new VIPER in the geochronology lab, Anthony Koppers, works mainly on geochronology of seamounts and large igneous provinces. He is also setting up geochemistry and igneous petrology databases as part of EarthRef.org and GERM (Geochemical Earth Reference Model). Together with Roger Nielsen, he has been setting up and improving the database on partition coefficients. Dave Graham, with research interests in noble gas geochemistry, is building a state-of-the-art noble gas lab with Ed Brook, a paleoclimatologist in Geosciences. Also in COAS, Martin Fisk, associate dean of the graduate school, works on microbes in volcanic rocks.

Visiting VIPER post-docs from France include Isabelle Chambeafort, working with John Dilles on sulfur and metal transport in melts (Yanacocha,
Peru), and Perrine Paquereau, doing experiments on welding in pyroclastic deposits with Anita and Kelly Russell at the University of British Columbia. Guido Salas, from Peru, is working on pumice textures with Shan de Silva.

VIPER faculty teach part of the basic curriculum in introductory geology, mineralogy and petrology and contribute to teaching of the field course and the running of field trips. Several advanced VIPER courses are taught between GEO and COAS. Shan is developing a course in volcanoes and mythology for a general education audience. Here’s a general-education VIPER fact: Ammunition ships in World War II were named for volcanoes, including USS Katmai.

Five VIPERs completed advanced degrees last year. Mike Rowe (Geosciences PhD) worked on melt inclusions in basalts and is now a post-doc at Iowa State. Chris Russo (COAS PhD) worked on uranium-series disequilibria of mid-ocean ridge basalts to understand mantle heterogeneity; he is a post-doc at the University of Hawaii. Kaleb Scarberry (Geosciences PhD) worked on the relationship between faulting and volcanism in southeastern Oregon where the Basin and Range joins the High Lava Plains. Kaleb now has a term teaching appointment at Central Washington University. Jeremiah Oxford (MS) worked on alkaline volcanic rocks in the forearc of the Cascades and is furthering his experience in the geochronology lab at OSU. Cris Darr completed her MS on the origin of dacites at Mount Hood. Students active in the VIPER group are Rob Lee, Mark Ford, B.J. Walker, Allison Weinsteiger, Chris Harpel, Morgan Salisbury and Bob Peckno in the PhD program and Denise Giles, Abi Stephens, Mike Iademarco, and Ashley Hatfield in the MS program. Emelda Zuschlag, Circe Verba, Sarah Baxter, Jenn Cash and Travis Jones have undergraduate VIPER projects. New VIPERs Manggon Abbot (from Malaysia) and family, Erin Lieuallen, Nancy McCann, and Alison Koleszar joined the graduate program this Fall.

Despite our acronym (thanks to Denise Giles), VIPERs are friendly. To meet a VIPER, come to the Beanery around 10 a.m. and you’ll likely find a few.

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The Yeats Chair:
“Thanks to all who made it possible”
Bob Yeats

A couple of years ago, several of you teamed with faculty members Andrew Meigs, Roger Nielsen, John Dilles and others to propose an endowed professorship in my name. Earlier this year, Andrew sent me an email stating that enough money had been pledged and contributed to make the Yeats chair a reality.

The committee organized social events at Houston, Denver, and Newport and invited my former students at OSU and Ohio University who had put up with my unreasonable demands on their thesis research (“Yeats will haunt you until you finish”), including the dreaded Yeats red pen. For me, the best part of these social occasions was reconnecting with people, some after many decades, and learning that you forgave me for being so hard on you. You are contributing to the world in so many ways, some in quite unexpected directions.

I am humbled and overwhelmed by this gesture. I have been privileged that engaging and talented people have agreed to work with me on interesting geological problems, and it has been great fun. Many of your theses have been published and are still widely cited in the international literature. The contributions you have made to science would fill several pages; I mainly watched it happen. If the Yeats group had some measure of success, it was due to your creativity and hard work, which were a continued inspiration to me.

I owe thanks to Dean Sherm Bloomer and Roger Nielsen, who spoke at all the social events, to Maya Abel and Anne Ruggiero of the OSU Foundation, to Ken Barrow and Ken Yeats for making their homes available for social events, to Gary Blackie for contacting my former students from Ohio University, to Ellen James Moore for requesting that memorials to George be made in support of the Yeats chair, and to the Geosciences Board of Advisors for continued encouragement and support.

Although the goal of the Yeats chair is to add to the Department’s strengths in earthquake geology, in a real sense, it will be a recognition of the faculty’s continued focus on first principles of geology, including the field course. These principles are the source of the Department’s strength, established long before I showed up. My hope is that the chair-holder
will assume responsibility for my scientific methods course, GEO 516, Interpretation of Geologic Maps, which I am still offering.

We can’t recruit until those pledges materialize as dollars in the bank, but we anticipate that this should happen sometime next year. As soon as all the money has been raised, we are off and recruiting. Again, I am grateful to all of you. I ask only one thing: please keep in touch.

George W. Moore, 1928-2007

George Moore, courtesy professor of geology at OSU, died October 4 in a car crash on his way home from delivering the Condon lecturer to the Eugene airport. He and his wife, Ellen, a paleontologist specializing in Tertiary mollusks of California, Oregon, and Washington, had been part of the Department of Geosciences since their retirement from the USGS in 1987. George had produced the Geosciences newsletter for several years, and was actively engaged in this one at the time of his death.

After receiving his PhD from Yale in 1960, George became active in mapping Alaska, and he was the first person from the Lower 48 states to hike across Kodiak Island as part of his mapping. He directed a lab in marine geology at San Diego and thereby participated fully in the plate tectonics revolution that was taking place at that time. In addition to introducing Oregonians to the geology of Alaska, one of the important new ideas he brought to Corvallis was the concept of tectonostratigraphic terranes, about which he taught a graduate class.

George was curious about many things, and early in his career, he became interested in caves. His travels to caves around the world led to his becoming president of the National Speleological Society in 1963, and his writing a book with Nicholas Sullivan: Speleology: Caves and the Environment, published in 1997. He also worked on the Arctic Panel of the Circum-Pacific Map Project, serving as chair of the panel while at OSU, from 1989 to 2005. These maps will serve as a basis for future political discussions as Arctic nations debate the sovereignty of the Arctic Ocean floor based on the location of continental shelves.

Many pleasant evenings were spent sampling Oregon wines from the Moore wine cellar, but George’s interest extended well beyond that of most people. He was interested in how wine is influenced by the soils and bedrock geology of the terroirs where Oregon vines are planted. This interest has led to a book, Oregon’s Phenomenal Wine: the Subsoil Geology, which will soon be published by the OSU Press.

George took minutes at faculty meetings for most of his time in Corvallis. In addition, he was responsible for the famous Condon lecture series, which brought earth scientists of worldwide renown to Corvallis to present a lecture to the general public in honor of Oregon’s first geologist, Thomas Condon. Many students were touched by George’s encyclopedic knowledge of geology, and many faculty members benefited from his superb editing skills.

Ellen Moore has requested that contributions in George’s memory be made to the Robert S. Yeats endowed professorship, discussed elsewhere in this newsletter. Contributions in George’s name may be mailed to the OSU Foundation, 850 SW 35th, Corvallis, OR 97333, or made online at osufoundation.org and clicking “other amount-other designation.”

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Lieuallen, Athena Erin, Geology BS 07
Loree, Kraig Michael, Geography BS 06
Awards to Geoscience students 2006-7

UNDERGRADUATE AWARDS

Amanda Prewitt Award. Geoscience female sophomore or junior who has shown an enthusiasm for a career in the earth sciences: Jennifer Cash

Jess Johnson Student Writing Award. Geology undergraduate who has demonstrated excellence in the classroom and an aptitude for writing: Della Fawcett

Samuel M Evans Jr Memorial Award. Geology sophomore demonstrating excellence of scholarship and professional motivation: Jennifer Cunningham

Earl L Packard Achievement Award. Geology junior who is scholarly and professionally motivated: Breanne Craig

Award for Excellence in Geology. Outstanding graduating senior in geology: Logan Mitchell, Athena Erin Lieuallen

Christian John Hunt Award. Geography undergraduate: Don Derrick, Brendan Soule, Trevor Taggart, Daniel Warren

Richard Chambers Award. Support for an undergraduate research project in Geology or Earth Science: Sarah Baxter, Ajeet Johnson

GRADUATE AWARDS

Lance Forsythe Memorial Fellowship. Graduate student from Geology, Geography, or Marine Geology exhibiting breadth and independence of thought: Jennifer Woody

Arthur Parenzin Fellowship. Assistance to graduate students for preparing their research for publication or presentation at professional meetings: Brett Lord-Castillo

Jess Johnson Student Writing Award. Geology graduate student who has demonstrated excellence in the classroom and an aptitude for writing: Faron Anslow

Sharp Fellowship. Graduate student in structural geology or sedimentary geology: David Trench

Keith Muckelston Fellowship in Water Resources. Outstanding student in water resources: Krystal Fesler, Nate Eidem

John Pine Award Support to students going to their first professional meeting, preferably older than average students: Wiley Thompson

Outstanding Graduate Teaching Assistant Award - Geology. Barry Walker

Outstanding Graduate Teaching Assistant Award - Geography. Biniam Iyob

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