During the past year we have been lobbying at the federal, state, and university levels to expand earthquake monitoring in Oregon and establish a West Coast Earthquake Early Warning system. Department of Geological Sciences faculty have had strong support from US Congressman Peter DeFazio, Oregon State Representative Nancy Nathanson, staff of Governor Kitzhaber, the UO administration, and UO federal and state lobbyists (Betsy Boyd, Hans Bernard, and Nate Stice). In June 2014, Doug Toomey testified before the US House of Representatives Committee on Natural Resources, subcommittee on Energy and Mineral Resources. The oversight hearing was entitled “Whole Lotta Shakin’: An Examination of America’s Earthquake Early Warning System Development and Implementation.” What follows is a slightly modified version of the oral testimony.

A magnitude 9 (M9) earthquake and tsunami comparable to those that occurred in Alaska in 1964, Sumatra in 2004, Chile in 2010, and Japan in 2011, has, and will again, hit the Pacific Northwest. The source of this devastating earthquake will be the Cascadia Subduction Zone, which lies beneath the coastal areas of Northern California, Oregon, and Washington. It has been more than 300 years since the last great earthquake and tsunami along the subduction zone, and we’re now in the window for its recurrence. We know that enough energy has built up as strain in the rocks around the fault to generate a devastating magnitude 9 earthquake.

The Pacific Northwest is not prepared for a catastrophe of this scale. FEMA estimates that direct financial losses would be $60 billion, and the Insurance Bureau of Canada expects losses of $75 billion in Canada. Because the Cascadia fault zone lies offshore, we do not understand it as well as onshore faults. However, several ongoing initiatives and monitoring efforts—including the NSF-supported Cascadia and Ocean Observatories Initiatives and the USGS-supported Advanced National Seismic System—are laying a solid foundation to help mitigate the seismic hazards of the next great earthquake in this region. As laudable as these efforts are, they fall well short of providing society with real-time warnings to take emergency action. Only a West Coast Earthquake Early Warning system can provide advance warnings that will save lives, protect businesses, and improve recovery for local communities, the federal government, and the economy as a whole.

An Earthquake Early Warning system is well suited for the impending magnitude 9 earthquake on the Pacific Northwest Coast because the most powerful earthquakes in this region occur along the Cascadia Subduction Zone offshore, not directly beneath major metropolitan areas. Given the immense length of this fault, if it were to begin rupturing in the south—as research indicates—Portland could receive a warning as much as three minutes—and Seattle, as much as five minutes—prior to the earthquake hitting. Even in Eugene, our...
Greetings From the Department Head

Becky Dorsey and Alan Rempel spend another exciting year in the department hot seat

Over the past year our faculty and graduate students carried out innovative research on a wide range of topics, traveling around the world for field work, conferences and workshops. We published about 70 peer-reviewed papers in leading international journals, a testament to the incredible quality and hard work of our faculty and graduate students. Dave Blackwell won a prestigious University teaching award, Ray Weldon led a group of students and faculty members on an incredible geology field trip to Kyrgyzstan, Paul Wallace led the department toward a new cluster of excellence in volcanology, and Doug Toomey testified before the U.S. House of Representatives Committee on Natural Resources to explain the need for an Earthquake Early Warning system in Oregon. (For more details, see stories inside this newsletter.) I am deeply grateful to Alan Rempel, who continues to serve with great skill and good humor as Associate Head.

I’m delighted to welcome Sandy Thoms, our new graduate coordinator and office specialist! While we miss Shari Douglass who retired in the spring, we are very lucky to have Sandy on the team. Sandy joined us from the UO Department of Global and Online Education, and brings a lot of talent and a big smile to the position. She is an outdoor enthusiast and loves rocks. Her father is a retired professor of paleontology, and her husband Bryn works as a hydrogeologist for the Oregon Department of the Environment, so geology runs in the family. Welcome aboard, Sandy!

Thank You for your generous donations

This year the Emeritus Faculty Fund provided substantial support to all UO undergraduate students who attended our summer Geology Field Camp, including special merit awards to Kyle Haggart, Brian Meyers, and Anthony Miller. The James C. & Mary Douglas Stovall Award for excellence in undergraduate research was shared by Eva Biedron, Brooklyn Gose, and Logan Wetherell. The newly created NW Energy Association / AAPG Scholarship was awarded to Beth Morter, Christen Peery, and Noah Simonson. The new Walter Youngquist Scholarship for achievement in undergraduate research was awarded to Jered Hogansen and Amber Tucker. Awards for excellence in graduate student research went to graduate students Win McLaughlin, Ashley Streig, Kristin Sweeney, and Kristina Walowski. The Baldwin Fund supported research in geomorphology, environmental geology, and paleontology by Scott Maguffin, Win McLaughlin, and Kristin Sweeney. The Condon Scholarship Fund supported paleontology research by Meaghan Emery and Nick Famoso. The Johnston Fund supported geophysics research by Gillean Arnoux, Miles Bodmer, Al Handwerger, Julia Irizarry, and Brandon Vanderbeek. The Jay M. McMurray Fund supported summer research activities and travel for special workshops in volcanology, petrology, and geophysics by Ellen Aster, Dillon Colon, Randy Krogstad, Madison Meyers, and Kristina Walowski. The Staples Fund supported 29 undergraduate and graduate students to attend a remarkable field trip to Kyrgyzstan led by Ray Weldon (see story inside). Finally, contributions to the general Geology Department Fund support undergraduate student field trips, graduate student attendance at professional meetings and workshops, and our weekly department seminar series of distinguished speakers.

Honor Roll of Donors

We’d like to offer special thanks to our Kimberlite class of donors, who have contributed $100 or more to our department during the past year: Burton Anderson ’57, Jane and Murray Anderson ’85, Kimberly ’83 and Patrick Anderson ’81, Evelyn ’64 and John Armentrout ’64, Phoebe Atwood ’45, Melanie ’61 and Calvin Barnes ’78, Matthew Beachly ’11, Betty ’68 and Theodore Bezzerides ’63, Louis Bortz, Box Family Revocable Trust, Laura and William Box Jr. ’67, Hilda and Herbert Bradshaw ’64, Tom Brkowiski ’82, Martha ’99 and Daniel Bullock, Shirley ’79 and John Byrne, Daria and Christopher Cappucci ’95, Claire Carter ’64, Ann Staley and James Cloyd ’68, Ann and David Cordero ’70, Federica ’82 and Arthur Curby, Michael Darin ’11, Timothy Dawson ’94, Roberta ’72 and Roger Dickinson ’70, Donald L. Hicks Revoc Living Trust, Rheta ’69 and Alan Edwards ’69, Judy Ehlen ’66, Sally ’69 and Thomas Fouch ’68, Wynn and William Gandera ’73, Martha Godchaux ’69 and Bill Bonnicheen, Cora ’55 and Edward Goffard ’49, Holly Graham ’87, Ann and Arthur Green ’62, Faith and Gerald Haddock ’67, Karen Artiaco and John Hart Jr. ’75, Sharon and Paul Hess ’65, Carole Hickman ’86, Delia and Donald Hicks ’62, Karen and Frank Hladky ’82, John Jordan ’74, Dorothy ’69 and M. Allan Kays, Patricia and John Kerns ’52, Hai ’88 and Chong Kms ’68, Carol and Wallace Kleck ’60, Michele and Curtis Koger, Helen Lang ’83, Ellen ’80 and James Leavitt ’80, Shirley and Robert Lent ’64, Sandra Lilligren ’70, Leslie Magoon Ill ’64, June ’70 and Norman McAtee, Jean ’74 and David McClain ’74, Andrew Mead ’00, Edward Merewether ’51, Gail ’68 and Gregory Miles ’77, Brooke Miller ’04, Robert Murray ’82, Jack Napper ’52, Eric Nelson, Danielle Nye, Terry ’67 and Peter Osborne, James Palaendri ’87, Peter Pomeroy ’67, Jacqueline ’65 and Alan Ramey ’65, Shirley Rawson ’84, Patricia Red ’87 and Paul Hunt ’85, Sherry and John Redmond ’66, Margaret Reed ’84, Karen and Mark Reed, Beth ’99 and Brian Rusk ’03, Carole and William Schetter ’62, Rebecca and Scott Sloan ’84, Karen ’86 and Eric: Sonnenthal ’90, Jason Spiller ’58, Elizabeth Stearns, L. Evelyn and Richard Stewart ’65, Sally ’58 and George Thomas ’56, Nora and Marcus Traut ’75, James Tyburczy ’83, Margaret Vanderbeek ’61, Bonnie and Jack West ’56, Karen and Robert Williams ’84.

Geological Sciences Selected as a Priority for “Cluster of Excellence” Hires by Paul Wallace

The Department of Geological Sciences has been among the top volcanology research programs since the 1960s, when the UO first assembled an internationally prominent research group under the guidance of Professor Alexander McBirney and established the program in the Volcanology building. Our prominence in this area has continued to grow as a result of two decades of innovative research by faculty members including Kathy Cashman (now at the University of Bristol), Ilya Bindeman, Emilie Hooft, Dana Johnston, Mark Reed, Jim Watkins, and many graduate and undergraduate students.

In Spring 2014, the UO embarked on an ambitious new plan of growth that will focus resources in a select group of “clusters of excellence,” to be built around existing areas of strength. Our department’s proposal for a volcanology cluster, titled “Securing National Prominence in Volcanology, Volcanic Hazards, and Geothermal Energy” was one of 10 selected for priority in the quest for donor support of new faculty hires by the university. The UO is seeking support for this and other selected initiatives through the new capital campaign. With several focused hires, our department could become the top academic center for the study of volcanoes in the US and one of a few top programs worldwide. As one of only five states in the US with active volcanism, Oregon is an obvious location for a national center for research in this area.

Volcanic eruptions are spectacular manifestations of a dynamic earth. With rapidly growing populations worldwide, more people and infrastructure are at risk from volcanoes, particularly in developing nations and Pacific Rim countries. Our goal is to build on our current strengths in volcanology, petrology, geochemistry, and seismology to create a world-class center focused on active volcanic processes and hazards. This is an exciting time in volcanological research because the inherently interdisciplinary nature of the field, rapidly evolving new technologies, advances in computer modeling, and emerging ability to handle very large datasets ensure that dramatic scientific advances are on the horizon. In the upcoming decades we will likely be able to make accurate, intermediate-term (hours to weeks) eruption predictions, thereby greatly mitigating volcanic hazards. At the same time, volcanic systems also have the potential to be a source of renewable geothermal energy to help sustain our nation’s evolving energy needs, and our plan thus includes a focus on energy resources as well.

We have identified five research fields that we believe will be at the forefront of exciting new discoveries in volcanology over the next several decades. These include physical volcanology, volcano geodesy and remote sensing, computational modeling of eruption processes, geothermal energy resources, and radiogenic isotope geochemistry. We are currently running a faculty search that encompasses the first three of these targeted research areas. Our proposal to the university would fund as many as four additional new faculty positions.

Our volcanology cluster would expand the UO’s national and international visibility in the earth sciences and natural hazards research, and would enhance opportunities to partner with the USGS Volcano Hazards Program. We hope that it will also increase our involvement with scientists and non-governmental organizations in developing nations, particularly around the Pacific Rim. In addition, our initiative will be integrated with expansion of the Pacific Northwest Seismic Network (PNSN). The expanded PNSN and associated geodetic networks will provide new opportunities for research and for leveraging of funds for studies of Cascade volcanoes.
Research success in the department is illustrated by continued success with external funding awards. Thirty grants totaling about $8 million are currently active, and include:

- Ilya Bindeman (NSF) “Career: Stable Isotope Insights into Large Volume Volcanic Eruptions”
- 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) “PICASSO: Program To Investigate Convective Alboran Sea System Overtum”
- Mark Reed (DOE) “Maximizing Rare Earth Element Recovery in Geothermal Systems”
- Alan Rempel (NSF) “Slow Slip at Elevated Pore Pressures on Brittle Faults in a Compliant Subduction Channel”
- Josh Roering (NSF) “Clarifying the Ingredients and Significance of Nonlocal versus Local Sediment Transport on Steepland Hillslopes”
- Dave Sutherland (NSF) “Spawning During Storms and the Subsequent Dispersal and Settlement of Coastal Invertebrate Larvae”
- Alan Rempel (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) “Ca-Mg Probe of Transport Processes in High Temperature Geochemical Systems”
- Ray Weldon (NSF/SC/EC) “Modeling Slip per Event on the San Andreas Fault from Fold Deformation Across A Step-Over at the Frazier Mountain Site”

Faculty News

Samantha Hopkins

Associate Professor Samantha Hopkins continues her research on conservation paleobiology. An understanding of how extinct organisms responded to changes in climate and in the environment helps illuminate processes expected to drive future responses to human-mediated environmental change. Fieldwork in eastern and central Oregon has led to description of new fossil finds that are filling gaps in Oregon’s fossil record. With Oregon’s remarkably complete and continuous record, Hopkins is beginning to assemble a picture of ecological change over almost 40 million years. Oregon’s history of climatic changes, floral change, and tectonic activity provide natural experiments with which to understand these changes. Preliminary studies by Hopkins and collaborators Edward Davis and Joshua Samuels are finding evidence that responses to environmental change differ significantly between large and small mammals. Thus, small mammals are much more sensitive indicators of local ecological change, and their fossil record may be critical for recognizing the signs of human impact on living ecosystems. Through collaborations with Jessica Theodor (University of Calgary) and former UO graduate student Jonathan Calede, the research now includes comparison of the Oregon record to other records of the same time interval in Alberta and Montana. These comparisons will allow a deeper understanding of the biogeographic context of mammalian evolution in the Cenozoic of Oregon.

Gene Humphreys

Professor Gene Humphreys is wrapping up a major research project in the western Mediterranean region where he worked with a team of graduate students, technicians, international collaborators, and UO postdoc Max Bezada who recently joined the faculty at the University of Minnesota. The study sought to explain a peculiar subduction zone in the Alboran Sea whose location and geometry defy plate tectonic models; and understand enigmatic uplift of the Atlas Mountains in Morocco. The group deployed about 200 seismometers across southern Spain and Morocco, and used the data to create toomorphic images of the solid earth to depths of 800 km. From these results, Humphreys and his team infer that the Gibraltar subduction zone “rolled back” from east to west through time, extending the Alboran Sea in its wake, while uplift of the Atlas Mountains resulted from delamination of mantle lithosphere beneath northern Morocco.

Marli Miller

Senior Instructor Marli Miller recently completed her book Roadside Geology of Oregon, published by Mountain Press (Missoula) in full color and now widely available. This was a four-year project that took her to all parts of the state. The book was enriched with expert information and input from many of her colleagues here at the UO, as well as OSU, Portland State, USGS, and the University of Washington. Besides road guides and over 50 geologic maps, the book features color cross sections, conceptual diagrams, and many aerial photos that Marli took from small planes. This book truly invites you to “hit the road!”

In addition to her book, Marli helped the Museum of Natural and Cultural History create the exhibit “Roadtrip! The Roadside Geology of Oregon,” which will be on display until June 2015. In Fall 2014, Marli taught her popular course Geology of National Parks and her special 1-credit seminar Geophotography. She also gave well-attended “Science Pub” lectures in Eugene and Portland, and was honored at a Dean’s reception along with other book authors in the College of Arts and Sciences.
2014 Staples Field Trip to Kyrgyzstan

In late Summer of 2014, 29 undergraduate and graduate students and five faculty members spent two weeks exploring the geology and active tectonics of the Tien Shan (“Heavenly Mountains”) in Kyrgyzstan. Students’ costs were paid largely by the Lloyd Staples Scholarship Fund, which subsidizes a major Department field trip every three to four years. The Tien Shan is the second highest mountain range in the world and absorbs about half of the ongoing collision between India and Eurasia. This range is remarkable because it formed thousands of kilometers from the plate boundary and is a spectacular example of basement-involved uplift and orogenesis. From glaciated valleys in high alpine ranges to deserts in deep intermontane basins, one can see geology and tectonic deformation in action at rates and scales as great as anywhere else on Earth.

The trip was led by Ray Weldon—who has been doing research in Kyrgyzstan since 1994—with help from his Kyrgyz collaborator Kanatbek Abdrakhmatov, and Samantha Hopkins, who recently started studying the vertebrate paleontology of the region. During spring term, students took a seminar course to learn about the geology of the Tien Shan and prepare for the trip. Each student chose a topic with Ray’s approval, researched that subject, and created a poster about their topic that they presented to the rest of the group at various stops during the trip.

Ray and his Kyrgyz collaborators met the group in the capital city, Bishkek, and whisked them away to a beautiful beach-front resort on Lake Issyk-Kul. A mile high, more than 100 miles long, up to 2000 feet deep, and surrounded by mountains up to three miles high, Lake Issyk-Kul is the 10th largest lake in the world (by volume). Day trips were taken along the lake shoreline and into the surrounding mountains while people acclimated to the time and elevation change.

The group was treated to a guided tour of the Kumtor gold mine at an elevation of over 13,000 feet in the Terskey Range. The huge open-pit mine, excavated at the toe of an active glacier and surrounded by peaks up to 17,000 feet high, is both a remarkable and appalling example of large scale economic geology and related environmental risks. Kumtor produces about 15 percent of the Kyrgyz GDP, and the mine has generated huge piles of heavy metal- and sulfur-rich tailings and cyanide ponds at the headwaters of the Naryn River which flows across Central Asia. The scientific and environmental issues of this site generated days of lively discussion.

After the first four days, the group traveled around the country to view active fault zones and spectacular stratigraphic sections while camping in the high ranges of the Kyrgyz Tien Shan. Highlights included the Chon Kemin surface rupture created by the 1911 M8 earthquake, fossil rhino bones preserved in eight million year old deposits in Kochkor Valley, inversion of the Naryn At-Bashi basin to reveal a Neogene section over five kilometers thick, and some of the most spectacular active thrust faults in the world. We saw many fluvial terraces that have been uplifted and offset across active thrust faults, and took a half day off to see Naryn, the “most Kyrgyz city” in the Tien Shan. The trip culminated with a breath-taking drive back across the country and down the front of the Kyrgyz Range, and ended with a day of site seeing in the historic capital city of Bishkek.

Students learned much more than just world-class geology on this trip. None of the students had been to Central Asia, and some had never even left the US. The trip gave all participants a chance to experience a very different culture, and everyone was impressed by how kind and friendly the Kyrgyz people were to them. We learned that an Islamic country whose name ends in “stan” is not necessarily populated by radicals who hate America. After the end of the two-week trip, seven students stayed in Kyrgyzstan to help PhD student Win McLaughlin collect fossils for her research, and nine others traveled to various destinations around Turkey. The Staples trip to Kyrgyzstan was an amazing educational and cultural experience for everyone.

continued on page 6
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David Sutherland and graduate student Molly O’Neill finished a study examining the oceanography and dissolved oxygen variability in Coos Bay, a small southern Oregon estuary. Although dead zones (areas of low oxygen) are increasing on the Oregon shelf, O’Neill and Sutherland found no evidence of these encroaching into the estuary.

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Faculty News Briefs continued from page 5

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**Dave Blackwell Receives UO Teaching Award**

Senior Instructor Dave Blackwell was honored in Spring, 2014, with the Thomas F. Herman Faculty Achievement Award for Distinguished Teaching. The Herman Award is presented to faculty members who have demonstrated long-standing excellence in teaching at the UO, and have contributed significantly to student learning at the undergraduate or graduate level. Dave received this award for his inspiring record of teaching, student mentorship, leadership of the Geology Club and student chapter of the AAPG, and annual field trips to the Colorado Plateau. Congratulations Dave!

**AAPG Student Chapter**

The Willamette Valley Student Chapter of the American Association of Petroleum Geologists (AAPG) was established in May of 2014 with 13 initial members, and has since grown to 22 members. The chapter was inspired by John Armentrout’s enthusiastic teaching of Petroleum Geology in Winter Term 2014, and is sponsored by the Northwest Energy Association in Portland. The Chapter holds monthly meetings with guest speakers, and aims to run at least one field trip per term. The Spring 2014 excursion was a three-day field trip to the southern Oregon Coast and Redwoods, and this Fall the group traveled to the Cape Arago area. The chapter is planning to attend the AAPG Pacific Section meeting in Oxnard, CA, in Spring term 2015.

**Walter Youngquist Scholarship**

A new scholarship, the Walter Youngquist Scholarship Endowment for Geology, was created in Spring 2014 to support mentored research in geology by outstanding undergraduate students, thanks to the dedicated work of John Armentrout ('64) and generous donations of many department friends and alumni. The scholarship was established in honor of former UO professor Walter Youngquist who taught Petroleum Geology and Paleontology in the department during the 1950s and ‘60s. Youngquist is widely admired by his former students, who have had a remarkable string of successful careers in the petroleum industry, academia, and public sector. The first scholarships were awarded to Amber Tucker and Jered Hogansen in Spring 2014.

**Geology Club**

The UO Geology Club had another active year under the guidance of faculty mentor Dave Blackwell. Membership continues to grow, and weekly meetings are packed. Club activities include a variety of field trips and outreach activities. Twenty-five students did two- or three-day backpacking trips on last year’s trip to Zion National Park. They got a little sun, rain, hail, and snow, but all had a good time. Logan Wetherell led a climbing trip up the Umpqua drainage in the Western Cascades, and twenty students attended the overnight yurt trip to Beverly Beach near Newport. The Club takes pride in their ongoing outreach and educational activities in the local school districts. They recently completed a school-wide presentation at Centennial Elementary School, and are scheduling high school activities with Northwest Youth Corp. The Club also hosted their first Silent Auction Fundraiser, and sold thunder eggs at the local Picc-A-Dilly Flea Market.

**Graduate Degrees 2014**

- **Jiangzhi Chen** (PhD) — “Evolution of Fault Strength from Microscopic Asperity Scale to Macroscopic Fault Zone Scale”
- **Hannah Dietterich** (PhD) — “Remote Sensing, Morphologic Analysis, and Analogue Modeling of Lava Channel Networks in Hawaii”
- **Benjamin Heath** (MS) — “Seismic Imaging of Newberry Volcano”
- **Mindy Homan** (MS) — “Sedimentology and Stratigraphy of the Miocene-Pliocene Bouse Formation near Cibola, Arizona, and Milpitas Wash, California; Implications for the Early Evolution of the Colorado River”
- **Molly O’Neill** (MS) — “Seasonal Hydrography and Hypoxia in Coos Bay, Oregon”
- **George Roth** (MS) — “Monitoring Fjord Circulation Using Iceberg-Mounted GPS as Real-Time Drifters”
- **Ryan Seward** (MS) — “Geothermal Fluid Equilibrium Modeling: Comparison of Wellhead Fluid Samples to Deep Samples in the Reykjanes System, Iceland”
- **Ashley Streig** (PhD) — “High Resolution Timing and Style of Coseismic Deformation: Paleoseismic Studies on the Northern and Southern San Andreas Fault”
schools, businesses, and hospitals could be warned as much as two minutes before the severe shaking starts. This is enough time to evacuate many schools and businesses that would collapse in a magnitude 9 event. Because many structures in Oregon were built prior to current standards for seismic stability, it is imperative that the Pacific Northwest operate an Earthquake Early Warning system so our schools and public buildings can be safely evacuated.

An onshore Earthquake Early Warning system is entirely possible with the technology and scientific knowledge at hand. The University of Oregon already participates in the Pacific Northwest Seismic Network, a cooperative operated by the University of Washington and the University of Oregon; it monitors earthquake and volcanic activity in the Pacific Northwest. The only thing missing is the funding needed to develop this much-needed early warning system.

**Offshore Earthquake and Tsunami Early Warning**

Studies in the wake of recent magnitude 9 earthquakes in Japan and Chile show increasing evidence that subduction zones like Cascadia shimmy—sometimes for days or even weeks—before they shake. To investigate this, scientists are deploying ocean bottom seismometers directly above subduction zone faults. The NSF-supported Cascadia Initiative has deployed hundreds of seismometers along the coast of the Pacific Northwest. This $30 million project, led by geophysics professors Doug Toomey and Emilie Hooft and senior instructor of physics Dean Livelybrooks, features the largest array of onshore-offshore earthquake-measuring instruments in US history. This amphibious experiment uses seismic and geodetic instruments to study the mechanics of megathrust earthquakes, structure of the volcanic arc, and the formation, deformation, and hydration of the Juan De Fuca and Gorda oceanic plates. The seafloor seismometers of the Cascadia Initiative form the potential backbone of an offshore Earthquake Early Warning system, but the current method of retrieving data—which is done by ship, only once per year—is impractical for that purpose. If seafloor cables were attached to the seismometers, they could provide real-time, near-field monitoring of the Cascadia Subduction Zone.

By altering the function of instruments that are already in place on the ocean floor, we can transform our ability to monitor Cascadia. Cabled ocean-bottom seismometers can increase the warning time and make earthquake and tsunami warnings more accurate. Cabled ocean bottom seismometers will also accelerate discovery by allowing scientists to better monitor the creaks and groans that occur prior to catastrophic failure. The NSF-funded Ocean Observatories Initiative is currently installing a modest-sized seafloor observatory in the Pacific Northwest to record such events. Toomey and his colleagues are working to get the support needed to transform the offshore seismic network into a world-class offshore Earthquake Early Warning system.