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The Geological Society of the Oregon Country

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VISITORS WELCOME AT ALL MEETINGS

CALENDAR

JULY/AUGUST ACTIVITIES

There will not be Friday night talks in July or August for 2011. Have a nice summer and attend one of our field trips!

GSOC Annual Picnic

The GSOC Annual Picnic will be held on Sunday, July 17, 2011. This year's picnic will be a total potluck event at the picnic area atop Larch Mountain in the Columbia River Gorge. Bring your own food and beverages and we will provide the plates and plastic utensils. It also wouldn't hurt to bring your own chairs and perhaps a card table if you have one, as the available picnic tables are scattered. The picnic will begin at 12:00 noon and there will be a brief GSOC board meeting before the

picnic at 11:00 a.m. Plan an hour's driving time from Portland.

For information about the picnic site see the [Larch Mountain picnic area](#) page on the Forest Service website. You will need a \$5 day-use permit or a FS recreation pass to park there. Day-use permits may not be available on site according to our information. For more information on Forest Service recreation passes (and alternatives) see the FS Region 6 [Recreation Passes & Permits page](#). To purchase a day-use permit or FS recreation pass online or through a Forest Service outlet see [Discover Your Northwest Store](#) and [Store Locations](#). They are also available from some commercial establishments such as REI and Big Five. They are not available at the Nature of the Northwest store anymore. In the event that Larch Mountain remains closed due to prolonged snowpack we will announce an alternate location on the [GSOC website](#). However, at this point the Forest Service believes that the road will be open before our picnic date. Check to the GSOC website the

day before the picnic for final confirmation of the location, or call another member who has done so.

The directions to Larch Mountain on the website are really lousy, so here are some better directions courtesy Dave Olcott:

Traveling east on I-84 from the Portland area, take Exit 22 (Corbett). Travel 1.6 miles up Corbett Hill Road to the intersection with the Historic Columbia River Highway - turn left onto the old highway. Travel approximately 2 miles to Larch Mt. Road (go straight). If you go left at this point you will end up at the Vista House. Proceed 14 miles up Larch Mt. Road to the upper parking lot.

For more geology info on Larch Mountain refer to the [USGS](#) and [Wikipedia](#) sites. This should be an outstanding site for a picnic.

Ancient Walls: A Geological Walking Tour of Downtown Portland

Come see billion-year-old building stones and the fossils hidden under our feet. Join us Saturday, August 6th at 9:00 a.m. at Pioneer Place Mall in the food court in front of Paradise Bakery (700 SW 5th Avenue — parking at 4th and Yamhill — accessible by bus and MAX) for a two-and-a-half-hour outdoor walking tour of downtown Portland's geological mysteries and oddities. Bring good walking shoes, water, sunscreen and clothing for a cool, but possibly rapidly warming summer morning. Snacks are also advisable, although the trip will end at a lunch stop. Bring your own loupe if you have one. The trip is open to the public. Children under 12 must be supervised by their parents. Cost is \$5.00. Please RSVP to Clay Kelleher clayr2236kher@comcast.net by July 29.

2011 GSOC President's Field Trip: "Aggradation near Mt. Rainier"

August 11-14, GSOC President Rik Smoody is planning the GSOC President's Field Trip, with the theme of aggradation processes near Mt. Rainier. Aggradation is the process by which streams deposit material. This will be a car-caravan and camping trip which will include some stops in Mt. Rainier National Park.

The trip registration form and itinerary are located at the back of this newsletter. Rik has also put together some info on camping, lodging, and dining FYI:

Camping & Lodging: Smoody's have reserved site #8 for August 11, 12, & 13 at [Big Creek Campground](#), a USFS campground only a couple of miles from the Nisqually

entrance to the park, not even as far as Ashford. It's in a forest. RV or tent. All spots are within easy walk of each other. There are picnic tables and fire rings.

Other campgrounds, B&Bs and motels are available in the area. Without staying in any of them, Rik made note of several, and later found that Google maps knows of each one. The Cougar Creek and Ohanapecosh campgrounds within the Park have smaller spaces and more restrictions. Trip Advisor site has pages on [Mt. Rainier attractions and lodging](#). Call Rik or Carol Hasenberg (503/522-4249) if you have questions about other camping or lodging.

Some Dining ideas:

- Wild Berry Restaurant, just outside the park on the Leg A (Star Route 706). Sherpa-operated, tasty, \$8-13
- Paradise Inn: beautiful setting. Meals upwards of \$20

Several plausible restaurants are in Ashford.

- Train car restaurant in Elbe, 8mi W of Ashford. Venison and other uncommon burgers for \$13.
- Smaller burger joint across the road from the train cars. ~\$6
- Enumclaw has a full selection of fast food and others for Sunday on the way out

NOTE: You must be a GSOC member or guest of a member to attend this GSOC field trip. You may join GSOC at any time, for \$25.

FUTURE ACTIVITIES

Friday evening talk, September 9, 2011, at 7:30 p.m., in Room S17, Cramer Hall, 1721 SW Broadway Ave. (between Montgomery and Mill Sts.), Portland State University. Speaker Douglas W. Larson, limnologist and writer living in Portland, will present "Saving Lake Abert".

For more information about Larson's life and work on Lake Abert and other lake ecology studies, see [Oregonlive.com](#) article from February 2011, [Craterlakeinstitute.com](#), [Craterlakeinstitute.com](#) and [Americanscientist.org](#) articles. Also see the December 2007 issue of *The Geological Newsletter* for "Doug Larson Gives GSOC a Tour Of Lake Origins," an article about a previous lecture to GSOC by Mr. Larson.

Join GSOC members at **Pizzicato Pizza, 1708 SW 6th Ave.**, at **6:00 p.m.** before the lecture for an informal dinner and conversation.

Free parking is available at Portland State University **Friday** nights after 5 p.m. in Parking Structure 2 on Broadway Ave. directly across from Cramer Hall and on level one of Parking Structure 1, bounded by Broadway and 6th Aves. and Harrison and Hall Streets.

Check the GSOC website (www.gsoc.org) for updates to the calendar.

UPCOMING ACTIVITIES FROM OTHER ORGANIZATIONS

OMSI Science Pub Portland

There are TWO Science Pubs in Portland -- one at the Bagdad Theater in Southeast, and one at Mission Theater in Northwest. Learn about cutting-edge topics in science and technology from leading researchers and scientists, all while enjoying food and drinks. Experience an informal atmosphere where you can interact with experts and where there are no silly questions. No scientific background is required; just bring your curiosity, sense of humor, and appetite for food, drinks, and knowledge!

The Big Bang and Beyond: A Beginner's Guide to the Universe

Monday, July 11, 2011 - 7:00pm

Portland - Bagdad Theater

What does the Universe look like and what is our place in it? How is it evolving and what did it look like in the distant past? What will it be like in the future? Join Willamette University physics chair and cosmologist [Dr. Rick Watkins](#) in an exploration of the Universe and its evolution.

Demon Fish: Travels Through the Hidden World of Sharks

Tuesday, July 26, 2011 - 7:00pm

Portland - Mission Theater

One week later than usual!

with [author Juliet Eilperin](#), the national environmental reporter for The Washington Post.

Epigenetics: The Merger of Nature and Nurture

Tuesday, August 16, 2011 - 7:00pm

Portland - Mission Theater

Can your genes learn by experience?

Every cell in your body has the same set of genes, but those genes do not work in every cell in the same way. For example, your tongue cells don't grow hair and the cells in your eye don't digest food. Your cells are programmed to modify genes based on their function in the body, and some of those modifications occur in response to the environment: genes that cause the production of pigment in your skin are activated when your skin is exposed to sunlight, and genes that caused your fingers and toes to develop before you were born are inactivated for the rest of your life.

It has been thought that only mutations in the DNA could be passed on to the next generation and that traits acquired during a parent's life are not passed to their offspring, e.g. weight lifters don't produce babies with big muscles. However, recent research suggests that some genetic changes that happen over a lifetime are heritable. That is, while it may be true that "you are what you eat," it may also be true that "you are what your mother ate."

Epigenetics is the study of genetic changes that are based on mechanisms other than changes in the underlying DNA and it is changing the way scientists look at disease risk and treatment. At this Science Pub, come find out about new discoveries in genetics and how they might affect you or your kids.

[Lisa Sardinia, PhD, JD](#), is associate professor of biology at Pacific University and associate director of the Pacific Institute for Ethics and Social Policy.

Check the OMSI Science Pub website for updates to the lectures. <http://www.oms.edu/sciencepubportland>

BOARD MEETING NOTES

June 11, 2011

The meeting was called to order by President Rik Smoody at the home of Carol Hasenberg. Board and GSOC members present also included Jane Walpole, Paul-Edison Lahm, Richard 'Bart' Bartels, Bev Vogt, Julia Lanning, Larry Purchase, Carol Hasenberg, Dave Olcott, and Jan Kem. The minutes of the April 9, 2011 board meeting and the minutes of the May 14, 2011 special board meeting were approved with the following corrections: the annual picnic will be held in July instead of a regular

meeting; and the Downtown PDX field trip will start at 9:00 am.

Treasurer's report: Treasurer's Report was approved.

Events

Friday night lectures: Jane has arranged to have Doug Larson speak on "Saving Lake Abert" in September. Scott Burns will speak in November. Other speakers with dates yet to be arranged include Charlene Montierth from Clark College, Richard Waite from CVO, and Rob McCaffery from PSU. A larger room may be needed for Drs. Waite and Burns. Bev suggested bringing the "chatterbox" microphone to address the problem of people in the back having trouble hearing.

Publicity and poster distribution: Board discussed more efficient and effective means of publicizing Friday night lectures.

Field Trips

Neogene Floods trip recap: Seven field guides from the trip remain. Dave's proposal to price them at \$35 each was approved (with that price to be discounted later at the next annual meeting). Dave will also establish a price for his own guide later.

Central Oregon Coast Trip. Bart reports that this field trip is full!

Downtown PDX field trip: Field trip price will be \$5 per person.

President's Field Trip. Rik will do a dry run this weekend and check out campsite availability and get info to Carol for newsletter. Carol will assist in looking for group campsites. Speakers may include Pat Pringle and a geologist from University of Washington.

Annual Picnic will be held July 17th at noon. Picnic is potluck, BYOB & BYOM. Julia and Ann will work to coordinate plates/utensils, etc. Our next board meeting will be held before the picnic at 11:00 a.m.

Old and New Business

Newsletter distribution and membership issues. Jan's suggestion to drop members who haven't paid their dues since 2009 from the mailing list was approved... Jan will forward the list of the twenty-two members who haven't paid for 2011 to Rik who will send them nice reminder emails... Friday night

speakers and tour speakers will automatically be granted a one year membership, so Bart will need to be provided with the speakers' addresses so he can collect this information. Jan also requests that any names of prospective members be sent to him, so that he can send them a free copy of the newsletter. (This also assists in reaching the 200 piece bulk mail requirement.)

Website/Internet committee: Rik continues to look for a wiki server that will have an appropriate privacy policy so that some information, such as officer's duties and a list of GSOC property, can be viewed by board members only. Rik has the password for members who want to post items of geological interest on the "GeoSociety Oregon" Facebook account. This would also allow any inappropriate Facebook comments to be monitored and deleted.

Sales items/mugs: GSOC will be getting some new mugs ordered soon with the GSOC logo on them.

Next board meeting will be held at the annual picnic, Sunday July 17th at 11:00 a.m.

Meeting adjourned.

Respectfully submitted,
Paul Edison-Lahm,, GSOC Secretary

RAISING A DAM FOR BARNEY RESERVOIR AND WASHINGTON COUNTY'S WATER SUPPLY

Synopsis of the May 13, 2011, lecture by Charlie Hammond, geologist, Cornforth Consultants
by Carol S. Hasenberg

Charlie Hammond, son of long-time GSOC member and PSU professor emeritus, Paul Hammond, is a respected geologist in his own right, and has been employed by Cornforth Consultants, a local geotechnical engineering firm, since the late 1980's. He spoke to GSOC this past May about an interesting local project he was involved with in the mid to late 1990's – the raising of the Eldon Mills Dam. This earthen dam impounds water in Barney Reservoir, which is one of the principal sources of water for Washington County's Joint Water Commission, which supplies water to the cities of Forest Grove, Hillsboro, and Beaverton.

The original earthen dam for Barney Reservoir was built over the summers of 1969 and 1970 and impounded 4000 acre-feet of water in the high point of the Coast Range on the North Fork of the Trask River. It is located several miles west of Hagg Lake and is a bit off the beaten track, as one must travel many miles on gravel roads to get there. The original dam was 72 feet high, had an earth-fill core with a sand chimney drain to control seepage through the structure – a sloped sand layer in the middle of the dam directed water down to the base and out the bottom. The spillway for this old dam was a “glory hole,” or long pipe which had a downstream outlet from the dam (kind of like a bathtub drain).

The water commission hired Cornforth Consultants to design a dam capable of impounding 20,000 acre-feet of water. Because of the dam’s remote location, material for the new structure had to come from the surrounding area, and Hammond was involved in the categorization of the local geologic layers and the determination of their suitability for use in the dam construction, and also the problems that local geology will pose in the design of the dam. Cornforth also worked with the respected firm Geomatrix, who did the seismic hazard study for the dam site.

The local geology contained sedimentary and volcanic layers from the Eocene, which included the Yamhill Formation (marine sediments), Siletz River Volcanics, and Tertiary intrusive dikes and sills. There were also some Quaternary colluvium and saprolite. The most promising material for use in the construction of the dam was the intrusive rock which could be used to fill the new part of the dam. The most problematic material was the saprolitic sandy silt lying typically between 4 to 30 feet directly under the dam.

The design for the new dam called for its construction on the downstream side of the old dam with borrow materials taken from upstream and downstream of the dam area. The new construction was designed to be rock fill with a new chimney drain. The new dam raised the normal water level in

the reservoir 50 feet. The new dam also has a weir-type spillway

The earthquake design called for the new dam to withstand accelerations of 0.3g. Laboratory cyclic testing (shake testing) showed that the saprolitic layer beneath the dam could theoretically liquefy at this intensity, so under the new construction the layer was removed and replaced with rock fill. The earthquake modeling performed for the new dam showed that it is stable under the design load when the reservoir is full. One consequence exists due to the old dam and its underlying saprolite, when the reservoir is drawn down there is potential instability in the area of the old dam on the upstream side of the new dam. But since the reservoir is lowered this would not result in an uncontrolled release of water.

Definition

“saprolite – A soft, earthy, typically clay-rich, thoroughly decomposed rock, formed in place by chemical weathering of igneous, sedimentary, and metamorphic rocks. It often forms a layer or cover as much as 100 m in thickness, esp. in humid and tropical or subtropical climates; the color is commonly some shade of red or brown, but it may be white or gray. Saprolite is characterized by preservation of structures that were present in the unweathered rock.” – Glossary of Geology, Fifth Edition, American Geological Institute.

References and Additional Reading:

Cornforth Consultants website:

<http://www.cornforthconsultants.com/projects-earth-dams-barney.htm>

Joint Water Commission Home page:

<http://www.jwewater.org/Index.asp?pgid=1>

City of Beaverton’s Drinking Water Supply page:

<http://www.beavertonoregon.gov/departments/eccduilities/drinkingwatersupply.aspx>

Cascadia Subduction Zone is Giving Us the "Slow Slip"

Synopsis of the June 10, 2011, lecture by Evelyn Roeloffs, Research Geophysicist for the USGS Earthquake Science Center in Vancouver, Washington

by Carol S. Hasenberg

Things have come a long way since the 1980's with earthquake research in the Northwest. Back then, plate tectonics was a relatively new geologic discipline, and scientists mostly relied on the historical record to determine the seismicity of a region. Oregon was thought to be a region of little seismic hazard.

Earthquake scientist Evelyn Roeloffs began her lecture to a packed Cramer Hall S17 last month with a quote from former State Geologist, founder of PSU Geology Department and GSOC Past President John Eliot Allen in 1983, who had stated that "We in the Northwest may have to live with volcanic eruptions but we hope that the (U.S. Geological) Survey's vulnerability map is correct and that we will not also have to look forward to large earthquakes as well."

As we all know now, the hopes of Dr. Allen were not realized. Some excellent work done by a number of researchers, most notably by Brian Atwater, showed that Oregon, Washington, British Columbia, and the northern part of California are periodically affected by megathrust earthquakes along the Cascadia Subduction Zone (CSZ). The terror caused by these enormous earthquakes has been brought home to us in the last decade by modern media coverage of three such quakes that struck Indonesia in 2004, Chile in 2010, and Japan in 2011.

These events have caused more research efforts to be made in the Pacific northwest, and new types of instrumentation has facilitated this research. A number of scientists including OSU's Chris Goldfinger and CWU's Tim Melbourne began to use Global Positioning System (GPS) data to

monitor motion on the North American Plate in order to study the subduction zone. North of the border, Roy Hyndman and Kelin Wang of the Geological Survey of Canada were conducting studies of the overriding plate in order to determine the extent of the "locked zone," which would be the area of the plate boundary to rupture in a megathrust event. Their colleague Herb Dragert installed a network of continuous GPS stations to monitor crustal deformation.

An interesting phenomenon was observed when Dragert carefully analyzed his GPS data. The overriding North American plate, which was steadily being pushed east with the converging Juan de Fuca/Explorer/Gorda Plate system, would periodically reverse motion and move to the west over a period of several days. These slip events, on the order of a few millimeters, occurred about every 14 months. Not only that, but low frequency tremors were found to coincide with these slip events. Dragert was convinced that these slip events were really important in the study of subduction plate movement, and continued to do studies of them. The events have now been studied for about one and a half decades, primarily in the Pacific northwest and Japan where instrumentation arrays are more robust.

The slow slips observed in the CSZ were found to occur in a region east of what was believed to be the locked zone, and at depths of between 30 and 40 km of depth, the bottom of which coincides with the Moho boundary for the North American continent. The slow slip periods, referred to as ETS or "Episodic Tremor and Slip" by Dragert, are so named because tremors always accompany the slip. ETS events do not usually occur on the entire CSZ at the same time. There are three distinct regions, denoted from north to south as the Wrangellia, Siletzia, and Klamath Zones. Average times between ETS events are 14 months in Wrangellia, 22 months in Siletzia, and 8 months in Klamath.

The events in the northern region have been well-studied by Dragert and other researchers. In the US the PBO, or Plate Boundary Observatory funded by the National Science Foundation, provides instruments installed and operated by the non-profit

group UNAVCO to study Cascadia, including the first borehole strainmeters in Oregon, Washington, and on Vancouver Island. The strainmeters are about 10 feet long and are cemented into the bottoms of boreholes 500-800 feet deep to isolate them from surface “noise”. The tremor and borehole strainmeter data imply that Wrangellia slip events tend to start south and propagate north (Puget sound to Vancouver island), but sometimes start in the middle and propagate north and south. Different analyses of daily GPS positions show slow slips going into the locked zone or staying east of the locked zone. Tremors are centered in regions immediately adjacent to regions of slip, so that there seems to be a relationship between the tremors and propagation of the slip.

These slip events have also been observed in subduction zones in Japan and other areas. They are particularly prevalent where younger crust subducts beneath a continent, and there is variation of the timing and tremors accompanying the slippage. The physical processes which govern the slippage and tremors vary by rates of convergence, metamorphic processes of the crustal composition, amounts and types of fluids from these processes, plate boundary geometry and other parameters. Studying the phenomena is also difficult because very sensitive (and generally expensive) arrays of instrumentation are required. GPS sensors can just barely register the movements, but more sensitive borehole strainmeters are expensive and their data is harder to interpret. So far the instrumentation has also been limited to land-based sensors but some oceanic sensors are planned.

Of course the most important question about slow slip events is, how are they related to megathrust earthquakes? It is clear that slip events, which over the course of their movement, generate slippage equivalent to that of a M6+ earthquake, are a mechanism by which a lot of the strain in the plate boundary zone is released. However, they also are believed to load the locked zone with additional strain. Earthquake scientists are working on lab and computer models of the subduction processes by which they can simulate plate convergence and generate data that agrees with observed phenomena.

Detailed information about these slip events continue to give researchers food for thought about the physical mechanisms that characterize subduction zone movement, and perhaps someday, of providing means of predicting or warning populations of megathrust events. Roeloffs's research at USGS is focused on improving methods for interpreting borehole strainmeter data.

Definition

Moho – Short for Mohorovicic discontinuity. The Moho boundary is defined by the depth at which seismic P-waves abruptly change velocity from about 7 km/s above the zone to about 8 km/s below the zone. It represents either a compositional change or a phase change in the rock structure due to the heat and pressure conditions at this depth. The depth of the Moho is about 5-10 km below the oceanic crust and about 40-70 km below the continental crust. – adapted from the Glossary of Geology, Fifth Edition, American Geological Institute.

References and Additional Reading:

Joan Gomberg and the Cascadia 2007 and Beyond Working Group, “Slow-slip phenomena in Cascadia from 2007 and beyond: A review,” GSA Bulletin; July/August 2010; v. 122; no. 7/8; p. 963–978; doi: 10.1130/B30287.1; 10 figures, [Published online March 29, 2010; doi:10.1130/B30287.1](#). This article summarizes the state of knowledge on slow slip phenomena.

The Plate Boundary Observatory page on the [UNAVCO website](#) is loaded with information about this important research endeavor. There is also the [new PBO website](#). All PBO data are freely available and their use by students and the public is encouraged.

[Herb Dragert's Page](#) for the Geological Survey of Canada has a list of his important papers about ETS and related studies.

Quote from John Eliot Allen can be found on Beth Casper, “Danger lurks below in Oregon (Cascadia Subduction Zone)” *Statesman Journal*, September 15, 2005 and is published on the [freerepublic.com](#) website.

