



THE GEOLOGICAL NEWSLETTER

"NEWS OF THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY"

VOLUME 81, NUMBER 1
JANUARY/FEBRUARY 2015

The Geological Society of the Oregon Country

P.O. Box 907, Portland, OR 97207-0907

www.gsoc.org

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JANUARY/FEBRUARY ACTIVITIES

Friday Night Lecture, January 9, 2015, Jan 9: Dr. William Orr, professor emeritus, University of Oregon, will present "What Was It Before It Was a Wing"?

Dr. Orr's talk will address some of the issues and items that keep paleontologists awake late at night. An example is wings of fish, amphibians, mammals and birds as well as arachnids and insects. For the vertebrates, the wing won't work until it meets very stringent requirements as an airfoil. Dr. Orr will also address some of the other unlikely structures we see on fossils that seem impossibly complex and sophisticated.

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VISITORS WELCOME AT ALL MEETINGS

Friday Night Lecture, February 13, 2015, Jan 9: Dr. Scott Burns, Portland State University, will present "Mt. Lassen National Park - a must see site for all geologists!"

Mt. Lassen is a national park that few people visit, but it is very interesting. It is not that far away from Portland and the talk is put together to encourage everyone to make to trip there if they have not seen it. It has every type of volcanic eruption there in one place, and Mt. Lassen is the largest volcanic dome in the world. The Cinder Cone in the NE corner of the park is one of the most perfect in the US! An incredible debris avalanche landslide came off of the top of the volcano and formed the main lake on the west side. Come and hear Scott Burns talk about one of his newest favorite parks!

Join GSOC members at **Pizzicato Pizza, 1708 SW 6th Ave.**, at **6:00 p.m.** before the lectures 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.

FUTURE ACTIVITIES

Plans for the **Eightieth Annual GSOC Banquet** are in progress. The banquet is scheduled for Sunday, March 8, 2015. Full details and a registration form is available on the last page of this newsletter and on the GSOC website.

President's Field Trip, Sept. 9, 2015 – Sept. 13, 2015

Mark your calendars for next year's President's Field Trip to Steens Mountain on September 9th through 13th, 2015. Reservations can be made now for accommodations at the [Steens Mountain Resort](#). (Field trip will be Sept. 10th, 11th, and 12th, with the 9th and 13th being travel days.)

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

BOARD MEETING NOTES

December 13, 2014

President Sheila Alfsen called the meeting to the home of Rosemary Kenney. Other board members in attendance constituting quorum were Janet Rasmussen, Dawn Juliano, Paul Edison-Lahm, Bev Vogt, Marty Muncie, and Bo Nonn. Also in attendance was GSOC member Bart Bartels. The minutes of the October 11, 2014 board meeting were approved with a correction to the date.

Treasurer's Report

The Treasurer's report was approved. Friday night door "boxite" donations have garnered \$152 so far after three meetings.

Events

Friday night lectures.

Janet has commitments for Friday night lecture from Dr. Bill Orr (January) on the evolution of wings, and Dr. Scott Burns (February) on Mt. Lassen. Possibilities for addressing the need for a larger room were discussed, including working with the Portland State Geology department to allow our lectures to be assigned for credit. **Snack committee:** Marty has signed up enough volunteers through February. Dawn and Sheila will help with setup February while Marty is out that month.

Field Trips

Downtown Geology field trip: Paul hasn't decided when he will be able to plan this trip, so planning was tabled for the moment, but he reports that Tara, Rik, Clay, and Sheila have expressed interest in being guides. Sheila will contact the "Children at Home in Wild" (Volunteers of America) program about doing the field trip for students in that program. (Bo will also make a short presentation at a meeting on the "Children at Home in the Wild" field trip that he and Sheila participated in this summer.)

President's Field Trip to Steens Mountain (Janet): Field Trip dates are Sept. 9th – 13th, with 9th & 13th being travel days. Reservations can be made now at the Steens Mountain Resort. Paul will put this up on the website.

The Holiday Party was successful. People loved having it at Carol's house (thank you Carol!) and it was nice having the music scheduled at the beginning of the event.

Annual banquet: Dr. Tanya Atwater is confirmed as our keynote speaker at the annual banquet, Sunday, March 8th, where she will discuss her role in the development of plate tectonics. She will give an additional lecture on March 9th with PSU — which may pick up the cost of her hotel. The board voted to cover Dr. Atwater's airfare from Santa Barbara (approximately \$360), any additional transportation costs and her \$100 honorarium. Ticket prices will be increased to \$30 to cover airfare. We will also need to reserve two rooms at Ernesto's to accommodate additional attendance.

Sheila will put together a poster and send to local organizations such as CVO and DOGAMI. Dawn & Carol will write up the announcement.

80th Birthday Activities

Bo, Sheila and Paul have volunteered to produce articles on GSOC's 80th birthday for the website/newsletter. Topics may include plate tectonics, women and GSOC, and historically significant lectures that have brought in new members. Any additional suggestions for articles are welcome!

Old and New Business

Nomination Committee: Nominations are closed and will be announced at the January meeting and accepted by motion for adoption at the February meeting. The nominations are Janet for President, Bo for Vice-President, Dawn for Treasurer, Paul for Secretary, Kirben Smoody for Director (1 yr.), Marty for Director (2 yr.), and Larry Purchase for Director (3 yr.).

GSOC Business Cards: Anne O'Neill will put together a GSOC business card to hand out on field trips. Sheila will edit and the Board will review and cover costs.

Announcements: Fossil Fest is February 21st., 2015. Janet may be organizing a get-together again for GSOC members who want to meet up.

Next board meeting is 10:00 a.m., February 14th, 2015 at Rosemary Kenney's house.

Notes compiled from board meeting minutes submitted by GSOC Secretary Paul Edison-Lahm.

Rhyolites in Eastern Oregon

synopsis of GSOC Friday night lecture, November 14, 2014, given by Dr. Martin Streck, Portland State University Department of Geology chair, entitled "Eastern Oregon Rhyolites Provide New Clues to CRB Mysteries"

by Carol Hasenberg

Martin Streck spoke to a standing room only GSOC crowd about the work that he and a number of his graduate students have done in advancing our knowledge of the Columbia River Basalt (CRB) flows of the Miocene. His team has focused upon the rhyolite flows that occurred as a result of heating by the basalt magma that produced the CRB.

Miocene rhyolite flows in eastern Oregon have long been studied by geologists. The relationship between the rhyolitic magma and the massive amounts of CRB basaltic magma is not precisely known, although they are spatially close so infer that the rhyolite is a result either of partial melting of the crust by or fractional crystallization of the CRB magma. In fact, the spatial distribution over time of the rhyolite can give geologists ideas about the origin of the CRB magma itself.

Streck first filled the GSOC audience in on what is known of the basalts by themselves. Locations of feeder dikes for the CRB eruptions have been found in Northeastern Oregon (Chief Joseph Swarm), the Monument swarm further west, and the Steens swarm in the Steens Mountain area of southeastern Oregon. The main groups of eruptions that comprised the CRB are the Steens, Imnaha, Grande Ronde, Wanapum and the Saddle Mt., but the Grande Ronde output made up 75% of all the CRB. This main eruptive phase was dated at approximately 16-15.5 million years in age.

Rhyolite eruptions occurred in eastern Oregon in a similar period of time. They were part of a large swath of bimodal volcanism that erupted from McDermitt Crater in northern Nevada through the Snake River Plain in Idaho to modern day eruptions at Yellowstone National Park. These eruptions were younger towards the east, and are believed to have been caused by a plume of hot material from the earth's mantle that the North American tectonic plate has been traveling over these several million years.

In order to make much sense of all this volcanic material geologists needed to test the composition of the rock and determine its age. Previous studies

had age dated quantities of rhyolite of similar age occurring on the eastern and southern fringes of Steens basalt. More rhyolite was also found to the north of the Steens area dating around 16.5 to 15.5 million years in age. Within that time period the older flows were to the south in northern Nevada, and the younger flows were to the north, similar to what happened with the basalt feeder dikes. Other data showed that this northward trend continued toward Baker City dating to about 14.7 million years at Dooley Mountain.

Martin's team began to conduct age dating tests of rhyolitic material of this period. The isotope Ar39 was used for the dating. At the Mahogany-Three Fingers caldera system in SE Oregon the new age dates were found to be in the range of 16 to 15.75 million years. Also Littlefield rhyolite a little further north was found to date at 16 million years. There were some complications in the age dating because older material was mixed together with the magma in the eruption and crystals show two groups of ages. Also some of these rhyolites are black and can be confused with basalts. The team was required to measure density in the samples to categorize the type of eruption.

Streck's team also worked to date a mass of rhyolitic material in the John Day area associated with the Dinner Creek Tuff Eruptive Center (DITEC). Dating in three areas near Strawberry Mountain show age dates of 16.1 to 16.6 million years. Other DITEC sites show ages between 16 and 15 million years. These ages are contemporary with the main phase of CRB eruptions and do not show age trending to the north.

In addition to the dating work, Streck's team worked on determining the composition of crystals they found in thin sections of the DITEC material. Very interestingly they discovered mafic globules in the Dinner Creek Tuff which turned out to be the exact composition of Grand Ronde Basalt. Streck theorized that the Grande Ronde basalt magmas flowed into the rhyolite chambers before eruptions. The discovery and analysis of the globules also

strongly tied the origins of the two eruptive events together.

As a result of this work, modern thinking is that the main body of the CRB magma was stored in far southeastern Oregon (conversion zone) and migrated into the feeder dikes to the north. En route they interacted with the overlying crust to produce the rhyolites.

NOMINATING COMMITTEE RESULTS

The following slate of officers has been selected by this year's nominating committee:

President **Janet Rasmussen**
Vice President.....**Bo Nonn**
Secretary **Paul Edison-Lahm**
Treasurer**Dawn Juliano**
Director, 3 years.....**Larry Purchase**
Director, 2 years.....**Martha Muncie**
Director, 1 year.....**Kirben Smoody**

Nominations will be closed for this year's slate of officers after the January meeting of the society. The slate of officers will be voted on and approved at the February monthly meeting.

The Nominating Committee members were Richard Bartels, Janet Rasmussen and Sheila Alfsen. Our thanks to the selected members and members of the Nominating Committee!

Don't forget that annual **DUES PAYMENTS** are due! Think about all those great member benefits for a mere annual fee of \$25 for an individual and \$35 for a family!

PS – If you joined GSOC in September 2014 or later, your 2015 dues are paid, good deal!!!

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compiled by Carol Hasenberg

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.

FIELD TRIPS: About 4 per year. Fees: see field trip announcements on the calendar next page.

GSOC LIBRARY: Rm. 69, Cramer Hall, Portland State University. Open 7:00 p.m. prior to meetings.

PROGRAMS: Second Friday evening most months, 7:30 p.m., Rm. S17, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon.

MEMBERSHIP: Per year from January 1: Individual--\$25, Family--\$35, Junior (under 18)/Student--\$15.

Membership applications are available on the website www.gsoc.org.

PUBLICATIONS: THE GEOLOGICAL NEWSLETTER (ISSN 0270 5451), published bimonthly and mailed to each member. Subscriptions available to libraries and organizations only at \$20.00 per year. Single Copies are available at \$2.00 each. Order from:

Geological Society of the Oregon Country, P.O. Box 907, Portland, Oregon 97207

TRIP LOGS: Write to the same address for names and price list.

APPLICATION FOR MEMBERSHIP THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Name _____ Spouse _____

Children under age 18 _____

Address _____ City _____ State _____ Zip _____ - _____

Phone (____) _____ - _____ Email address _____

Geologic Interests and Hobbies _____

Please indicate Membership type and include check for appropriate amount:

Individual \$25.00 _____ Family \$35.00 _____ Student \$15.00 _____

Make Check Payable to: The Geological Society of the Oregon Country
PO Box 907
Portland, OR 97207-0907



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VISITORS WELCOME AT ALL MEETINGS

MARCH/APRIL ACTIVITIES

The **Eightieth Annual GSOC Banquet** is scheduled for Sunday, March 8, 2015. Full details and a registration form is available online and in the January/February issue of *The Geological Newsletter*.

There will be no March Friday night meeting due to the annual banquet.

Friday Night Lecture, April 10, 2015: Dr. John Bershaw, Department of Geology, Portland State University, will present "Using Fossil Teeth to Understand How and When the Andes Formed."

The Altiplano and Andes Cordillera of South America are one of the most significant topographic features on Earth. Though basic models exist to

explain how they formed, the details are not well understood.

Recent paleoelevation constraints from fossil leaves and stable isotopes of sedimentary carbonates suggest that significant surface uplift may have occurred over a relatively short period of time, shedding light on the geodynamic mechanisms responsible for the topography seen today.

Dr. Bershaw has examined teeth from modern and extinct mammals spanning the late Oligocene (~29 Ma) to present which preserve a record of surface water isotopes that animals ingested while their teeth were mineralizing. A predictable relationship between tooth isotopes and elevation exists across the Andes. Tooth data show substantially more positive isotopic compositions ($\delta^{18}O$) for the late Oligocene compared to mid-late Miocene teeth.

This suggests that the Andean plateau was at a very low elevation during the late Oligocene and had risen to present-day elevation by the late Miocene. In addition, these data suggest modern climate variations across the Andean plateau have persisted since the late Miocene. Ongoing research indicates that modern climate has complex effects on environmental isotopes across the Altiplano.

Join GSOC members at **Pizzicato Pizza, 1708 SW 6th Ave.**, at **6:00 p.m.** before the lectures 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.

FUTURE ACTIVITIES

President's Field Trip, Sept. 8, 2015 – Sept. 13, 2015 PLEASE NOTE THE DATE CHANGE FROM EARLIER ANNOUNCEMENTS

Mark your calendars for next year's President's Field Trip (PFT) to Steens Mountain. Reservations can be made now for accommodations at the [Steens Mountain Resort](#). (Field trip will be Sept. 9th, 10th, 11th, and 12th, with the 8th and 13th being travel days.)

Janet also wants all PFT participants to have a copy of Marli Miller's new 2014 edition of [Roadside Geology of Oregon](#). Of course couples can share a copy. Everyone will want a copy anyway and Miller's diagrams and maps are wonderful. People who don't often drive across Oregon will enjoy having it to interpret the landscape along the way. Janet says she got her copy via Amazon for about \$25 w/ shipping.

Janet would also like to compile a list of those who intend to go on the PFT, so those people should email jkayerocks@yahoo.com or call her.

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

BOARD MEETING NOTES

February 14, 2015

President Sheila Alfsen called the meeting to the home of Rosemary Kenney. Other board members in attendance constituting quorum were Paul Edison-Lahm, Marty Muncie, Bev Vogt, Bo Nonn, and John Piccinnini. Also in attendance was GSOC member Bart Bartels, and Directors-elect Kirben Smoody and Larry Purchase. The minutes of the December 13th, 2014 board meeting were approved.

Treasurer's Report

The Treasurer's report was approved by the board.

Events

Friday Night Lectures: Bo will be lining up speakers for Friday night lectures starting in April. Sheila is working with PSU on possibility of a seminar credit for PSU students who attend lectures. Pizzicato needs to be reminded of our Friday night meetings in order to reserve a section for us. (Bev will ask Janet for their email.)

Snack committee: Marty has volunteers for April and May, and needs volunteers for June.

Field Trips

Downtown Geology field trip: Tour guides for this year include Rik, Clay, Tara, Cris Morgante, Larry, Barbara and Paul. The tour format will be similar to that of two years ago. Paul will update the printed guide and put it online. The board suggested that the trip be scheduled for late August.

President's Field Trip to Steens Mountain: Field Trip dates are Sept. 8th – 13th. Bev will check with Janet about lodging availability. *PLEASE NOTE THE DATE CHANGE FROM EARLIER ANNOUNCEMENTS*

Mt. Hood Field Trip: Larry will be planning the trip for July 11-12th and will plan a preliminary trip as soon as the access road is opened. An

accompanying Friday night lecture may be planned as well.

Annual Picnic scheduled for August 2nd. John will reserve our spot at Guy Talbot State Park.

Annual banquet: Forty-one people have signed up for banquet so far. Dawn has reserved two rooms at Ernesto's for the banquet. Students will meet with Dr. Atwater at PSU afterwards. Students are eligible for discounted rate (\$26) that is calculated to cover their costs for the banquet room and meal only. Paul will announce the banquet by Facebook, Twitter, and email one week prior to the February 28th deadline.

80th Birthday Activities: Our online archive of newsletters is now completely searchable back to 1935. Bev, Rosemary and Sheila will be working on an article on geologist and GSOC member Margaret Steere. Paul will be reposting Viola Oberson's 1979 *Ore Bin* article on Lon Hancock with an updated bio by her daughter Mary Lou Oberson. *We have also completed the GSOC president's history bios through 1990 on the website.*

Old and New Business

The board voted to designate Sheila as **Public Outreach Coordinator**. This will be publicized on the website. Sheila may be coordinating the Kids in the Wild program again or planning a Downtown Geology Tour for highschool students.

New members: The board would like to continue to receive the email notification of our new members that Paul has been sending out. As long as these emails are going out to board members only, they may include publically available member photos. In the future, we may want to ask members if they consent to having their information and/or photo in an online directory of GSOC members. Paul will send membership list to out to the board. Sheila will continue to meet and greet new members at our Friday night meetings as part of her Outreach Coordinator duties.

GSOC Business Cards: Anne O'Neill has put together a draft of the business card. Sheila will contact her.

Director-elect **Kirben Smoody** was welcomed to the board.

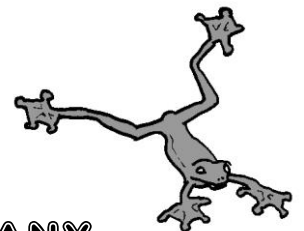
Next board meeting is 10:00 a.m., **April 11th, 2015**, at Rosemary Kenney's house.

Notes compiled from board meeting minutes submitted by GSOC Secretary Paul Edison-Lahm.

GSOC has a new officer's position of Public Outreach Coordinator!

One of GSOC's objectives is to support and promote geologic study and research, and as requests for speakers/educators come to GSOC, the board felt it would be appropriate to create this new position. Sheila Alfsen has volunteered to staff the position, in keeping with her interest in public education. She has given numerous public talks to civic groups and schools throughout her term as president. She looks forward to keeping the public's interest and curiosity for Geology alive.

EVOLUTIONARY FLIGHT PATHS



-THERE WERE MANY

synopsis of GSOC Friday night lecture, January 9, 2015, given by Dr. William Orr, professor emeritus, University of Oregon, entitled "Perspectives on the Origin of Flight"

by Kyle Dittmer

Over 100 of us gathered in Cramer Hall 53 – a big upgrade from the smaller classroom – to hear a former aeronautical engineering student now turned paleontologist share the geologic evidence on how the ability to fly has come to evolve. He described the various modes of flight and the thresholds between what humans might define as “true flight” and all the ways evolution has developed gliding,

falling, and powered flight. The idea of flight is a major part of American culture, along with automobiles. The idea of flight goes back to ancient times. How did the wing evolve? Unlike a simple airfoil, a bird-wing is a complex venetian-blind like structure and with an opening-and-closing folding motion.

Clear record of wings goes back 300 million years ago in the fossil record. The earliest bird is Archaeopteryx – a hybrid of bird and reptile (but more bird than reptile). That bird was discovered in a “Lagerstätten” (or stellar fossil site) in Germany-the Solnhofen Limestone. Similar localities of “Lagerstätten” are the Green River Shale (SW Wyoming) and the John Day Formation (central Oregon). Archaeopteryx clearly had feathers but was its effort true flight or soaring/gliding? The modes of flight: suspension, leaping, jumping, gliding, and powered/hovering flight (most advanced) were examined.

The flying lizard (SE Asia) is a good example of gliding, as are flying squirrels and snakes. Even spiders can “fly” with a net of webbing extended like a parachute. We even see ancestors of the modern flying fish go back to early Cenozoic times (~60 m.y.). One example of the earliest flying creature was the Dragonfly (~330 m.y.) with a 3-ft wingspan. Modern bats can be traced back to Paleocene times (66-56 m.y.). The largest bird known was a Pliocene (5-2.5 m.y.) condor/raptor with a 22-ft, wing-span.

Conclusions: (1) There were many evolutionary paths to flight, (2) These modes of flight – jumping and gliding – preceded powered flight, (3) The first flying creatures were small in size, (4) Early flight was most likely an evasion tactic rather than being used in a predatory manner, (5) Flight was more easily developed in coastal areas, given the constant supply of onshore/offshore breezes, (6) Some creatures that do not fly well are still evolving and will likely improve in ability over time, (7) Evolution is continuous, so there are no “missing links” in seeing the progression of flight. Dr. Orr also quoted author Michael Crichton (of “Jurassic Park” fame) that “Life will find a way” and implied that the ability of flight always finds a way. We

enjoyed Dr. Orr’s presentation. He took on many questions afterwards as we retreated to the PSU Geology Office for a reception of tasty treats.

Additional Reading

Wikipedia – The Solnhofen Limestone: en.wikipedia.org/wiki/Solnhofen_limestone

Livescience article - Archaeopteryx: The Transitional Fossil: www.livescience.com/24745-archaeopteryx.html

University of California Museum of Paleontology (UCMP) article The Solnhofen Limestone of Germany: www.ucmp.berkeley.edu/mesozoic/jurassic/solnhofen.html

Another UCMP article discusses the evolution of gliding and parachuting in vertebrates: www.ucmp.berkeley.edu/vertebrates/flight/gliding.html

NOVA – “The Evolution of Flight” addresses the evolution of powered flight, mostly in birds: www.youtube.com/watch?v=g2dXznoURBw

The University of Portsmouth, UK, has a website which discusses variations of the evolution of flight: www.port.ac.uk/special/pterosaurs/evolutionofflight/

Mt. Lassen - a Geological Must-See

synopsis of GSOC Friday night lecture, February 13, 2015, given by Dr. Scott Burns, professor emeritus, Portland State University, entitled " Mt. Lassen National Park – A “Must See” Site for Geologists "

by Kyle Dittmer

About 100 of us gathered in Cramer Hall 53 to hear a very knowledgeable geologist talk about his newest adventure – first trip to Mt. Lassen National Park. This active volcano, the southernmost in the Cascade Mountains, last erupted in 1916. The mode of eruptions seems to be bi-modal – either quiet or violent. The volcano was named after Danish immigrant Peter Lassen who was a local blacksmith. The LA Times recently wrote that Mt.

Lassen was California's "most overlooked volcanic park" with only 400,000 visitors per year, as compared with Yosemite's 4-million visitors per year.

The geology of Mt. Lassen is complicated, being near the edge of the Sierra-Nevada Range. Unlike the Cascades, the Sierras were formed during the Nevadan Orogeny over 100-million years ago. Much granite formed deep underground. The Sierras underwent uplift 2-3 million years ago and has been sculpted by Pleistocene glaciers. Field studies suggest that although one may expect the granites of the Sierras to be beneath the Mt. Lassen magma chamber, we have yet to find this evidence.

The tectonic subduction of the Gorda Plate, very close to the northern California coast, is the driver of the southern Cascade volcanoes. Mt. Tehama was a large composite volcano that erupted over 1-million years ago, erupted violently 30,000 years ago, then formed a caldera on its internal collapse. Mt. Tehama would serve as the base for the newly emerging Mt. Lassen about that time and formed on the northeast slope of Mt. Tehama. The lakes are formed due to lava flows damming and/or diverting the local streams. There are tarns and some deep lakes, such as Soda Lake.

Mt. Lassen's origin began 5-million years ago as new volcanic activity was increasing. The Willow Creek Basalt, a major event, was 3-million years old. Andesite was flowing at 2-million years ago as seen at Juniper Lake. The Lava River Basalt flowed at 1.8 million years ago. By 100,000 years ago, four shield volcanoes had formed – Raker Peak (north), Prospect Peak (NE), Red Mountain (south-central), and Mt. Harkness (SW). Glaciation occurred during 25,000 – 15,000 years ago.

Mt. Lassen, at 10,457 feet elevation, is the largest volcanic dome in the world. The primary rock is dacite, although flows of basalt and andesite have added to the complex rock mosaic.

There are four craters in the summit that formed in 1917, 1915-16, 1914-15, and pre-1914. There were 400 eruptions during 1914-17. The May 22, 1915 eruption was a great event with ash plumes and lahars. Bumpass Hell is a 16-acre geothermal area of boiling springs, mud-pots, and fumaroles. We see hydrothermal alternation of some of the andesite. Sulfur Works had a community bathhouse since 1865, driven by hot springs. Cinder Cone (10-miles NE) was formed by two basalt eruptions (1850s) building up to 750 feet and is perfectly preserved. Diatoms (algae), which look like white dust, can be found near the edge of the basalt flows.

The Cascade Volcano Observatory does monitor the area, but Mt. Lassen is not active now and probably dormant. He did point out that since Mt. Lassen is an active geothermal area then the magma chamber is active and close to the surface.

Dr. Burns raved about the beautiful ponderosa pine forest that surrounds the volcanoes, which just adds to the majestic beauty of the area. He ended with a good quote, "This park has everything that a geologist could wish for – shield volcanoes, cinder cones, calderas, composite cones, domes, geothermal areas, and great biology!" We enjoyed Prof. Burns' presentation. He took on many questions afterwards then we retreated to the PSU Geology Office for a reception of yummy treats.

WELCOME NEW MEMBERS FOR 2015!
We've gotten some new members already this year! We wish you a warm welcome!

Martha Kiser	Elizabeth VanBoskirk
John Anderson	Barbara Portwood
Debbie & Steve Shannon	Melissa Lehman
Elizabeth VanBoskirk	Adrian Nunenkamp
Karen Small	Megan Scott

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.

FIELD TRIPS: About 4 per year. Fees: see field trip announcements on the calendar next page.

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THE GEOLOGICAL NEWSLETTER

"NEWS OF THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY"

VOLUME 81, NUMBER 3
MAY/JUNE 2015

The Geological Society of the Oregon Country

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Larry Purchase (3 years) – 360/254-5635

lkpurchase@q.com

MAY/JUNE ACTIVITIES

Friday Night Lecture, May 8, 2015: Dr. Alex Ruzicka, PSU Geology Department, will present "Meteorites: Latest Hits".

Friday Night Lecture, June 12, 2015: Dr. Vic Baker, University of Arizona, will present "The Geology of Megafloods: Earth, Mars and Beyond".

Join GSOC members at **Pizzicato Pizza, 1708 SW 6th Ave.**, at **6:00 p.m.** before the lectures 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

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VISITORS WELCOME AT ALL MEETINGS

1, bounded by Broadway and 6th Aves. and Harrison and Hall Streets.

FUTURE ACTIVITIES

Upcoming 2015 field trips and outdoor events are scheduled:

- Mt. Hood/Eliot Glacier – July - exact date TBA – registration form will be available online on the GSOC website www.gsoc.org. The trip may be partnered with a July Friday night talk, so please check the schedule updates on the website and the July/August edition of the newsletter.
- GSOC Annual Picnic – Sunday, August 2 - [Guy W. Talbot State Park](#)
- Downtown Portland Buildings Geology Tour - August 22, 9:00am – 12:00pm – “Ancient

Walls: A Geological Walking Tour of Downtown Portland”

- President’s Field Trip – September 8-13 – Steens Mountain

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

President’s Field Trip, September 8 – 13, 2015

Mark your calendars for this year's President's Field Trip (PFT) to Steens Mountain. Reservations can be made now for accommodations at the [Steens Mountain Resort](#). Cost of the trip is \$70 and the registration form is available online and attached to the mailed edition of this newsletter.

Janet also wants all PFT participants to have a copy of Marli Miller's new 2014 edition of Roadside Geology of Oregon. Of course couples can share a copy. Everyone will want a copy anyway and Miller’s diagrams and maps are wonderful. People who don't often drive across Oregon will enjoy having it to interpret the landscape along the way. Janet says she got her copy via Amazon for about \$25 w/ shipping.

For more information about the trip please email Janet Rasmussen at jkayerocks@yahoo.com or call her.

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

BOARD MEETING NOTES

April 11, 2015

President Janet Rasmussen called the meeting to order at the home of Rosemary Kenney. Other board members in attendance constituting quorum were Bo Nonn, Dawn Juliano, Paul Edison-Lahm, Marty Muncie, Kirben Smoody, Sheila Alfsen, and John Piccinnini. Also in attendance were GSOC members Doug Rasmussen, Dave Olcott, and Carol Hasenberg. The minutes of the February 14th, 2014 board meeting were approved.

Treasurer’s Report: Approved. Janet reminds us that as a non-profit our volunteer contributions of mileage for field trip planning are tax-deductible.

Liability Insurance: Our insurance will expire on June 1st unless our agent finds an insurance company that will cover our field trips. Janet is following up with agent to get a new policy in place.

EVENTS

Annual Banquet Recap Annual banquet resulted in \$3,170.70 in ticket sales and \$3,556.60 in expenses, for a loss of \$290.90. Thanks to everyone who contributed time and energy - it was lots of work but rewarding and people were very happy with Dr. Atwater as speaker. Ernestro’s did a great job with the seating.

Friday Night Lectures:

GSOC donations have been received and reported from the Friday night meetings. Bo has scheduled Dr. Alex Ruzicka for May, Dr. Vic Baker for June, and Dr. Marly Miller and Dr. Nancy Price upcoming.

Nancy Eriksson can arrange for larger room for lectures if given notice after the first of the month. Pizzicato also needs regular notice about our Friday night meetings.

Sheila is looking into the possibility with the PSU Geology Department of having a seminar credit for PSU students who attend our Friday night lectures.

Snack committee: Marty has snack volunteers scheduled for May and June, but will need someone for July and beyond. Also she needs someone to open the room for the June lecture.

FIELD TRIPS

Portland Day Field Trip: Sheila will be coordinating the local Portland field trip that was designed by Ian Madin – perhaps in July. We will pre-run the trip using public transportation. Bo wrote paper on the MAX tunnel core and may be available to present for that segment of the trip.

Salem Buildings Geology Tour: Sheila has taught a “Rocks on the Blocks” Salem field trip in the past and may want to plan it again for GSOC in 2016.

Mt. Hood Field Trip: Bo needs dates from Larry so that he can schedule Dr. Andrew Fountain’s lecture. This trip is dependent on Dr. Fountain’s availability.

Downtown Geology field trip: (Paul) Trip is planned for August 22nd. We did an initial pre-run on Wednesday and will do at least one more pre-run. We currently have enough guides. Cost will be \$10 and pre-registration and payment will be online. This will also allow Janet to make up nametags ahead of time for \$0.17 per nametag.

President’s Field Trip to Steens Mountain: (Janet)

Janet will pre-run again this trip again. So far 31 people have expressed interest. Janet got the BLM permit and we are not restricted by numbers.

Annual Picnic will be August 2nd at Guy Talbot State Park near Latourell Falls. John has paid our fee to reserve our spot. The cost will be \$58 for the picnic site, and a possible charge of \$5 per vehicle.

80th Birthday Activities

Carol has been adding Past Presidents to the GSOC website and is looking for the most recent President’s book which is at large. Sheila, Bev, and Rosemary are collaborating to write articles about some of the Past Presidents for the website.

OLD AND NEW BUSINESS

Student Liaison: Kirben Smoody has volunteered to fill this position for now.

Business Cards: Anne has a draft of the business card. Sheila will follow up with her about getting these printed.

Scanning Old Field Guides? Scanning old field guides was discussed, but there are concerns about copyright and out-of-date info. However future field trip content organized in blog format (such as

Janet’s ongoing jmonthly blog) will be a good way to keep members involved who aren’t on the field trip. Geo-locating our photos may also be helpful.

The next board meeting is 10:00 a.m., **June 13th, 2015** at Rosemary Kenney’s house.

Notes compiled from board meeting minutes submitted by GSOC Secretary Paul Edison-Lahm.

WELCOME NEW MEMBERS FOR 2015!

More members have signed up this year! We wish you a warm welcome!

James Bela

John Roberts

Zane Emry

Richard Testut

Woodruff ‘Woody’ English

Cyndi Dion

James Currier

Sara Wilson

Marilyn Rudin

Margaret Kiser

Shaping the Tectonic World View



synopsis of the 80th GSOC Annual Banquet with speaker Dr. Tanya Atwater, University of California Santa Barbara

by Carol Hasenberg

Outgoing GSOC President Sheila Alfsen introduced Dr. Tanya Atwater by discussing the origins of GSOC and its name “The Oregon Country”. The first decades of exploration and research into the geology of the Oregon Country answered the questions of What and Where, she said. It was clear that Oregon contained a strip of volcanism that was present all around the edges of the Pacific Ocean. The big question left to answer was the Why. And that is what the work of Dr. Atwater and many other scientists did over the last 50 years. Plate tectonics has been one of the greatest scientific discoveries of all times.

Atwater began her address by acknowledging that yes, she was able to be involved in the development of this discovery shortly after the birth of the idea. She told the GSOC audience that although she had

been asked to relate an oral history of her work in the talk, her brain did not really function that way. Her memory does not work so much in chronological details but in the **strength of the ideas**. So instead she presented her work in a series of vignettes illustrating the powerful ideas that she helped to develop. A crucial aide in the talk and one that the reader may follow at home is her EMVC website which contains a number of animations illustrating particular details of plate tectonic processes. The site address is emvc.geol.ucsb.edu. So the reader is encouraged to open it up and follow along!

Dr. Atwater studied geology in college, but she thought that the program involved more memorization than her brain could handle, so instead she opted to do geophysics as her profession. It was so much easier for her to work with the mathematics of geophysics. And that is how she found herself working in Chile reading seismographs where a conference of international scientists studying the south Pacific sea floor convened. At that meeting a **paleomagnetic trace** through the spreading center of the south Pacific Ocean was presented by Jim Heirtzler. This trace showed areas of alternating magnetic orientation that formed symmetric patterns as one headed away in either direction from the high point of the mid ocean ridge. The existence of this phenomenon, so like that found in the Atlantic Ocean, had only one logical explanation-the process of sea floor spreading. And sea floor spreading confirmed and provided a driving mechanism for the theory of Continental Drift proposed by Alfred Wegener in 1912.

So Atwater's career focus was inspired at this meeting. She has spent her career **researching and modeling tectonic processes** and has made particular studies of the western North American region. She has produced educational animations of the California coastline changes in shape from the San Andreas transform fault movements. She has also made animations of the breakup of supercontinent Pangea. These are available on the EMVC website.

Atwater recommended a book called "Plate Tectonics: Insider's History of the Modern Theory of the Earth" by Naomi Oreskes. In this book Oreskes has collected the writing of key scientists involved in developing plate tectonics theory, one chapter of which was written by Atwater. One of the things that Atwater mentioned in discussing the book was that **the development of plate tectonic theory was a multi-disciplinary effort**, and each scientist was convinced most strongly by the evidence from her or his field. For examples, the geophysicists were convinced by the paleomagnetic data, and the seismologists were convinced by the locations and frequency of earthquakes around the plate boundaries.

The next idea discussed by Atwater is that the **tectonic plates are in general quite rigid** and their shapes are only altered by growth along the boundaries, subduction, and crinkling under extreme pressure such as that found in boundaries like the Himalayas. How that is known is that after traveling thousands of miles apart, continental (shelf) margins can be pieced together quite accurately.

In tandem with this notion, Atwater then discussed the **role of transform faults** in the growth of plate boundaries. These are the faults that run perpendicular to the "stair steps" in the mid oceanic spreading centers. For a while their role and creation were poorly understood. But researchers have come to understand that these are simply scars that are generated at a stair step while the generated material is traveling in two different directions along the step. The steps themselves are the result of irregularities in the plate boundaries that have divided. Atwater had made a really good model of this action with a box and fabric, and this model is discussed on the EMVC website.

Another idea discussed by Atwater that is global in scope for plate tectonics is the fact that upwelling of magma does not drive the creation of new plate material on the seafloor; rather, it is the pull of the weight of the subducting slabs at the cold plate margins which drives the process. In this sense the **"boiling pot of jam"** analogy fails to correctly model the behavior of the earth's crust. Atwater

illustrated this by having the audience study the African continent and the spreading margins which surround it. It is clear that over time this tectonic plate has grown larger, and the spreading centers have shifted with respect to one another. So the spreading centers do not remain in fixed locations on the earth's surface—they migrate as the process continues.

Atwater also discussed the more detailed, location specific work she has done. She has studied how the lateral motion of the Pacific Plate along the North American plate at the San Andreas Fault has **altered the coastline of California** in the last several million years. She showed the audience at least two examples of this. In the first example a block of the coastline broke off from the main mass and rotated clockwise to become the Santa Barbara Peninsula that we see today, and the space it used to occupy now holds the Los Angeles Bay. A key marker layer of pebble conglomerate from a volcano in northern Mexico, called the Poway conglomerate, ended up in three different locations and indicated the movement to the researchers. Another example of movement along the San Andreas Fault is the Pinnacles and Neenah formations, which are the same in origin but have been separated by 315 miles of movement along the fault. Atwater has developed animated illustrations of the changing coastline over time on her website and also has done some manual models which can demonstrate the changing coastline to school children in Southern California.

Atwater's talk concluded with questions from the GSOC audience. One listener asked what was the mechanism that started the original breakup of Pangea. The answer was that hot spots in the mantle start to break up a continent. When asked what had **inspired her to believe in her own work at that age**, Tanya said that a confidence building upbringing and the sheer arrogance of youth helped her to have the courage to present her papers to geophysical conferences which numbered "1000 men to one woman". She had people tell her that they were interested to see "the girl" present. As there was no dress code for professional women at that time, she would show up "wearing love beads and barefoot" to conferences.

The talk concluded with an announcement of two sessions that were scheduled between Atwater and students from PSU. Atwater has an important role in passing her experiences and confidence to a new generation of geoscientists.

Paleoclimatology in the Andes Mountains



synopsis of GSOC Friday night lecture, April 10, 2015, given by Dr. John Bershaw, Portland State University Department of Geology, entitled "Using Fossil Teeth to Understand How and When the Andes Formed" by Carol Hasenberg

map from
TBjornstad 18:03,
25 November
2006 (UTC),
public domain

John Bershaw, one of the newest additions to the faculty of Portland State University's Department of Geology, came to the GSOC Friday night lecture in April to discuss research he conducted for his PhD dissertation at the University of Rochester, New York. The topic of the research was using **fossils to determine information about past climate change**. Specifically, Bershaw's task was to use oxygen isotopes in fossil mammal teeth to bracket the age of formation of the Andean Plateau (Altiplano) in South America.

The use of proxies from the rock record as climate change indicators is widely used by **paleoclimatologists**. Methods include the study of isotopic compositions in fossil teeth, leaf morphology, tree-ring analysis, carbonate (limestone) analysis, gases encased in ice, or isotopic composition of lake and ocean sediments. Ideally, two or more methods are used to provide corroboration for a given problem in determining paleoclimates.

Bershaw's method was to grind off tooth samples from fossil teeth of herbivorous, water-dependent mammals found in fossil bearing formations in the

Andes' Altiplano, a high, dry plain is found between high mountains in the southern parts of Peru and Bolivia, and the northern part of Chile (see map). The Altiplano averages about 4000 meters (13,000 feet) in elevation. The fossil teeth came partly from the Salla Formation, a 25 million year old sedimentary rock unit found today at an elevation of 3600 meters in Bolivia, and other Altiplano sites with 10 million year old and younger fossils. The tooth samples were analyzed for oxygen and carbon isotopic composition.

In order to get a calibration scale for the model, one must first examine the **isotopic composition of oxygen in the rainwater drunk by the mammals** at various elevations in the study area. This was done for a cross-section that stretched up the Eastern Andean Cordillera, through the Altiplano and down the western side. Basically, the atmosphere contains mostly O_{16} with a small percentage of O_{18} . At higher elevations, the heavier O_{18} tends to precipitate out and so the percentage of the O_{18} isotope diminishes downwind. Relationships were determined between elevation and O_{18} concentration. There are some seasonal variations in the numbers as well as continental and latitudinal variations which made the issue a bit more complex than the basic relationship of elevation, which were addressed by Bershaw in his interpretations.

Next, one must see if the oxygen isotopic composition of mammalian teeth correlates with surface water. This had been done in a number of previous studies with established relationships.

The fossil tooth sample results from the Altiplano were **compared with values found from two other groups of teeth** from herbivorous mammals. Samples were taken from 25 million year old teeth from a formation near Sao Paolo, whose owners lived near sea-level on the western edge of the continent. Additional samples were taken from modern mammals on the Altiplano. The fossil tooth samples from the Altiplano were then analyzed and compared with these other samples and the elevation/isotopic composition chart. It was found that the 25 million year old Altiplano fossils had an oxygen isotopic composition similar to the fossils

from Sao Paolo, but the 10 million year old and younger Altiplano fossils had a composition similar to the modern teeth of the Altiplano, suggesting that the mountains were formed between these times.

Research for this problem is ongoing with **several types of climate proxies to confirm these results** and further constrain the periods of mountain formation. It is hoped that the end result will determine how fast the Andes mountains formed from a lowland to the high mountains that are there today. Underlying this research is a problem in plate tectonics - Did the Andes form continuously and gradually as the Nazca plate subducted beneath South America, or were there periods of rapid (punctuated) mountain growth followed by periods of relatively little elevation change? At this time, the results of multiple climate proxies suggest that the punctuated mountain building model holds sway for the Andes.

References and Additional Reading

John Bershaw, Carmala N. Garziona, Pennilyn Higgins, Bruce J. MacFadden, Frederico Anaya, Herculano Alvarenga, "Spatial-temporal changes in Andean plateau climate and elevation from stable isotopes of mammal teeth," *Earth and Planetary Science Letters*, 289 (2010) 530–538, available on [Bershaw's PSU faculty description page](#).

DeLene Beeland, "[The Andes' Mountainous Paradox: so tall, so young](#)," from blog Science Stories, updates on Florida Museum research, March 1st, 2009, Florida Museum of Natural History website.

University of Rochester, "[Taking the pulse of mountain formation in the Andes](#)," from Science Daily, www.sciencedaily.com, April 21, 2014

Wikipedia [Proxy \(climate\)webpage](#) describes ways paleoclimatologists use climate proxies in their research.

Wikipedia [Altiplano webpage](#) describes the Andes Altiplano region.

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Please indicate Membership type and include check for appropriate amount:

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VISITORS WELCOME AT ALL MEETINGS

JULY/AUGUST ACTIVITIES

Friday Night Lecture, July 10, 2015: Mr. Julian Gray, Rice Museum, will present "Digital Specimen Photography for Geologists". This lecture will take place in Cramer Hall room 171.

Geologists constantly need to depict rocks, minerals, and fossils for presentations and publications. Digital photography has extended the range of possibilities in illustrating samples. One common problem, reduced depth of field at high magnifications, is easily overcome using stacking techniques. This technique uses sharply focused portions of sequential photographs focused on different slices or stacks to produce a synthesized image in which the subject is crisply focused. Julian Gray, executive director of the Rice Northwest Museum of Rocks and Minerals, is a

geologist and semi-professional photographer who has experimented with stacking techniques and others to produce stunning images. Julian's specialty is photomicrography. His images have been published in mineral magazines and books.

Join GSOC members at **Pizzicato Pizza, 1708 SW 6th Ave.**, at **6:00 p.m.** before the lectures 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.

GSOC Friday night lectures will be closed for August and September! Please stay tuned until October.

July/August field trips are as follows:

- Mt. Hood/Eliot Glacier – July 11 – 12, 2015 - registration form will be available online on the GSOC website www.gsoc.org.
- GSOC Annual Picnic – Sunday, August 2 - [Guy W. Talbot State Park](#) When: Sunday, August 2nd, 2015 at 12 noon. Bring your own beverages and we will provide the plates and plastic utensils. The format for the picnic will be a potluck. If your last name begins with:
 - A through G bring a main dish
 - H through P bring a side dish or salad
 - Q through Z bring dessert..

GSOC is reserving the picnic shelter for the day, therefore a suggested contribution of \$3 per person, during the picnic, will be appreciated to help cover the cost. Directions: Traveling east on I-84 from the Portland area, take Exit 28 (Bridal Veil). Travel about 2 miles west on the Historic Columbia River Highway to the park. Note: Guy Talbot State Park is NOT at Latourell Falls. It is along Latourell ROAD, which intersects with the Columbia River Highway at two points on the NORTH side. Watch for signs for GSOC event. There is no parking fee.

After the picnic, participants may wish to take the short walk to Latourell Falls, or drive to the trailhead near the freeway exit and hike up to Angel's Rest. Participants are encouraged to watch for last-minute announcements on this page.

- Downtown Portland Buildings Geology Tour - August 22, 9:00am – 12:00pm – “Ancient Walls: A Geological Walking Tour of Downtown Portland” - Join us Saturday, August 22, 2015, 9:00am-12:00pm at the Pioneer Place Mall Fountain for a two-hour outdoor walking tour of downtown Portland’s geological mysteries and oddities. Bring good walking shoes, sunscreen and clothing for a cool, but possibly rapidly warming summer morning. Water and snacks are advisable, although the trip will end at a lunch stop. Open to public. Children under 12 must be supervised. \$10

registration fee. Registration will be available online at www.gsoc.org.

FUTURE ACTIVITIES

Friday Night Lecture, October 9, 2015: Dr. Marli Miller, University of Oregon and author of the New Edition of Roadside Geology of Oregon (2014) will present TBA.

Future 2015 field trips and outdoor events are as follows:

- President’s Field Trip – September 8-13 – “Geologic Wonders of Southeast Oregon” – Registration for this trip has closed, please check with field trip leader Janet Rasmussen jkayerocks@yahoo.com for updates if you are a participant. Janet also wants PFT participants to have a copy of Marli Miller's new 2014 edition of Roadside Geology of Oregon. Miller’s diagrams and maps are wonderful. People who don't often drive across Oregon will enjoy having it to interpret the landscape along the way. Janet says she got her copy via Amazon for about \$25 w/ shipping.
- Portland Geology Field Trip - Saturday, September 12, 2015, 9:00am 3:00pm, will be led by GSOC Past President Sheila Alfsen. Please check the September/October edition of the newsletter and the website for updates to this field trip.

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

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

BOARD MEETING NOTES

June 13, 2015

President Janet Rasmussen called the meeting to order at the home of Rosemary Kenney. Other board members in attendance constituting quorum were Bo Nonn, Paul Edison-Lahm, Lawrence Purchase, Kirben Smoody, Sheila Alfsen, and John Piccinnini. Also in attendance was GSOC member

Doug Rasmussen. The minutes of the April 11th, 2015 board meeting were approved.

Treasurer's Report (Submitted earlier by Dawn): Approved by the board.

EVENTS

Board consensus was reached that we should charge more for the field trips and increase our donation to PSU from \$800 to \$1000. Janet will email Sheila about increasing our PSU donation to \$1000 and securing lecture arrangements.

Surveying our membership was also discussed. We should think about what burning questions we have for our members, such as the cost and location of field trips, other social activities, etc.

Friday Night Lectures: Snack committee discussion deferred.

FIELD TRIPS

Mt. Hood Field Trip: Trip is still open. One day option is available. Larry will be getting more info to Paul for the website.

Downtown Geology field trip: (Paul) Yesterday's collaborative Meetup architectural and geology downtown tour with Eric Wheeler netted GSOC \$80. The board approved using Meetup for a limited period to promote Friday night lectures and those field trips that are open to the public, such as the Downtown PDX Geology Tour and the Portland Geology Tour.

President's Field Trip to Steens Mountain: Janet did another pre-run of the trip and will make some further adjustments. She has scheduled an archeologist to make a presentation. Trip registration is now closed.

Portland Geology Field Trip

Sheila is fine-tuning the route of this trip. She may research the meteorite at OHSU. Bo can present his research on the MAX station core. Alternately Sheila's **Rocks on the Block** field trip is also ready to go.

Annual Picnic will be August 2nd at 12:00. Board meeting will convene at 10:00 a.m. [Potluck assignments are as follows: If your last name begins with A through G bring a main dish; H through P bring a side dish or salad; Q through Z bring dessert.]

OLD AND NEW BUSINESS

Janet has purchased a new and better insurance policy that will cover our field trips.

Community Outreach – Sheila paid last night's Pizzicato tab for our speaker and the PSU AEG/CORIBA presidents. Sheila will be reimbursed from the treasury.

Student outreach. Kirben will do a presentation on GSOC for PSU students.

Media Committee: Paul will form committee to bring together members working on the newsletter, website, FB, Twitter, MeetUp, and photography.

Offer from Courtyard Village in Raleigh Hills Sheila has given talks at Courtyard Village and they are offering us the opportunity to use their venue for meetings and events.

The next board meeting is 10:00 a.m., **August 2nd, 2015 at Guy Talbot State Park** before the Annual Picnic.

Notes compiled from board meeting minutes submitted by GSOC Secretary Paul Edison-Lahm.

WELCOME NEW MEMBERS FOR 2015!
More members have signed up this year! We wish you a warm welcome!

Kerry Jeffrey	Carter Kennedy
Matthew Blizotes	Jon Gallagher
Judith Clark	Marilyn Rudin
James Currier	

Meteorite Findings and “Greatest Hits”

synopsis of the May 8, 2015, GSOC Friday Night Lecture “Meteorite Discoveries: Greatest Hits” with speaker Prof. Alex Ruzicka, Ph.D., Portland State University
by Kyle Dittmer

Over 70 of us gathered in Cramer Hall 53 to hear the latest science of meteorites. This topic is of great interest to geologists and planetary astronomers alike because space rocks are the best rock record of the early days of the solar system and the processes that formed it.

We need to distinguish from a Meteoroid (rock in space), Meteor (rock falling through Earth’s atmosphere and burning up), and Meteorite (a meteor that survives a fall and lands on Earth). When meteorites fall, they tend to come down in pieces and land in a strewn field.

Common meteorite size and frequency of falls: 1 m (hours-days) to 10 m (years). This means that the small ones fall more frequently (and less likely to cause major damage). The rare ones are 100 m (century-millennia) and can cause major damage anywhere on Earth.

The sources of meteoroids come from interplanetary bodies (e.g., Asteroid Belt, etc.), Moon, Mars. The main geological evidence to distinguish meteorites is mineralogy (as compared with rock samples from the Moon or Earth). Meteorites are classified as Iron, Stony-Iron, and Stony (a.k.a., Chondrite). There are also the Achondrites – made of different materials from the Moon, asteroid, etc. that formed from multiple collisions.

Statistics (2000): meteorite falls (957) vs. finds (3854). In 2015, over 52,000 meteorites were found, with a good number in the Sahara (and the Bedouin nomads are trained to spot such rocks, gather them, and trade them in for currency!). The use of a log-scale plot of a meteorite’s chemistry vs.

the Sun’s spectral photosphere can be very useful in comparing meteorite types.

Here are the latest “Greatest Hits”: (1) The solar system formed relatively fast, in only 10 million years; (2) Much early planetary material was either partly melted, evaporated, and/or dispersed in the early solar nebula; (3) Pre-solar grains are incorporated in the chondrite matrix; (4) Pre-biotic organic synthesis occurred as building blocks in the early solar system; (5) Decay of short-lived radioactive isotopes gave the heat source of silica-rich bodies in the early solar system; (6) Planetary rock swaps occurred throughout the history of the solar system.

Dr. Ruzicka’s presentation was interesting and insightful. He took on questions afterwards then we retreated to the PSU Geology Office for a reception of some cookies.

Women in Geology – Margaret Steere

by Sheila Alfsen

Diligent, talented, industrious and devoted are only some adjectives to describe Margaret Steere. Margaret was a native of Michigan, but came to Oregon early during her career. Schooled at the University of Michigan with degrees in geology, Margaret applied her skills in cartography for the U.S. Army Corps of Engineers during World War II. She joined the staff of Oregon’s Department of Geology and Mineral Industries and worked for 30 years as a geologist and geologic editor. Upon retirement, Margaret continued her service to the state as a volunteer. Margaret’s expertise in geology included paleontology as she utilized her skills to maintain and curate the collection for DOGAMI’s museum as well as authoring numerous articles on fossils.

Her contributions to the Geological Society of the Oregon Country include many articles for the Geological Newsletter, publication preparation, leading field trips and other, behind-the-scenes

tasks in the Society's operation. She joined GSOC in 1945 while still living in Michigan but moved to Oregon the following year. So significant were her contributions, she was elected a GSOC Fellow in 1981.

As a young woman in the geosciences in the pre-war era, Margaret was a trendsetter to pursue a career and excel in a field that was dominated by males. Her memory lives on as an outstanding example of a professional geologist and loyal member of the Society.

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TRIP LOGS: Write to the same address for names and price list.

APPLICATION FOR MEMBERSHIP THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Name _____ Spouse _____

Children under age 18 _____

Address _____ City _____ State ____ Zip _____ - _____

Phone (____) _____ - _____ Email address _____

Geologic Interests and Hobbies _____

Please indicate Membership type and include check for appropriate amount:

Individual \$25.00 _____ Family \$35.00 _____ Student \$15.00 _____

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THE GEOLOGICAL NEWSLETTER

"NEWS OF THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY"

VOLUME 81, NUMBER 5
SEPTEMBER/OCTOBER 2015

The Geological Society of the Oregon Country

P.O. Box 907, Portland, OR 97207-0907

www.gsoc.org

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VISITORS WELCOME AT ALL MEETINGS

SEPTEMBER/OCTOBER ACTIVITIES

GSOC Friday night lectures will be closed for September!

Friday Night Lecture, October 9, 2015: Dr. Marli Miller, University of Oregon and author of the New Edition of Roadside Geology of Oregon (2014) will speak.

Dr. Miller's research emphasizes the use of small-scale structures to reconstruct the structural and kinematic histories of high strain zones. She is especially interested in the transition from brittle to ductile behavior in these zones at meso- to microscopic scales. Much of Marli's work is in Death Valley, California, where she is also involved with tectonic interpretations.

Join GSOC members at **Pizzicato Pizza, 1708 SW 6th Ave.**, at **6:00 p.m.** before the lectures 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.

FUTURE ACTIVITIES

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Registration for this trip has closed, please check with field trip leader Janet Rasmussen jkayerocks@yahoo.com for updates if you are a participant. Janet also wants PFT participants to have a copy of Marli Miller's new 2014 edition of Roadside Geology of Oregon. Miller's diagrams and maps are wonderful. People who don't often drive across Oregon will enjoy having it to interpret the landscape along the way. Janet says she got her copy via Amazon for about \$25 w/ shipping.

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

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

IN MEMORIAM

Two notable GSOC members have died recently, Walter Allen Sunderland and Ralph Eugene Pratt. Walt was the 1990 GSOC President and Ralph was very active in the club for many years.



Walt Sunderland died June 15th of this year at age 85. He was a pediatric physician and was on the faculty at Oregon Health & Sciences University. His obituary listed his many interests which included doing the New York Times crossword puzzles in ink, the Oregon Shell Club, the Geological Society of the Oregon Country and compiling a lexicon of malacology (seashell) terms.

Ralph Pratt died June 5th, just a few hours after celebrating his 90th birthday. He was a gentle soul who enjoyed coffee, beer, folk dancing, liberal politics and the wonders of his native state Oregon. He served in the navy during WWII, and was

married in 1953. His wife of 62 years, GSOC Past President Evelyn Pratt, survives him, as well as 2 daughters and 3 grandchildren.

BOARD MEETING NOTES

August 2, 2015

President Janet Rasmussen called the meeting to order at the Guy Talbot State Park picnic shelter. Other board members in attendance were Dawn Juliano, Kirben Smoody, Marty Muncie, and John Piccinnini. Also in attendance were GSOC members Anne O'Neill and Dave Olcott. The minutes of the June 13, 2015, board meeting were approved.

Treasurer's Report was reviewed by the board.

EVENTS

The board discussed increasing our donation to PSU and asking about getting a larger room for our lectures.

Friday Night Lectures: Marli Miller is coming in October. Marty Muncie has volunteers lined up for snacks at October and November meetings. She will pass around sign up soon for January meeting.

Field Trips

Mt. Hood Field Trip: Attending members said that the trip was great!

PDX Building Tour August 13th pre-run, August 22nd PDX tour, August 29 **PDX geology tour** pre-run and future events all deferred since no one present has been involved in the planning of these events.

President's Field Trip to Steens Mountain: Janet discussed plans to improve logistics due to large number of participants. She will send out email to all registered persons in the next week or so.

OLD AND NEW BUSINESS

80th Birthday topic: This was not addressed as none present have been involved.

Community Outreach, Rice Museum, Media Committee, were also not addressed for the same reason.

Student Liaison: Kirben said he will try connecting with other students again in the fall, when he'll be attending PSU part-time. The board discussed posting announcements of our activities that the students will see. Kirben will work on this using the data & photos from the email announcements for upcoming speakers.

Picnic turnout was very good (25 people), and including several new members. Clay and Janet led a hike to Latourell Falls with an overview of the geology there. There was plenty of food available and the weather was very pleasant.

Dawn discovered a trove of **old GSOC songs**, many written by members using popular tunes to commemorate a field trip or to build camaraderie. Following the business meeting, which was unusually short, several members commenced to singing. Anne offered to choose and transcribe ten songs for the Steens Trip.

Offer from Courtyard Village in Raleigh Hills: We were enthusiastic about the possibility of having our holiday party at Courtyard Village. I included this info in my recent email to Sheila.

The next board meeting is 10:00 a.m., **October 10, 2015.** Location TBA.

Notes compiled from board meeting minutes submitted by GSOC President Janet Rasmussen.

WELCOME NEW MEMBERS FOR 2015!

More members have signed up this year! We wish you a warm welcome!

**Nicole Miller
Evelyn Bennett**

**Katie Zerzan
Brianna Young**

Janet's Journal: GSOC Mount Hood and Eliot Glacier Field Trip

by GSOC President Janet Rasmussen. *Editor's note: Please click on the title link to visit this trip on the GSOC website and view the many photos that were taken on the trip. This article is a compilation of the text excerpts from the website article edited for reading without the photos.*

On Saturday, July 11, 2015, Bo Nonn and Larry Purchase led GSOC members on a field trip to Mount Hood and Eliot Glacier.

We met at Panorama Point Overlook outside of Hood River and traveled to our first stop on the shoulder of Highway 35 beneath a railroad overpass. We looked at a cut bank of lahar sediments from Mount Hood, which are less than 38,000 years old.

Our next stop was the debris flow below the Middle Fork Hood River Bridge. Yes, we spent quite a bit of time beneath bridges. The one-lane bridge at this stop was replaced after the 1996 debris flow, caused by the failure of a lateral moraine at Eliot Glacier. It primarily served logging trucks. While scouting the trip, Bo had to leap over the railing to avoid being crushed by one of them.

Following Lava Bed Road took us to a colorful junkyard, and just beyond it, to the foot of the massive 7700 year-old Parkdale Lava Flow. The lower end of the flow loomed more than 300 feet above us.

Our next stop was where the 1996 debris flow came across the road to Mount Hood. We walked through the debris flow to the vent area at the top of the Parkdale Lava Flow. In the photo, Dawn stands for scale against an enormous boulder that was carried down the mountain by the power of the debris flow.

Next we began the long drive up to the Cloud Cap Inn campground, not far below Eliot Glacier. This is a part of Mount Hood I've never seen. There were

some outcrops of volcanic rock along the way that exhibited puzzling fracture patterns.

Finally we arrived at the campground! We all chose spaces near one another for ease of visiting. We had trouble understanding the posted rules for payment and usage, which were vague, contradictory, and certainly open to interpretation. Finally we chose a plan and stuck to it. We weren't ticketed anyway.

Now for the fun part: We took a great hike. I was walking slowly up the forested trail and suddenly came into the open. There was my group, far ahead on a narrow path along the ridge of a moraine.

It was exhilarating! Down below us was the toe of Eliot Glacier, where the meltwater is running out of the holes. The Glacier is covered with debris down here, so not the sparkling beauty we see farther up the mountain.

Bo and Ellen Nonn have climbed this mountain a number of times, and by a different route than most. While we were up there, some younger folks came down carrying skis. They had hiked up thousands of feet to ski on the snowfields!

Back at the campground, Bo drew my attention to the unusual assemblage of rocks on the hilltop nearby. We pondered how the lava forms curving cooling fractures and the significance of the red scoria caught between the smoother gray andesite on the rocks here.

In the morning, we all walked over to view nearby Cloud Cap Inn. I had watched an Oregon Field Guide episode about this wonderful old lodge, so I was excited to see it. It was locked up but Larry gave us an overview of its history.

The lodge is huge, and built sturdily of logs way back in 1889 by William Ladd of Portland. It's off the grid, and lit by lanterns and propane lights. There is a generator for a two-way radio.

Larry discussed the history of the Inn's ownership over the years. We regretted that the only tours would be later in the day and were by reservation only. As he wrapped up his presentation, though,

here came two rangers to open the lodge for the day's tours. They were kind enough to invite us in and we got a tour after all! It was wonderful!

A 1931 poster at the lodge illustrated a failed plan to put a tram up to the top of Mount Hood from a rebuilt Cloud Cap Inn. Another photo showed the gracious living achievable in the early days of the Inn. I could sit around reading in this environment!

One of the rangers pointed out the signatures written in pencil on some of the walls. I wouldn't have seen them, but my flash picked them up.

Climbers back in the day included women. Another photo shows climbers including women climbing Mt. Hood that were all hanging onto a rope...but not attached to it. I understand there was a secured rope at one time all the way up. That would help, or maybe just give false assurance.

Later, we took another short hike past some of the cottages which can be rented near Cloud Cap. We passed an A-Frame crowded with trees that have grown too big. Some were flagged to be taken out. We finally got on the right trail to see the headscarp of the 1980 landslide that caused a flood at Pollalie Creek downstream. Searching for more information about this event, I found United States Geologic Survey open-file report on the Christmas Day event. Here is an excerpt from the abstract of the above-mentioned report, written by Gary Gallino and Tom Pierson in 1984:

At approximately 9 p.m. on December 25, 1980, intense rainfall and extremely wet antecedent conditions combined to trigger a landslide of approximately 5,000 cubic yards at the head of Polallie Creek Canyon on the northeast flank of Mount Hood. The landslide was transformed rapidly into a debris flow, which surged down the channel at velocities between about 40 and 50 ft/s, eroding and incorporating large volumes of channel fill and uprooted vegetation. When it reached the debris fan at the confluence with the East Fork Hood River, the debris flow deposited approximately 100,000 cubic yards of saturated, poorly sorted debris to a maximum thickness of 35 ft, forming a 750-ft-long temporary dam across the

channel. Within approximately 12 minutes, a lake of 85 acre-feet formed behind the blockage, breached the dam, and sent a flood wave down the East Fork Hood River. The combined debris flow and flood resulted in one fatality and over \$13 million in damage to a highway, bridges, parks, and a water-supply pipeline.

Our last official stop was at White River Bridge. The White River has washed out bridges repeatedly in the last 100 years. The problem is that the glacier rests over geothermally active ground. It can melt at its contact and when certain threshold conditions arise, suddenly release a flood of pent-up water and debris, which incorporates more loose material farther down the canyon.

GSOC past President Rik Smoody had assisted in planning this trip for the past couple years while the road was being repaired. During his presidency, he lead an excellent field trip to Mount Rainer, focusing on the process of aggradation. Aggradation is the increase in land elevation due to the accumulation of sediment. We took 20 minutes or so to sit under the White River Bridge and observe this process close-up. Sometimes we helped it along by throwing another rock into the stream. As we sat, fascinated, I saw enough small rocks go by in the narrow, shallow, but rapid flow of one streamlet to fill the bed of a truck. Or at least a large wheelbarrow. Anyway, it was hard to pull away from it. Thanks, Rik!

And a huge thank you to Bo and Larry for several years of planning and leading this trip!!!

The Bellevue Erratic – Then and Now

by Clay Kelleher

The photo shows that visitors have NOT been recently removing significant pieces of the famous

Erratic Rock near Bellevue Oregon (as is alleged by others). After a GSOC meeting this spring, several of us were browsing through the scrapbooks in the GSOC library and found the 1950 black & white photo.

The Ice Age Floods Institute just happened to have a field trip planned that would include a stop there, so I sent them the photo and they re-staged the photo with the same number of people taken from the same angle. The people are dressed differently and nobody's holding a hammer, but the rock is the same.

The non-shrinking Bellevue Erratic



So while it might have been "mined" prior to 1950, possibly by locals for flat stones, I believe today's tourists are respectful.

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THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY		
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Children under age 18 _____		
Address _____	City _____	State ____ Zip _____ - _____
Phone (____) _____ - _____	Email address _____	
Geologic Interests and Hobbies _____		

Please indicate Membership type and include check for appropriate amount:		
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Make Check Payable to:	The Geological Society of the Oregon Country	
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	Portland, OR 97207-0907	



THE GEOLOGICAL NEWSLETTER

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VOLUME 81, NUMBER 6
NOVEMBER/DECEMBER 2015

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P.O. Box 907, Portland, OR 97207-0907

www.gsoc.org

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Martha Muncie (2 years) – 503/232-6342

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Larry Purchase (3 years) – 360/254-5635

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NOVEMBER/DECEMBER ACTIVITIES

Friday Night Lecture, November 13, 2015: Dr. Nancy Price, recent faculty addition to Portland State University Department of Geology, will present "Addressing Tectonic Questions from the Perspective of Rheology."

There are two ways in which structural geologists look at the formation of mountain belts and transform plate boundaries. The first is to describe the folds and faults as rocks reacting to events, and to study the deformation and mineral growth as a reaction to these events. The second is to study the material properties and deformations of the rock layers as a response to stress fields, and to explain the formation events in terms of these properties. In effect, the strength and deformation behaviors of the

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VISITORS WELCOME AT ALL MEETINGS

rocks control the formation of the mountain belts and fault zones. This is the perspective of rheology. In this lecture, Price will show examples of viewing rocks from a rheological perspective and interpreting tectonic history in this light.

Join GSOC members at **Pizzicato Pizza, 1708 SW 6th Ave.**, at **6:00 p.m.** before the lectures 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.

GSOC 7th Annual Holiday Party – GSOC Members and their guests are invited to the 7th

GSOC Annual Holiday Party and field trip slideshow, Friday December 4th, at 614 NE 114th Ave., Portland. GSOC Board Members will provide main dishes with protein of various sorts. Other members please bring vegetable, side dishes or desserts for 6 to share, plus beverage of their choice. Music will be organized by Dawn Juliano.

Schedule of Christmas Party activities:

- 6:00 pm: Set-up
- 6:30 pm: Dinner buffet
- 7:15 pm: Welcome presentation. Nominations for GSOC Board members for the 2015-2016 year will be open.
- 7:30 pm: Dessert and musical entertainment
- 8:30 pm: This year's GSOC field trip leaders with present the "Year in Review" program with brief slide show summaries of their trips.
 - Larry Purchase: "Mt. Hood/Eliot Glacier," July 11-12
 - Paul Edison-Lahm: "Downtown Portland Buildings Geology Tour," August 22
 - Janet Rasmussen: "Geologic Wonders of Southeast Oregon," September 8-13
 - Sheila Alfsen: "Portland Geology Field Trip by Public Transport," September 12
- 9:30 pm: Clean-up

Donations will be accepted for party supplies. Send donations to Dawn Juliano c/o GSOC, P.O. Box 907, Portland, OR 97207, or give them to her in person at the event.

FUTURE ACTIVITIES

Friday Night Lecture, January 8, 2016: Kyle Dittmer, GSOC member and faculty member, PCC Southeast Campus and Portland State University, will present "Steno."

Prof. Dittmer will talk about a little known but smart Renaissance Danish scientist named Steno. What were Steno's contributions to Geology? Why is his story unique? Come join us and find out! Prof. Dittmer has taught Earth Science for 25 years. Come hear this interesting thought-provoking science-history talk!

Friday Night Lecture, February 12, 2016: Dr. Ashley Streig will speak.

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

BOARD MEETING NOTES

October 10, 2015

President Janet Rasmussen called the meeting to order at the home of Rosemary Kenney. Other board members in attendance were Bo Nonn, Dawn Juliano, Paul Edison-Lahm, Kirben Smoody, Marty Muncie, Larry Purchase, Sheila Alfsen, and John Piccinnini, constituting quorum. Also in attendance were Rosemary Kenney, Carol Hasenberg, Dave Olcott, and Doug Rasmussen. The minutes of the August 2nd, 2015 board meeting were approved.

Treasurer's Report: Dawn reports that as of October 10, 2015, our bank balance is above average because we've had a good year with field trip revenues and Friday night lecture donations.

Events

Friday night lectures: Last night's lecture with Dr. Marli Miller was a near record with 116 attendees, many of whom were attending from seeing the announcement in the social media Meetup, with \$120 received in donations.

Snack committee: Thanks to Bev Vogt, Bart Bartels, Carolyn Powers and Kyle Dittmer who brought snacks last night. Marty needs more sign-ups for after January.

Upcoming speakers include Dr. Nancy Price, Ashley Streig and Kyle Dittmer on Nicolas Steno.

Hosting by PSU: We are continuing to explore ways to strengthen our ties with PSU Geology Department and benefits which we can give to the department through their hosting of our meetings. We will be increasing our yearly scholarship contribution to PSU from \$800 to \$1000.

Field Trips

Downtown Geology Tour recap: Paul reports that the trip went very well with 50 people attending. We will plan to do the trip again in August 2016. Tours of Vancouver (WA) and Salem building stone may also be in the offing.

President's field trip recap: Janet reports that it was a great trip with 34 people attending! She would however set a maximum of 24 if she does this trip again in several years. It helped to have options for lodging (including a tent with a live mouse under it) however we might offer the option of more "luxury" accommodations in the future.

Portland by Bus, Tram, & Trolley recap: Sheila reports that attendance was low, in part because of poor advertising, and the sites are a little underwhelming for the average person; plus there were some unexpected problems with access to sites. However, with some modifications we definitely should do this trip again next year. Special thanks to Clay for his invaluable contribution and setting up our meeting with former GSOC president Evelyn Pratt at the CRB's at Terwilliger Plaza.

Community Outreach/PSU: Kirben has been liaising with CORIBA officers; Janet offered to help with a presentation on GSOC to CORIBA. Sheila is liaising with PSU's AEG chapter and has also been handling numerous requests for school talks. She will be returning for a third talk at Courtyard Village, this time on subduction earthquakes. She also recently attended an important and fascinating symposium given by NWEA on earthquake preparedness.

Holiday Party: Carol has offered her home for the 2015 GSOC Holiday Party location to be held Friday, December 4. GSOC party organizers promise to bring dishes, silverware, and cups this year.

Annual Banquet: the date for the banquet was set by the Board for Sunday, March 13, 2016. Janet is considering speaker possibilities.

Old and New Business

DOGAMI materials: Larry has accepted thirteen boxes of historical materials from DOGAMI and there are seven more boxes of text books to come.

Nomination Committee: Janet appointed Carol, Paul and herself to the Nomination committee and possible board recruits were discussed.

GSOC Business Cards: Paul will submit a draft to the Board using an image from our field trips and Anne O'Neill's text.

Mt. Tabor brochure: Carol & Sheila finished the brochure content and it has been published by the Friends of Mt. Tabor. Paul will adapt this content for the website.

Membership Issues: Janet will send membership cards and acknowledgment of new members by actual mail. We will also email notifications of membership expiration. Paul will add family members to online membership form.

Media Committee: Paul will meet with Carol to discuss forming a Media Committee to address archiving issues and work flow between the newsletter, website, and other social media.

Next board meeting will be at 10:00 a.m., Saturday December 5th, location TBA.

Notes compiled from board meeting minutes submitted by Secretary Paul Edison-Lahm.

WELCOME NEW MEMBERS FOR 2015!
More members have signed up this year! We wish you a warm welcome!

Ken Karsted
Liz Nakazawa

Irene Ortega
John Wertzler

Traveling Oregon's Geologic Highways and Byways

synopsis of GSOC Friday night lecture, October 9, 2015, given by Dr. Marli Miller, University of Oregon Department of Geology and author of

Roadside Geology of Oregon, Second Edition,
Mountain Press Publishing Co., 2014
by Carol Hasenberg

Marli Miller explained and gave examples of her recent book, Roadside Geology of Oregon, Second Edition, to one of GSOC's largest audiences ever. The book was a 4 year project from which Miller laughingly said that she learned an embarrassingly large amount of material. Amongst her reviewers for the project were Portland State University professors Martin Streck and Scott Burns. The Second Edition is a long awaited rewrite of the classic Roadside Geology of Oregon by David Alt and Donald Hyndman, written in 1978.

After a few intro slides showcasing Oregon's beautiful and diverse landscapes, Miller approached the geology of Oregon in three different ways: descriptions of the geological provinces of Oregon, roadside geology tours along specific highways, and a chronology of events in Oregon's geologic history. These approaches are also reflected in the book's organization, with the chronological history given in the introduction, then the roadside tours being grouped according to the geological province in which they occur.

Also in the introduction of the book is a discussion of plate tectonics, which is the basis of modern geologic concepts. Miller mentioned that the movements and boundaries of the North American, Juan de Fuca, and Pacific Plates form the environment in which the geology of Oregon occurs. The subduction of the Juan de Fuca Plate under the North American Plate provides material which forms an active chain of volcanoes and also intrusive bodies such as those found in the Wallowa Mountains. In addition to the volcanism, landscapes are formed as material carried by the oceanic plates is accreted to the margin of the North American continent. The large accreted terranes in Oregon are the Wallowa, Franciscan and Siletzia Terranes.

The most recent of these terranes, Siletzia underlies the Coast Range geologic province of Oregon. Siletzia formed in an oceanic environment and accreted onto North America about 54 million years ago. The Coast Range consists largely of sandstone

sedimentary formations sitting atop oceanic basaltic of the Siletzia terrane. The sandstone consists of the Umpqua and Tyee formations, which represent sediments from before and after terrane accretion, respectively. The headlands north of Florence are made out of Columbia River Basalt Group (CRBG) basalts, which flowed through the Cascade Range in the Miocene and cut through some of the coastal rock layers to erupt and cool in the ocean.

The Cascade Mountains geologic province is divided chronologically into the Western Cascades and High Cascades. The older, eroded Western Cascades are now the foothills for the more recent High Cascades. Both mountain ranges are volcanoes of andesite, basalt, lahar, and ashfall sequences of material produced by the action of oceanic subduction of the Juan de Fuca Plate.

The Lava Plateaus geologic province surrounds the Blue Mountains, and is bounded to the west by the High Cascades and to the south by the Basin and Range province. The Lava Plateaus are relatively flat terrain which has been inundated repeatedly by sequences of Columbia River Basalt Group floods from 17-6 million years ago, ashflow tuffs such as the Rattlesnake Tuff of 7 million years ago, and similar volcanic events.

The Basin and Range geologic province covers the southeastern part of the state, extending south through most of Nevada. It consists of blocks of land which have been slowly pulled apart by the action of crustal extension, so there are abrupt edge displacements between blocks which may be thousands of feet high.

The Blue Mountains geologic province may be the most variable terrain in the state. It consists of the oldest accreted terranes plus intrusive batholith and stitching plutons. Not only that, but the CRBG originated in sheet dikes in this province which cut through the older rock sequences.

After this broad tour of the state through the descriptions of the geological provinces, Miller then toured the state using some key examples of highway routes from the book starting with US 197 from the Dalles to the junction of US 97 south of

Maupin. The stratigraphy of this area starts with the youngest and topmost Dalles Group strata (also called the Deschutes Formation in the Bend area), consisting of material eroded from the early High Cascades volcanoes. Below the Dalles Group lies the CRBG, which is considerable. Miller showed the audience a slide showing the Maupin setting and all the exposed landscape is CRBG. The John Day National Monument lies on the route and showcase the John Day and Clarno Formations from the Oligocene and Eocene. These formations record a gradual climatic change from tropical to subtropical, from 48 to about 38 million years ago.

Miller spoke at length about the Wallowa Mountains and the Wallowa Terrane, as seen from traveling the Oregon 82 and Oregon 86 byways. The Wallowa Terrane was the first accreted terrane to form Oregon, and consists of material from an island arc environment where an oceanic plate is subducting under another oceanic plate. Limestones, turbidites, and other such oceanic features are found in this terrane. Fossils of the Tethys Ocean between Laurasia and Gondwana from the Triassic and Jurassic now reside in Eastern Oregon, transported on the conveyor belts that are the oceanic crust. This terrane and others to the south and west are also intruded by stitching plutons.

The Wallowa Mountains consist largely of granite of the Wallowa Batholith, one of the largest intrusive bodies in Oregon. The view from the town of Joseph shows Jurassic Martin Bridge Limestone overlain by granite of the Wallowa Batholith, then capped with CRBG. The chronological sequence represented in this view is limestone formation, terrane accretion, granite intrusion, uplift, and deposition of CRBG flow. Cutting through these formations are CRBG feeder dikes, and these dikes were the conduits which carried the massive flood basalts to the surface during the Miocene.

The Wallowa Mountains also have interesting glacial features and deposits. Wallowa Lake near Joseph is dammed by a glacial moraine. Glacially deposited granite boulders are strewn about the surface.

Miller then traveled to the opposite corner of the state to discuss US 199, which travels the boundary between the Paleozoic Triassic belt and the Western Klamath Belt in the Klamath mountains, which are formed by a series of accreted masses piled together. The different areas of the Klamaths have radically different compositions representing completely different formation environments. By example the Paleozoic Triassic belt consists largely of limestone while the Western Klamath belt is peridotite.

Heading towards the coast and US 101, Miller described some features of the Franciscan Complex, the youngest of the Klamath accreted terranes. This rock originated in the accretionary wedge of a subduction zone. Rainbow Rock near Brookings features ribbon chert derived from a buildup of radiolaria. Most of the sea stacks at Bandon beach are sandstone, but some mudstone, chert, greenstone, and blueschist are present. Blueschist forms in the low temperature, high pressure environment of a subduction zone.

Miller quickly wrapped up the talk with the chronological development of Oregon:

- Early accreted terranes, granitic intrusions
- Siletzia, Clarno and John Day volcanics, Western Cascades
- Columbia River Basalt Floods
- Early High Cascades, glaciation, younger basalts

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.

FIELD TRIPS: About 4 per year. Fees: see field trip announcements on the calendar next page.

GSOC LIBRARY: Rm. 69, Cramer Hall, Portland State University. Open 7:00 p.m. prior to meetings.

PROGRAMS: Second Friday evening most months, 7:30 p.m., Rm. S17, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon.

MEMBERSHIP: Per year from January 1: Individual--\$25, Family--\$35, Junior (under 18)/Student--\$15. Membership applications are available on the website www.gsoc.org.

PUBLICATIONS: THE GEOLOGICAL NEWSLETTER (ISSN 0270 5451), published bimonthly and mailed to each member. Subscriptions available to libraries and organizations only at \$20.00 per year. Single Copies are available at \$2.00 each. Order from:

Geological Society of the Oregon Country, P.O. Box 907, Portland, Oregon 97207

TRIP LOGS: Write to the same address for names and price list.

APPLICATION FOR MEMBERSHIP THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Name _____ Spouse _____

Children under age 18 _____

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Please indicate Membership type and include check for appropriate amount:

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