THE GEOLOGICAL NEWSLETTER

GSOC

JANUARY 2001

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OF THE OREGON
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Merry Mackinnon
Laurie O'Connor
Lee Walkling

Francis (Frank) Higdon

Frank Higdon died December 4, 2000, in Portland, Oregon. He was born in 1912 at White Salmon, Washington, and lived near Battle Ground, Washington, on a farm, until at the age of 21 he joined the U.S, Army Signal Corps, serving most of his time in Alaska. After his discharge in 1945, Frank worked for the Rabbit Meat Company in Portland for 18 years. He then worked for Portland Public Schools until retiring in 1974.

Frank married Rosina Law in Anchorage, Alaska, in 1937. They joined GSOC in 1965, and they and their children attended many field trips, considering the trips a wonderful way for children to learn natural history outdoors. Frank is survived by wife Rosina, son Jay and daughters Marietta, Rene, Linette, Yvonne, and six gradchildren.

The Impact Versus Volcano Dinosaur Extinction Debate

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Sixty-five million years ago, some phenomenon triggered mass extinctions on the lands and in the oceans so profound that they define the geological boundary between the older Mesozoic Era, often called the "Age of Reptiles," and the modern Cenozoic Era, the "Age of Mammals." On a finer scale, the extinctions define the boundary between the Cretaceous (geological symbol, "K"), and Tertiary ("T") periods. This mass extinction is usually referred to as the K-T extinctions. The dinosaurs became extinct during the K-T mass extinction. To examine how the K-T extinctions fit into a broader perspective, please see the Geologic Time Scale. The cause of the K-T extinctions is one of the great mysteries in science, and many scientists have proposed theories to account for it. Theories span a vast spectrum of causes including: sea level change, supernova explosions, climate change, and on and on. Beginning in the 1980s, two new theories became the topic of an intense scientific debate. They are the K-T impact extinction theory originated by the Nobelist physicist, Luis Alvarez, and his team, and the K-T Deccan Traps volcanism-induced carbon cycle perturbation extinction theory which I originated, which, for short, I call the volcano-greenhouse theory.

The K-T impact and volcano-greenhouse theories were created at the same time in the mid-late 1970s. In May 1981, the theories met, and clashed, at the K-TEC (Cretaceous-Tertiary Environmental Change) II meeting where the K-T impact versus volcano debate began when I debated the Alvarez team (Russell and Rice, 1982). They have since become the topic of an intense scientific conflict between impactors, as advocates of the impact theory are known, and K-T volcanists. This conflict has been unfortunate for science because it prevented cooperation among scientists who were examining extinction processes via extraterrestrial mechanisms and those who were examining them via earthly mechanisms.

Much was at stake in K-T extinctions science-new, and competing paradigms on the dynamics that drive bioevolution and extinction on planet Earth. Luis Alvarez hoped that his impact theory would be a universal one that explained mass extinctions via impacts throughout geological time. I hoped to develop my carbon cycle perturbation theory into a universal mechanism. Several volcanic events similar to the Deccan Traps volcanism correspond

time-wise to times of mass extinctions. Passions ran high. In June 1980, the same month as publication of the Alvarez theory (Alvarez et al., 1980), NASA adopted it as the basis for its Spacewatch program. Promises of new funding for the space sciences, new careers, honors, and glory were in the air. Physicists, chemists, astronomers, and astrophysicists who suddenly discovered Earth's fossil record as a rich plum ripe for the picking raced into K-T science like miners flooding to a new gold strike. K-T extinctions science, that had long been a quiet and gentlemanly affair, suddenly went ugly, and damaging, as scientists new to geological time-rock relationships-that can trap the unwary into illusions of catastrophe where none, in fact, can be demonstrated from the geobiological record-declared that paleontologists do not understand how to interpret Earth's fossil record. But that they did. Some openly ridiculed paleontologists who had spent much of their career studying the K-T record. For example, in a New York Times article titled "The Debate Over Dinosaur Extinctions Takes an Unusually Rancorous Turn" (Malcolm Browne, 19 January 1988), Luis Alvarez stated publicly that, "I don't like to say bad things about paleontologists, but they're not very good scientists. They're more like stamp collectors." He insulted his major opponents by name. (Please see my 6/1/88 Letter to Luis Alvarez). With much at stake, K-T science, and scientists, got hurt as politics of science, and control of the media, cut the channels that determined the direction of K-T science. Some editors and journalists, and popularizers of science, promoted the impact theory, in the process literally blanking out the volcano side of the debate. (Please see Science Coverage of the K-T Debate).

The intrusion of politics into K-T science was unfortunate because both theories have good in them. We know that objects from outer space have hit Earth in the past, and will do so again. To defend our civilization, we need to prepare for such potential catastrophes. For my work, it is about how variations in the carbon cycle exert control upon bioevolution and extinction. Today, our civilization faces the potential of a human-generated greenhouse climate change. I believe that major greenhouses have triggered extinctions in the past, and can do so again if Earth is hit by a major greenhouse. In my work, I isolated a greenhouse physiological killing mechanism that couples rapid greenhouse warming directly to vertebrate populations in ways that can trigger extinctions. Most people do not realize that today, every summer, environment heat is already killing mammalian embryos on a vast scale prior to any significant warming, and that an increased environmental heat load can only expand embryo death rates.

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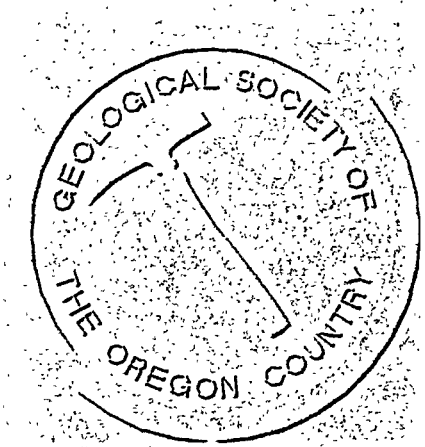

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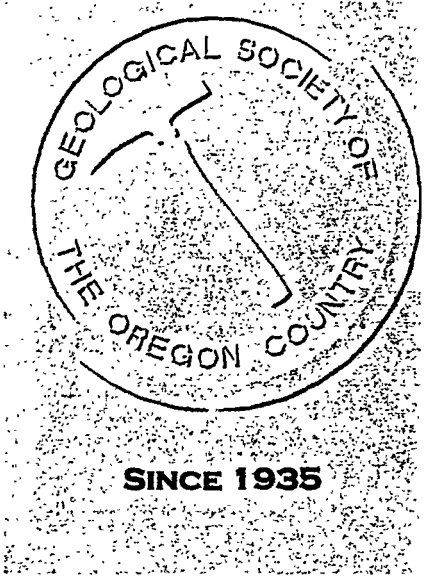

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THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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 $20.00 _____ **Family $30.00** _____ **Student $10.00** _____

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

GEOLOGICAL NEWSLETTER

THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
P.O. BOX 907, PORTLAND, OR 97207

VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 2
FEBRUARY 2001

FEBRUARY ACTIVITIES

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Leader: Taylor Hunt. For more information, call him at 503-662-4790.

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WELCOME

We welcome the following new member to the Geological Society of the Oregon Country

Allen Throop
Richard Romaine
Jim Versteeg
Marcia Marvin
Joy Miller

COMPLETELY FRACTURED GEOLOGY

By GSOC members traveling on Missoula Floods President's Field Trip

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The GSOC Board of Directors has voted to encourage this effort and has sent a letter of endorsement to Mr. Reed Jarvis of the consulting firm Jones & Jones, who are the coordinators for the project:

Mr. Reed Jarvis
Jones and Jones
105 S. Main street
Seattle, WA 98104

Dear Mr. Jarvis,

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Montana, to the Pacific Ocean. Founded in 1935, the Society has long been interested in studying and educating the public about the geology of the Pacific Northwest (what we call "the Oregon Country"). Consequently, we were pleased to learn about the current project on the Ice Age Floods and the possibilities it presents to inform the public about these catastrophic floods. We believe that the telling of this story will increase any visitor's or resident's understanding of the forces that shaped our great Pacific Northwest and the importance of understanding geology.

We support your work and will help in whatever capacity we can. We think it is a project worthy of support from both the private and public sector, and we wish you good luck in whatever you do.

Sincerely,

Ray Crowe
President, Geological Society of the Oregon Country

Anyone interested in endorsing this project may also do so. We suggest writing or sending emails to Ray Crowe. Address the comments to Mr. Reed Jarvis.

GSOC ANNUAL REPORTS

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The Vice President is responsible for the Second Friday talk each month. From April 2000 through January 2001, eight public presentations occurred. They ranged from the reaches of space with Jupiter's moon Io to microorganisms living in extreme environments, from the glaciers of the north Cascades to the depths of Crater Lake, from the volcanism of Hawaii to the case of the disappearing bridge during a recent Eliot Branch (Mt. Hood) glacier debris flow, and from predicting earthquakes and landslides to a tour of PSU's geology laboratories.

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The February presentation will focus on the geoarchaeology of the Willamette Valley, and the March Annual Banquet will feature the geology and archaeology of the times of Kennewick Man.
Sandra Adamson, Vice President

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New member packets were sent to 25 new members. The secretary had correspondence with Ewart Baldwin and Peter Baer related to their becoming Honorary Life Members plus correspondence related to gifts to the PSU Foundation by Rena Finlayson, Adrienne Bartlett, and Robert and Louise Gamer. The secretary also sent out announcements for four Board meetings and took minutes for three of those meetings.
Beverly Vogt, Secretary

ANNUAL REPORT - Treasurer - 2000

As Treasurer for the society this year, I have collected and distributed the mail each week; paid the bills; arranged to rent the Cramer Hall meeting room with Portland State University; and prepared the GSOC federal tax return and required forms to the Justice Department of Oregon and the Oregon Corporation Commissioner as required for our non-

profit organization. As of the end of year 2000, GSOC has 105 individual memberships and 41 family memberships, including 25 new members this year. The Annual Financial Report will be on file in the GSOC library after the Annual meeting in February.
Phyllis Thorne, Treasurer

ANNUAL REPORT - Business Manager - 2000

2880 newsletters were printed at cost of $600.30. Mailing costs were $309.28 and miscellaneous expenditures were #12.77. Copies were sent to all members, 12 libraries, 10 universities, 19 high schools, one outdoor recreation facility, and four personal complimentary.
Rosemary Kenney, Business Manager.

ANNUAL REPORT - Publications - 2000

Field Trip Guides were sold at evening meetings, totaling $141.50. Two Caravan cards were sold, totaling $2.00. Field Trip Guides are also sold at Nature of the Northwest Information Center, totaling $184.75. Total for Field Trip Guides sold is $326.25.
Rosemary Kenney, Publications.

ANNUAL REPORT - Calendar - 2000

12 calendar pages were included with the year's newsletters.
Evelyn Pratt, Calendar Editor.

ANNUAL REPORT - Publicity - 2000

A calendar of each month's events was sent via e-mail to the Oregonian's Science Page editor, Richard Hill, and later to Heidi Woods. Ordinarily an article about our activities has been printed in the Science Section on the first Wednesday of each month.
Evelyn Pratt, Publicity.

ANNUAL REPORT – Field Trips - YEAR 2000

1. JANUARY - Reynolds Aluminum Plant tour, Troutdale. Evelyn Pratt, leader
2. FEBRUARY - Triceratops and other OMSI exhibits. Dave Taylor of OMSI tour director
3. MARCH - Bretz Flood related geological features of Willamette Valley. Taylor Hunt, leader
4. APRIL - Mt Adams Ice Caves at Trout Lake. Taylor Hunt, leader
5. MAY - Mary's Peak near Corvallis, highest mountain in our Coast Range. Taylor Hunt, leader
6. JUNE –Coastal geology between The Capes and Cannon Beach. Evelyn Pratt, leader
7. JULY I - revisit of April's trip to the Ice Caves. Taylor and Jean Hunt, leaders
8. JULY II - Mt St Helens south side. Taylor and Jean Hunt, leaders
9. AUGUST - Ancient Columbia River Canyons of the Benson Plateau. Taylor and Jean Hunt, leaders
10. SEPTEMBER - The annual President's Field Trip. This year President Ray Crowe designed his trip to follow the effects of the Missoula Floods on the landscape of the Columbia River Plateau. Dr Richard Waite, Dr Gene Kiever, and Dr John Whitmer were field trip leaders. Taylor Hunt acted as wagon master in Ray's absence.
11. NOVEMBER - Boring Volcanics in the Portland area. Clay Keller, leader
12. DECEMBER – Minerals of different types in the stone façades and foundations of Portland's downtown buildings. Migmatites, metasomatic rocks and granites prevailed. And, we now know 'What Makes Bricks Red'. Taylor Hunt, leader

Taylor Hunt, Field Trip Director

ATTENTION GSOC MEMBERS – The following is a preview of the field trips we are anticipating this year. Consult your newsletter or website calendars for updates!!!

FIELD TRIP PLAN 2001

Taylor Hunt, Field Trip Chairman

1. January - Scabland Quarries – Sherwood Area
2. February - Island Seamount Quarys – Forest Grove Area

3. March - Geology of Portland – East side and Vancouver
4. April - Geology of Portland – West side, Beaverton/Forest Grove
5. May - Geology of Clackamas River Basin, a Paul Hammond field Trip of 1980
6. June - Mary's Peak Revisited – Corvallis
7. July - South side Mount St Helens
8. August - Where Did The River Go? – ancient Columbia River Channels exposed in the Gorge, Troutdale to Bonneville Dam.
9. September - President's Field Trip – Led by Sandy Adamson.

Also Taylor would like to invite you to these events:

February Sat 2/10/01...NOT a GSOC event but all welcome...Collection of Zeolites in quarries of Vancouver area...call Taylor Hunt.
March Sat 3/17/01...NOT a GSOC event but all welcome...Collecting field trip along Hwy 84 around the Dalles....call Taylor Hunt.

COMPLETELY FRACTURED GEOLOGY

Correct definitions adapted from AGI Dictionary of Geological Terms, 3rd Ed., Bates & Jackson, by E. Pratt

1. **Footwall:** The mass of rock beneath a fault, an ore body, or a mine working, especially the wall rock beneath an inclined vein or fault.
2. **Dry falls:** In Washington's coulee country, sites of 12,000-15,000 year old Missoula Floods waterfalls. Quaquaversal: Said of strata and structures that dip outward in all directions from a central point; a geologic structure such as a dome has a quaquaversal dip.
3. **Igneous complex:** An assemblage of closely associated, roughly same-age igneous rocks differing in form or composition. It may consist of volcanic rocks, intrusive igneous rocks, or both.
4. **Kink fold:** A fold with flat-lying limbs and a sharp angular hinge line.
5. **Graben:** A block, bounded by normal faults, that has dropped down. (Physical Geology 5th Ed., Plummer & McGeary. German word for ditch.)
6. **Structural depression:** A low place produced by deformation or displacement of rocks rather than by weathering or erosion.
7. **Boudin:** One of a series of structures found in sedimentary or metamorphic rocks in which a layer has been stretched, thinned, and broken at regular intervals into boudins or sausages.
8. **Whaleback bar:** An elongate mound of sand or gravel, formed in a river or channel, with the shape of a whale's back - steep at one end, sloping gradually downward toward the other.
9. **Pluton:** An igneous body that crystallized deep underground. Small plutons are called stocks; plutons over 100 square kilometers are called batholiths. (Physical Geology 5th Ed., Plummer & McGeary)

IN MEMORIAM

Alta Brooks Fosback Stauffer was born in Portland and raised in Lane County. She was an assistant principal for Lowell Grade School for 10 years while attending the University of Oregon, where she obtained her bachelor's and master's degree. She had a long and illustrious career in education and retired in 1982. She was an active member of GSOC, including being our field trip chairman for several years. She married Harold Stauffer in 1982. Those who enjoyed and led GSOC field trips will remember her well for her attention to our comfort and travel ease. She is survived by her second husband, one son, three grandchildren and one great grandchild. The family suggested remembrances to a scholarship in her name through the Oregon Retired Educators Assoc., Unit 29, 13623 N.E. Fremont St., Portland, OR 97230

DETECTING LIFE SIGNATURES

January 12, 2001
Friday Night Meeting

GSOC members were treated to a fascinating microbial world at the January Friday night meeting when Portland State University assistant professor Dr. Sherry Cady described her current research topics.

Dr. Cady's research involves distinguishing biological from non-biological signatures in the mineral record. Her work takes her to search for organisms that exist in extreme environments, such as pools with hot springs or frigid northern lakes. Her current venues include Yellowstone National Park, the Taupo Volcanic Zone in New Zealand, and Lake Pavilion in British Columbia. She has been studying living organisms in those environments as well as recent remains of the organisms and the structures that they create in order that fossilized biological records can be distinguished from non-biological records. Cady's research is funded by NASA's Astrobiology Institute.

The three main categories of her searches are:

- Microfossils – trace fossils of the organisms themselves
- Microbialites – structures built by the organisms
- Chemofossils – Biomarkers of recalcitrant organic compounds which are produced by the organisms or trace elements which are concentrated by the organisms

Her research interests includes studying preservation in silica rich rocks, carbonates and iron rich minerals.

At Yellowstone National Park, Cady is collecting samples from the edges of hot spring pools. Silica is constantly being deposited at the edges of the pool in a material called sinter. On the surface of the sinter is a microbial mat of thermophiles, or heat-loving organisms. These organisms are prokaryotic (genetically distinct unicellular organisms – see http://www.bact.wisc.edu/Bact303/MajorGroupsOfProkaryotes for more info). The organisms control where the silica is deposited, so that knobby structures called spicules are formed. The spicules eventually become columnar in form and surround the edges of the pool.

Dr. Cady prepares samples for study by dehydrating them and preparing images from a scanning electron microscope (SEM). She looks at living samples, samples which are several years old, and at the structures of the spicules for information about the living organisms and how they decay and become incorporated into the silica. As a comparison to the fossil record, Cady has observed these same spicule structures in a Devonian chert.

At the Taupo, New Zealand geothermal plant site, Cady is collecting non-biological accretions with laminated surfaces. The laminations are too tight and regular to have housed microbial mats, which create a porous surface. These samples can be compared to the porous layers in the spicules from Yellowstone Park and other such locations.

In a very different setting, Cady's research has taken her to the bottom of a frigid Lake Pavilion in British Columbia. There are various mound-like structures composed of carbonates on the bottom of the lake which are constructed primarily by prokaryotic organisms. The appearance of the mounds differ at different water depths, but the organisms and materials are essentially constant. This study was featured in the October 2000 issue of Nature magazine, which is available in the GSOC library.

Dr. Cady's work is timely because it helps other scientists who are looking for evidence of life on the planet Mars and in meteors. "If microorganisms emerged on early Mars, and if their early evolution paralleled that of Earth's earliest microbial populations, then the ancient Martian landscape is likely to have been riddled with ecosystems dominated by microbial mats and biofilms."

Carol Hasenberg

To view CNN interviews of Dr. Cady and to find out more about her research, go to the following link page from the PSU geology department website:
http://www.geol.pdx.edu/Biogeochem/default.asp

WEB TEASERS

Want to find out more about the search for Martian life? Duane Diller has located an article about the Martian ALH84001 meteorite on the Astronomy.com website:
http://www2.astronomy.com/Content/Dynamic/Articles/000/000/000/250xqqog.asp

Don't forget that annual **DUES PAYMENTS** have arrived! Please send your dues checks to the GSOC post office box (address on the inside cover of this newsletter. Think about all those great member benefits for a mere annual fee of $20 (individual)!!!

Annual Banquet

The Geological Society of the Oregon Country will be having its annual banquet on Sunday, March 18, 2001 (1-4:30 pm). The program topic will be "The Geological and Archaeological Times of Kennewick Man", with **Dr. James C. Chatters**, owner of Applied Paleoscience, specializing in archaeological and paleoecological data. Dr. Chatters' work is discussed in the December 2000 issue of National Geographic magazine. He also has a website regarding his work on Kennewick Man at http://kennewickman.paleo.net/. Also speaking will be a geological expert to be announced...

Location of the banquet will be the Sheraton Airport Hotel in Portland, Oregon, 8235 NE Airport Way, Portland. The hotel is located on the service road on the north side of Airport Way and plenty of free parking is available. Dinner price for GSOC members with guest is $23 each, non-GSOC members $28 each, dinner choices are London Broil (steak choice), Grilled Salmon, or Vegetarian.

Please fill out your banquet form below and send it in today with payment to guarantee your place, as we will be advertising to other organizations. Send your **payment with the form** to The Geological Society of the Oregon Country, P. O. Box 907, Portland, OR 97207.

cut here

GSOC ANNUAL BANQUET REGISTRATION FORM

Number in Party _____

Names of persons attending:

_____ Meal choice (circle one) Steak Salmon Vegetarian

_____ Meal choice (circle one) Steak Salmon Vegetarian

_____ Meal choice (circle one) Steak Salmon Vegetarian

_____ Meal choice (circle one) Steak Salmon Vegetarian

Amount Due:

_____Members and guests @ $23 each .....Amount due $_____

_____Non-members @ $28 each .....Amount due $_____

Total Amount due $_____

THE GEOLOGICAL NEWSLETTER

GSOC

FEBRUARY 2001

GEOLOGICAL SOCIETY
OF THE OREGON
COUNTRY
P. O. BOX 907
PORTLAND, OR 97207

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

2000-2001 ADMINISTRATION
BOARD OF DIRECTORS

President:
Ray Crowe – 503/640-6581
Vice-President:
Sandra Adamson – 503/667-6287
Secretary
Beverly Vogt – 503/292-6939
Treasurer
Phyllis Thorne – 503/292-6134

Directors:
Taylor Hunt (3 years) – 503/662-4790
Archie Strong (2 years) – 503/244-1488
Richard Donelson (1 year) – 503/654-1098

Immediate Past Presidents:
Carol Hasenberg - 503/282-0547
Beverly Vogt - 503/292-6939

THE GEOLOGICAL NEWSLETTER

Editor:
Carol Hasenberg – 503/282-0547
Calendar:
Evelyn Pratt – 503/223-2601

Business Manager:
Rosemary Kenney – 503/892-6514
Assistant Business Manager:
Cecelia Crater – 503/235-5158

ACTIVITIES:

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

FIELD TRIPS: Usually one per month, by private car, caravan, or chartered bus.

GEOLOGY SEMINAR: Fourth Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.

GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.

PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Suggest time and date be verified by phone: 503/235-5158 or 503/892-6514.

MEMBERSHIP: Per year from January 1: Individual--$20.00, Family--$30.00, Junior (under 18)/Student--$10.00.

PUBLICATIONS: THE GEOLOGICAL NEWSLETTER (ISSN 0270 5451), published monthly and mailed to each member. Subscriptions available to libraries and organizations at $10.00 per year. Individual Subscriptions $13.00 per year. Single Copies: $1.00. Order from:

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Ray Crowe
President, Geological Society of the Oregon Country

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ANNUAL REPORT - Treasurer - 2000

As Treasurer for the society this year, I have collected and distributed the mail each week; paid the bills; arranged to rent the Cramer Hall meeting room with Portland State University; and prepared the GSOC federal tax return and required forms to the Justice Department of Oregon and the Oregon Corporation Commissioner as required for our non-

profit organization. As of the end of year 2000, GSOC has 105 individual memberships and 41 family memberships, including 25 new members this year. The Annual Financial Report will be on file in the GSOC library after the Annual meeting in February.
Phyllis Thorne, Treasurer

ANNUAL REPORT - Business Manager - 2000

2880 newsletters were printed at cost of $600.30. Mailing costs were $309.28 and miscellaneous expenditures were #12.77. Copies were sent to all members, 12 libraries, 10 universities, 19 high schools, one outdoor recreation facility, and four personal complimentary.
Rosemary Kenney, Business Manager.

ANNUAL REPORT - Publications - 2000

Field Trip Guides were sold at evening meetings, totaling $141.50. Two Caravan cards were sold, totaling $2.00. Field Trip Guides are also sold at Nature of the Northwest Information Center, totaling $184.75. Total for Field Trip Guides sold is $326.25.
Rosemary Kenney, Publications.

ANNUAL REPORT - Calendar - 2000

12 calendar pages were included with the year's newsletters.
Evelyn Pratt, Calendar Editor.

ANNUAL REPORT - Publicity - 2000

A calendar of each month's events was sent via e-mail to the Oregonian's Science Page editor, Richard Hill, and later to Heidi Woods. Ordinarily an article about our activities has been printed in the Science Section on the first Wednesday of each month.
Evelyn Pratt, Publicity.

ANNUAL REPORT – Field Trips - YEAR 2000

1. JANUARY - Reynolds Aluminum Plant tour, Troutdale. Evelyn Pratt, leader
2. FEBRUARY - Triceratops and other OMSI exhibits. Dave Taylor of OMSI tour director
3. MARCH - Bretz Flood related geological features of Willamette Valley. Taylor Hunt, leader
4. APRIL - Mt Adams Ice Caves at Trout Lake. —Taylor Hunt, leader
5. MAY - Mary's Peak near Corvallis, highest mountain in our Coast Range. Taylor Hunt, leader
6. JUNE –Coastal geology between The Capes and Cannon Beach. Evelyn Pratt, leader
7. JULY I - revisit of April's trip to the Ice Caves. Taylor and Jean Hunt, leaders
8. JULY II - Mt St Helens south side. Taylor and Jean Hunt, leaders
9. AUGUST - Ancient Columbia River Canyons of the Benson Plateau. Taylor and Jean Hunt, leaders
10. SEPTEMBER - The annual President's Field Trip. This year President Ray Crowe designed his trip to follow the effects of the Missoula Floods on the landscape of the Columbia River Plateau. Dr Richard Waite, Dr Gene Kiever, and Dr John Whitmer were field trip leaders. Taylor Hunt acted as wagon master in Ray's absence.
11. NOVEMBER - Boring Volcanics in the Portland area. Clay Keller, leader
12. DECEMBER – Minerals of different types in the stone façades and foundations of Portland's downtown buildings. Migmatites, metasomatic rocks and granites prevailed. And, we now know 'What Makes Bricks Red'. Taylor Hunt, leader

Taylor Hunt, Field Trip Director

ATTENTION GSOC MEMBERS – The following is a preview of the field trips we are anticipating this year. Consult your newsletter or website calendars for updates!!!

FIELD TRIP PLAN 2001

Taylor Hunt, Field Trip Chairman

1. January - Scabland Quarries – Sherwood Area
2. February - Island Seamount Quarys – Forest Grove Area

3. March - Geology of Portland – East side and Vancouver
4. April - Geology of Portland – West side, Beaverton/Forest Grove
5. May - Geology of Clackamas River Basin, a Paul Hammond field Trip of 1980
6. June - Mary's Peak Revisited – Corvallis
7. July - South side Mount St Helens
8. August - Where Did The River Go? – ancient Columbia River Channels exposed in the Gorge, Troutdale to Bonneville Dam.
9. September - President's Field Trip – Led by Sandy Adamson.

Also Taylor would like to invite you to these events:

February Sat 2/10/01...NOT a GSOC event but all welcome...Collection of Zeolites in quarries of Vancouver area...call Taylor Hunt.
March Sat 3/17/01...NOT a GSOC event but all welcome...Collecting field trip along Hwy 84 around the Dalles....call Taylor Hunt.

COMPLETELY FRACTURED GEOLOGY

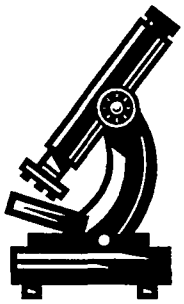
Correct definitions adapted from AGI Dictionary of Geological Terms, 3rd Ed., Bates & Jackson, by E. Pratt

1. **Footwall:** The mass of rock beneath a fault, an ore body, or a mine working, especially the wall rock beneath an inclined vein or fault.
2. **Dry falls:** In Washington's coulee country, sites of 12,000-15,000 year old Missoula Floods waterfalls. Quaquaversal: Said of strata and structures that dip outward in all directions from a central point; a geologic structure such as a dome has a quaquaversal dip.
3. **Igneous complex:** An assemblage of closely associated, roughly same-age igneous rocks differing in form or composition. It may consist of volcanic rocks, intrusive igneous rocks, or both.
4. **Kink fold:** A fold with flat-lying limbs and a sharp angular hinge line.
5. **Graben:** A block, bounded by normal faults, that has dropped down. (Physical Geology 5th Ed., Plummer & McGeary. German word for ditch.)
6. **Structural depression:** A low place produced by deformation or displacement of rocks rather than by weathering or erosion.
7. **Boudin:** One of a series of structures found in sedimentary or metamorphic rocks in which a layer has been stretched, thinned, and broken at regular intervals into boudins or sausages.
8. **Whaleback bar:** An elongate mound of sand or gravel, formed in a river or channel, with the shape of a whale's back - steep at one end, sloping gradually downward toward the other.
9. **Pluton:** An igneous body that crystallized deep underground. Small plutons are called stocks; plutons over 100 square kilometers are called batholiths. (Physical Geology 5th Ed., Plummer & McGeary)

IN MEMORIAM

Alta Brooks Fosback Stauffer was born in Portland and raised in Lane County. She was an assistant principal for Lowell Grade School for 10 years while attending the University of Oregon, where she obtained her bachelor's and master's degree. She had a long and illustrious career in education and retired in 1982. She was an active member of GSOC, including being our field trip chairman for several years. She married Harold Stauffer in 1982. Those who enjoyed and led GSOC field trips will remember her well for her attention to our comfort and travel ease. She is survived by her second husband, one son, three grandchildren and one great grandchild. The family suggested remembrances to a scholarship in her name through the Oregon Retired Educators Assoc., Unit 29, 13623 N.E. Fremont St., Portland, OR 97230

DETECTING LIFE SIGNATURES



January 12, 2001
Friday Night Meeting

GSOC members were treated to a fascinating microbial world at the January Friday night meeting when Portland State University assistant professor Dr. Sherry Cady described her current research topics.

Dr. Cady's research involves distinguishing biological from non-biological signatures in the mineral record. Her work takes her to search for organisms that exist in extreme environments, such as pools with hot springs or frigid northern lakes. Her current venues include Yellowstone National Park, the Taupo Volcanic Zone in New Zealand, and Lake Pavilion in British Columbia. She has been studying living organisms in those environments as well as recent remains of the organisms and the structures that they create in order that fossilized biological records can be distinguished from non-biological records. Cady's research is funded by NASA's Astrobiology Institute.

The three main categories of her searches are:

- Microfossils – trace fossils of the organisms themselves
- Microbialites – structures built by the organisms
- Chemofossils – Biomarkers of recalcitrant organic compounds which are produced by the organisms or trace elements which are concentrated by the organisms

Her research interests includes studying preservation in silica rich rocks, carbonates and iron rich minerals.

At Yellowstone National Park, Cady is collecting samples from the edges of hot spring pools. Silica is constantly being deposited at the edges of the pool in a material called sinter. On the surface of the sinter is a microbial mat of thermophiles, or heat-loving organisms. These organisms are prokaryotic (genetically distinct unicellular organisms – see http://www.bact.wisc.edu/Bact303/MajorGroupsOfProkaryotes for more info). The organisms control where the silica is deposited, so that knobby structures called spicules are formed. The spicules eventually become columnar in form and surround the edges of the pool.

Dr. Cady prepares samples for study by dehydrating them and preparing images from a scanning electron microscope (SEM). She looks at living samples, samples which are several years old, and at the structures of the spicules for information about the living organisms and how they decay and become incorporated into the silica. As a comparison to the fossil record, Cady has observed these same spicule structures in a Devonian chert.

At the Taupo, New Zealand geothermal plant site, Cady is collecting non-biological accretions with laminated surfaces. The laminations are too tight and regular to have housed microbial mats, which create a porous surface. These samples can be compared to the porous layers in the spicules from Yellowstone Park and other such locations.

In a very different setting, Cady's research has taken her to the bottom of a frigid Lake Pavilion in British Columbia. There are various mound-like structures composed of carbonates on the bottom of the lake which are constructed primarily by prokaryotic organisms. The appearance of the mounds differ at different water depths, but the organisms and materials are essentially constant. This study was featured in the October 2000 issue of Nature magazine, which is available in the GSOC library.

Dr. Cady's work is timely because it helps other scientists who are looking for evidence of life on the planet Mars and in meteors. "If microorganisms emerged on early Mars, and if their early evolution paralleled that of Earth's earliest microbial populations, then the ancient Martian landscape is likely to have been riddled with ecosystems dominated by microbial mats and biofilms."

Carol Hasenberg

To view CNN interviews of Dr. Cady and to find out more about her research, go to the following link page from the PSU geology department website:
http://www.geol.pdx.edu/Biogeochem/default.asp

WEB TEASERS

Want to find out more about the search for Martian life? Duane Diller has located an article about the Martian ALH84001 meteorite on the Astronomy.com website:
http://www2.astronomy.com/Content/Dynamic/Articles/000/000/000/250xqqog.asp

Don't forget that annual **DUES PAYMENTS** have arrived! Please send your dues checks to the GSOC post office box (address on the inside cover of this newsletter. Think about all those great member benefits for a mere annual fee of $20 (individual)!!!

Annual Banquet

The Geological Society of the Oregon Country will be having its annual banquet on Sunday, March 18, 2001 (1-4:30 pm). The program topic will be "The Geological and Archaeological Times of Kennewick Man", with **Dr. James C. Chatters**, owner of Applied Paleoscience, specializing in archaeological and paleoecological data. Dr. Chatters' work is discussed in the December 2000 issue of National Geographic magazine. He also has a website regarding his work on Kennewick Man at http://kennewickman.paleo.net/. Also speaking will be a geological expert to be announced...

Location of the banquet will be the Sheraton Airport Hotel in Portland, Oregon, 8235 NE Airport Way, Portland. The hotel is located on the service road on the north side of Airport Way and plenty of free parking is available. Dinner price for GSOC members with guest is $23 each, non-GSOC members $28 each, dinner choices are London Broil (steak choice), Grilled Salmon, or Vegetarian.

Please fill out your banquet form below and send it in today with payment to guarantee your place, as we will be advertising to other organizations. Send your **payment with the form** to The Geological Society of the Oregon Country, P. O. Box 907, Portland, OR 97207.

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GSOC ANNUAL BANQUET REGISTRATION FORM

Number in Party _____

Names of persons attending:

_____ Meal choice (circle one) Steak Salmon Vegetarian

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_____ Meal choice (circle one) Steak Salmon Vegetarian

Amount Due:

_____Members and guests @ $23 each .....Amount due $_____

_____Non-members @ $28 each .....Amount due $_____

Total Amount due $_____

THE GEOLOGICAL NEWSLETTER

GSOC

MARCH 2001

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INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 3
MARCH 2001

MARCH ACTIVITIES

Fri. Mar. 2, 12-1:30 PM: Ice Age Floods. Taylor Hunt & officer from Ice Age Institute. Central Library, 801 SW 10th St., Portland.

ANNUAL BANQUET Sunday, March 18. The Geological and Archaeological Times of Kennewick Man, Dr. James Chatters. 1-4:30 PM, Sheraton Airport Hotel, 8235 NE Airport Way, Portland.

Seminar: Wed. March 21, 8 PM: Chronological Development: Portland Geology & Areas Within 1 Day's Drive of Portland, Part III. Richard Bartels. Rm. S-17 Cramer Hall, PSU.

Field Trip Sat. March 24: Geology of Portland – East Side and Vancouver.
Leader: Taylor Hunt. Call 503-662-4790 for more information.

****

Preview of Coming Attractions:
Fri. April 6, 12:30-2 PM: A Cruise on the Yangtze River, China. Rosemary Kenney, Past President, GSOC. Central Library, 801 SW 10th St., Portland.
Fri. April 13, 8 PM: Steens Mountain Geology. Dan Braden, OAS member
Seminar: Wed. April 25, 8 PM: Chronological Development of Portland Geology & Areas Within 1 Day's Drive of Portland – Part IV. Richard Bartels. Rm. S-17 Cramer Hall, PSU
Field trip: Sat. April 28: Geology West of Portland – Beaverton to Forest Grove.
Leader: Taylor Hunt. Call 503-662-4790 for more information.
****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.

WELCOME

We welcome the following new member to the Geological Society of the Oregon Country

Dave Jonson
Wayne Schweinfest

FIELD TRIP PLAN 2001

For those of you who may have missed this item in last month's newsletter, here is the tentative itenerary for this year's field trips. Look for updates in the schedule section of the newsletter and on the website.
Taylor Hunt, Field Trip Chairman

1. January - Scabland Quarries – Sherwood Area
2. February - Island Seamount Quarys – Forest Grove Area
3. March - Geology of Portland – East side and Vancouver
4. April - Geology of Portland – West side, Beaverton/Forest Grove
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6. June - Mary's Peak Revisited – Corvallis
7. July - South side Mount St Helens
8. August - Where Did The River Go? – ancient Columbia River Channels exposed in the Gorge, Troutdale to Bonneville Dam.
9. September - President's Field Trip – Led by Sandy Adamson.

Reminders on what to bring on the field trips:

- Taylor will be charging a small fee to reimburse himself for the printing costs.
- Bring boots, raincoats, layered clothing. Be prepared to get wet and muddy.
- Pack a lunch unless a lunch destination is announced, then bring lunch money.
- Be prepared to car pool.

Taylor may also plan to use busses as transportation on a couple of the field trips this year. This will be announced well in advance. A fee will be charged to cover the costs of the bus and driver.

WEB TEASERS

Glossary of Geological Terms
This glossary of geologic terms from Steven M. Richardson of Iowa State University is based on the glossary in Earth: An Introduction to Geologic Change, by S. Judson and S.M. Richardson (Englewood Cliffs, NJ, Prentice Hall, 1995):
http://www.geology.iastate.edu/new_100/glossary.html

National Park Service
Park Geology Tour of US National Parks, features the following topics:

- Basin and Range
- Caves
- Colorado Plateau
- Fossils
- Glaciers
- Hot Springs
- Human Use
- Mountain Building
- Oldest Rocks
- Plate Tectonics
- River Systems
- Sand Dune
- Shorelin eGeology
- Volcanoes
- Geology Photo Database

http://www.aqd.nps.gov/grd/tour/

Scablands in Our Backyard

Taylor Hunt leads field trip to quarries and Missoula Flood Scablands in the Sherwood area

On Saturday, January 27, Taylor Hunt led a field trip in the southern portion of the Tualatin Valley to explore Missoula Flood features, including flood channels, scablands, and depositional features. Also included were tours of several Columbia River

basalt quarries, which gave us an opportunity to examine flows of the Columbia River Basalt Group, plus overlying thin soils. The originally thicker overlying soils are believed to have been stripped away by the approximately 22 floods (Waitt, 1996) that poured into the southeastern part of the Tualatin Valley from the Willamette Valley via a channel in the Lake Oswego area during the catastrophic floods. The height of the divide between the Willamette and Tualatin River drainages is estimated to have been about 240 ft.

Most of the trip took place in the Sherwood 7-1/2 minute quadrangle. The group met in the parking lot of the Tualatin City Hall and Library. We traveled north and west across Onion Flats to observe flat-lying sediments deposited by the flood, plus various channels cut by flood waters. We then headed south and stopped at the C.C. Meisel and Morse Brothers quarries in Columbia River basalt, observing various basalt flow features and jointing characteristics plus very thin overlying soil. Allison (1978b) describes this thin soil as scabland resulting from erosion from the floods believed to have reached elevations of over 210 feet in the Tualatin Valley.

After lunch in the Morse Brothers parking lot, we stopped at the old Tonquin electric railroad station and walked the train tracks looking for rocks carried into the area via flood waters. We found numerous quartzite pebbles, basalt quarry rock, plus some slag from unidentified source areas. After a stop in a new development at the end of Helenous Road to observe the scablands and another stop at the Tigard Sand and Gravel quarry to imagine the roaring flood waters over our heads scouring out channels and carrying away overlying sediments, we concluded the field trip high on Dahlke Lane, on top of the scablands where boulders had been moved by the floodwaters.

This trip offered us a rare opportunity to observe flood features and to visit active basalt quarries rarely open to the public. It also served as a reminder to us in the Pacific Northwest that geology has had an active role in creating the scenery around us—and that truly unusual geology can be seen in our immediate surroundings.

References and additional reading

Allison, I.S., 1978a, Late Pleistocene sediments and floods in the Willamette Valley, pt. 1: The Ore Bin, v. 40, no. 11, p. 177-191.

----------, 1978b, Late Pleistocene sediments and floods in the Willamette Valley, pt. 2: The Ore Bin, v. 40, no. 12, p. 193-202.

Beeson, M.H., Tolan, T.L., and Madin, I.P., 1989, Geologic map of the Lake Oswego Quadrangle, Clackamas, Multnomah, and Washington counties, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-59, 1:24,000.

Schlicker, H.G., and Deacon, R.J., 1967, Engineering geology of the Tualatin Valley region, Oregon: Oregon Department of Geology and Mineral Industries Bulletin 60, 103 p.

Waitt, R.B., 1996, Numerous colossal Missoula floods through Columbia Gorge and Portland-Vancouver basin: Geological Society of America Abstracts with Programs, v. 28, no. 5, p. 120-121.

Wilson, D.C., 1998, Post-middle Miocene geologic evolution of the Tualatin basin, Oregon: Oregon Geology, v. 60, no. 5, p. 99-116..

Geology Tour of Southwest Portland Architecture - The Gneiss (Nice) Rocks of Portland - or - "Why Are Bricks Red?"

Summary Report on this December 28, 2000, Fieldtrip

This walking tour of the South Portland Downtown area unknowingly satisfied a broad variety of interests. Among the 13 or more attendees were artists, geologists, sociologists, downtown entrepreneurs, and fresh air enthusiasts, even a student from Seattle. The interests ranged from architectural to socio-historical to mineralogical to artistic to commercial.

The tour included 21 building sites dating from 1860 (the rubble wall and base for St Mary's Academy, Fourth and Market St. built by

parishioners who hauled discarded Belgian basalt ship-ballast from the Clay Street wharf) to early 1980"s (Pac West/Key Bank with polished "Blue Pearl" larvikite from Finland). It also included 9 statues or artifacts, from the statues and their base-rock in the park blocks to the pink gneiss plaque marking the last historic and huge Sycamore tree remaining of the original Park Blocks landscaping.

The oldest rock seen on this tour was 1.8 billion years old (red Cold Springs granite from Minnesota), and the State Office Building at 1400 SW Fifth, one of three buildings using this material, was the only one in the tour enclosed by ceramic panels. In various rock materials, fossils and crystal formations could be easily identified.

Sources of natural stone materials ranged from Oregon (basalt) to Wyoming and Indiana (sandstone) to Minnesota and California (granite) to Belgium (basalt, used on Clay Street within a few thousand feet of a basalt quarry source!), to Finland (Pac West's larvikite) to Italy (1st Interstate's marble), and more. Others included man-made brick, baked in varying shades of normal 'red', and overbaked (black) brick. Most interesting example of extreme variation was the Korean Church, Clay St between 10th and Park, where the Church rose sure and firm in spite of the varying size and thickness of the charred black brick which caused the mortar lines to waver and weave across the face of the structure. Straight across the street from this Church the eye questions a very recent structure – a mural in the new brick wall of an apartment building – Was the mural carved into the brick wall or was the carved brick installed as a mural-puzzle one brick at a time? Our conclusion...one carved brick at a time!

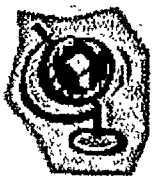
Other grand brick or stone 'art work' may be seen at the TOP of Lincoln High School (Broadway and Market), at Columbia Plaza (Columbia and Sixth), at City Hall (alternated sandstone and pink granite), at First Congregational Church (checkerboards of alternate colored and textured basalts), at the Portland Art Museum, and the Masonic Temple. Especially notice, too, the Sixth Church of Christ Scientist building, Columbia and Park, which though built over 65 years ago, still looks like new brick today, new and crisp.

Among architects of early South Portland buildings, Pietro Belluschi stood out.

A delightful discovery happened at the Portland Historical Society Building....on display in the right-hand lower court yard is an early to mid-1800's grist mill used in the Portland area. It's made of a 'floods' erratic and has more history to offer than originally thought (thanks to the Masters student from Seattle!).

The tour lasted from 9:00 am to 1:30 pm, with only one short break. A lunch break and more time at some sites could easily fill a sunny day.

Jean Hunt
1/31/2001



No Ringers Please

Taylor Hunt is offering a special prize for a new member (anyone who has joined in the last year) who can get the most correct. Send your answers to Taylor Hunt or e-mail to:
hunt6422@e-mail.msn.com

1. How may fossils be preserved?
2. What value are they to a geologist?
3. Is there any evidence of an uncomformity at the top of the Cambrian?
4. What are the four domes of early Ordovician time?
5. How did the Permian close?

BOOK REVIEW

Islands & Rapids – a Geologic Story of Hells Canyon by Tracy Vallier
Published by Confluence Press of Lewis & Clark State College: Lewiston, Idaho.
ISBN#1-881 090-30-2

Vallier started his work in Hells Canyon in the early 60's. He states the Canyon had been his mentor and comrade for over 35 years. His best friend, a four-pound hammer, while he rhetorically asked the endless question of what was the origin and history of the rocks he was cracking. The theories of plate tectonics added extensively to his understanding of the geologic axiom of uniformitarianism, which holds that "the present is the key to the past". Between 1976 & 1988 he was involved in offshore and onshore studies of the Aleutian, Tonga and Marianas island arcs, while working for the USGS.

Vallier's laboratory is a one-mile deep, 100-mile long canyon composed of an Ophiolitic series jammed into a subduction trench, uplifted and cut down by the Snake River. "Rapids have played an important role in the creation of Hells Canyon. The pounding and swirling turbulence of the rivers effervescent rapids have continued to cut the canyon ever deeper as the relentless tectonic forces lift the landscape ever higher."

The geology of Hells Canyon is a very complicated story of Pre-Cenozoic, Cenozoic and Late Quaternary rocks and deposits. But like any good book, it can be broken down into chapters with many segments albeit backwards, or in other words from the lowest, oldest rocks to the top or youngest rocks. Vallier describes how he identifies the stratified and intrusive rock of the pre Cenozoic and the Tertiary gravels below the CRB's from the Quantinary landslides/slump deposits, river terraces and alluvial fans. The effects of the Bonneville Floods and the layers of Mazama Ash are discussed in the narrative.

The history of the Snake River was the most fascinating part of the book for me. It would seem that the Snake River began as a small tributary of the Salmon River with its headwaters in the Seven Devils area. The Snake River at that time flowed into a large lake of southern Idaho. That lake flowed out to California through what we now know as the Owyhee River (determined by the fossil record of snails).

As the original Snake continued eroding its headwaters south in the Pleistocene, it captured Lake Idaho. This extra water helped cut Hells Canyon. The canyon was cut so fast that the new Snake River actually cut down below the grade of the Salmon making this river a tributary of the Snake River.

Even though the book has 151 pages of narrative, the first 42 pages are the bulk of the text. The next 81 pages are devoted to a geologic guide of the Canyon in two parts, 1) Hells Canyon Dam to the mouth of the Grand Rhonde River and 2) Oxbow Dam to the Hells Canyon Dam. The balance is Bibliography, Glossary, Safety in the Canyon and Acknowledgements.

The reading could be considered technical but a second year geology student would find it easy and enjoyable. The biggest hurdle is the captions for the figures and pictures. It is difficult in places to tell which pictures go with what captions. However I highly recommend this book to all people who yearn to know the answer to the question of why is this here and how did it happen?

Taylor Hunt

Don't forget that annual **DUES PAYMENTS** have arrived! Please send your dues checks to the GSOC post office box (address on the inside cover of this newsletter. Your **payment must be received by March 15, 2001**, to be listed in the 2001-2002 Membership Directory.

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Number in Party _____

Names of persons attending:

_____ Meal choice (circle one) Steak Salmon Vegetarian

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Total Amount due $_____

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GSOC

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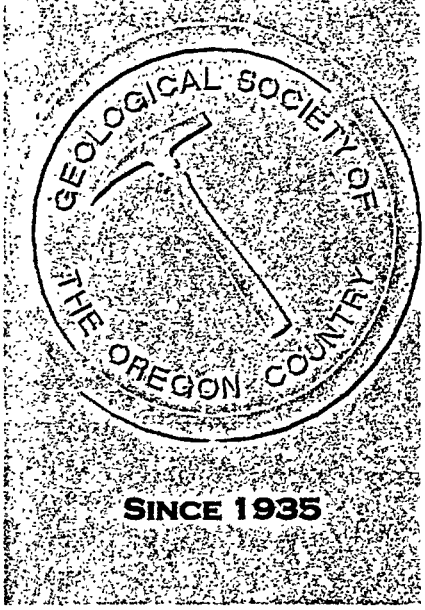

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- http://www.wsspc.org/links/weblinks.html
- http://mceer.buffalo.edu/infoService/faqs/edulinks.asp
- http://www.geophys.washington.edu/seismosurfing.html

And last, but not least, there's the SAND ROSE, or what a pendulum does when it gets all shook up, by popular demand:
http://www.gaelwolf.com/pendulum.html

GEOLOGICAL SNAPSHOTS

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The main reason that the accelerations were low was that the earthquake rupture was located 52 kilometers below the earth's surface. What happens to the seismic waves as they travel through the rock layers to the surface is called **attenuation**. Basically, the seismic waves become smaller in amplitude as they travel from the source and spread out spatially, similar to what happens to light waves or sound waves. And like light waves or sound waves, the amount of dissipation depends on the medium in which the waves are traveling. Seismologists are still collecting data to determine what attenuation relationships to use for the Pacific Northwest, because there just haven't been enough earthquakes to accurately determine them.

BUILDING DAMAGE

One of the objectives of the DOGAMI team was to observe locations of building damage and catalogue

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2. Where was the damage concentrated
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In general, building damage was localized in areas where these conditions occurred:

1. The buildings were poorly constructed. For the most part, damage occurred in buildings (or chimneys) which were constructed of unreinforced masonry (URM). Typically a URM building is a brick masonry building built before modern building codes were established. Most are older than the 1950's. In addition to being inherently weak without steel reinforcing bars, these buildings also are in a deteriorated condition. Even if some seismic upgrade work was performed, the building may have suffered damage, sometimes major damage.
2. Soil was soft, amplifying ground shaking. The damage in downtown Seattle and the Seattle industrial district was in soft fill or bay-type soil. Shaking is much stronger on these types of soils.
3. Ground failures often occurred as an accompaniment to building damage. Ground failures were very prevalent in the Seattle industrial district, Harbor Island, and other locations. Ground failure could be subtle as cracking of pavements or a slight settlement of a building or the soil around it. It doesn't take a very wide crack in the ground to affect the building on it. More spectacular examples of ground failures included sand boils, slumping, landslides and lateral spreading.

In the Seattle Pioneer Place area, many URM buildings were damaged. Damage usually consisted of parapet wall collapse, or diagonal cracking at the upper corner(s) of the building. In a few cases the lower piers of the building exhibited diagonal cracking. Buildings constructed of reinforced concrete showed little to no damage. A few concrete buildings were damaged in the industrial district, where the soil seemed to be exceptionally soft with widespread ground failure. The most notable of these was the Sodo Center (Starbucks HQ), which was an older concrete building with a brick veneer. Widespread ground cracking was found around this building by the team.

GROUND FAILURES

Ground failures which occur commonly in earthquakes are

1. Liquefaction – this occurs in loose sand or fine gravels with a high water table. As the loose granular material starts to settle during the shaking, it becomes suspended in the groundwater. The whole mass then behaves like a liquid until the water pressure disperses, either by shooting up out of the ground (sand boils) or by slumping away.
2. Lateral spreading – is one of the results of liquefaction. If a large liquefied soil mass is on a slope, even a very shallow slope, it will move downhill, creating ground settlement, cracking and slumping.
3. Landslides – these are steep slope failures due to ground shaking. Often the ground is wet and has a slick surface to slide on.

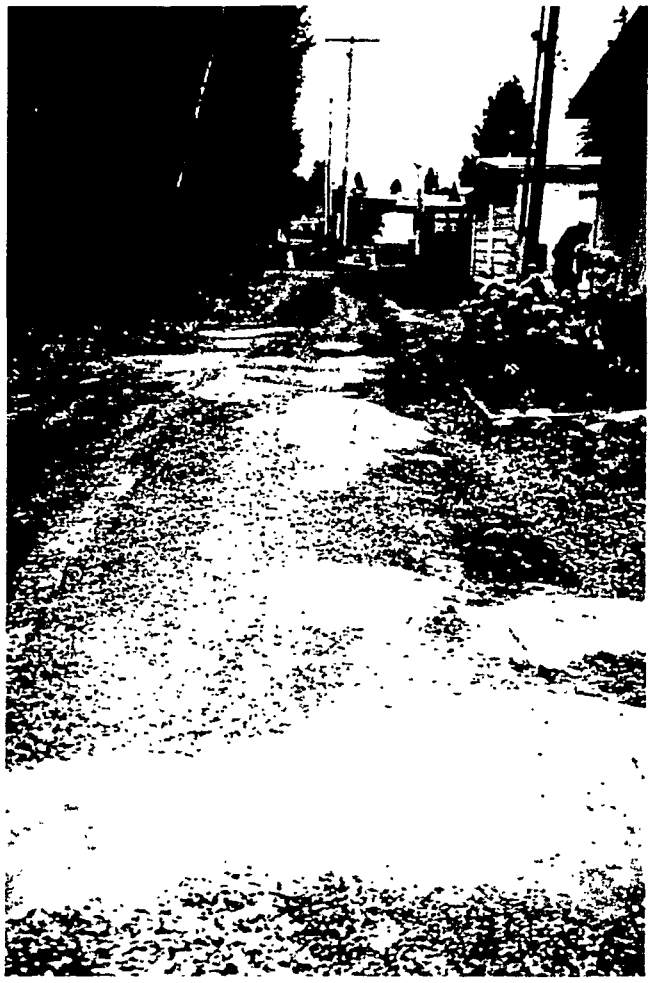
The team found lots of ground failures in the Seattle industrial district and on Harbor Island. The most spectacular example of liquefaction viewed by the team, though, was in Tumwater at the Sunset Lake Mobile Home Park. Sand boils had occurred in many areas of this park, and one of the streets had broken apart and slid into the lake. This area had been a natural spring and peat bog until the mobile home park was developed. Natural soil horizons could be viewed below the cracked pavement of the street.

Few landslides occurred as a result of the earthquake. The team observed a landslide on a very steep hillside in West Seattle. The dry weather conditions prior to the earthquake were the reason for such few landslides. Had normal winter (rainy) conditions been in effect, the number of landslides would have been orders of magnitudes higher.

In conclusion, the DOGAMI team viewed damage from the Nisqually earthquake, both of buildings and ground failures. The team observed that all of the damage was closely related to the soil conditions. You can see some of the team's photos on the following page.

Lateral Spreading at Sunset Lake Mobile Home Park

Sand Boils at Sunset Lake Mobile Home Park



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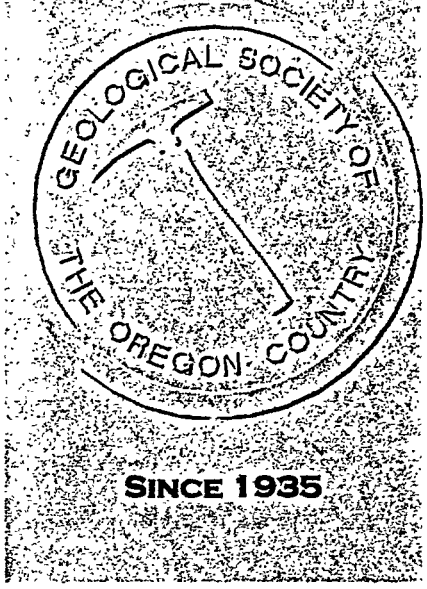

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In general, building damage was localized in areas where these conditions occurred:

1. The buildings were poorly constructed. For the most part, damage occurred in buildings (or chimneys) which were constructed of unreinforced masonry (URM). Typically a URM building is a brick masonry building built before modern building codes were established. Most are older than the 1950's. In addition to being inherently weak without steel reinforcing bars, these buildings also are in a deteriorated condition. Even if some seismic upgrade work was performed, the building may have suffered damage, sometimes major damage.
2. Soil was soft, amplifying ground shaking. The damage in downtown Seattle and the Seattle industrial district was in soft fill or bay-type soil. Shaking is much stronger on these types of soils.
3. Ground failures often occurred as an accompaniment to building damage. Ground failures were very prevalent in the Seattle industrial district, Harbor Island, and other locations. Ground failure could be subtle as cracking of pavements or a slight settlement of a building or the soil around it. It doesn't take a very wide crack in the ground to affect the building on it. More spectacular examples of ground failures included sand boils, slumping, landslides and lateral spreading.

In the Seattle Pioneer Place area, many URM buildings were damaged. Damage usually consisted of parapet wall collapse, or diagonal cracking at the upper corner(s) of the building. In a few cases the lower piers of the building exhibited diagonal cracking. Buildings constructed of reinforced concrete showed little to no damage. A few concrete buildings were damaged in the industrial district, where the soil seemed to be exceptionally soft with widespread ground failure. The most notable of these was the Sodo Center (Starbucks HQ), which was an older concrete building with a brick veneer. Widespread ground cracking was found around this building by the team.

GROUND FAILURES

Ground failures which occur commonly in earthquakes are

1. Liquefaction – this occurs in loose sand or fine gravels with a high water table. As the loose granular material starts to settle during the shaking, it becomes suspended in the groundwater. The whole mass then behaves like a liquid until the water pressure disperses, either by shooting up out of the ground (sand boils) or by slumping away.
2. Lateral spreading – is one of the results of liquefaction. If a large liquefied soil mass is on a slope, even a very shallow slope, it will move downhill, creating ground settlement, cracking and slumping.
3. Landslides – these are steep slope failures due to ground shaking. Often the ground is wet and has a slick surface to slide on.

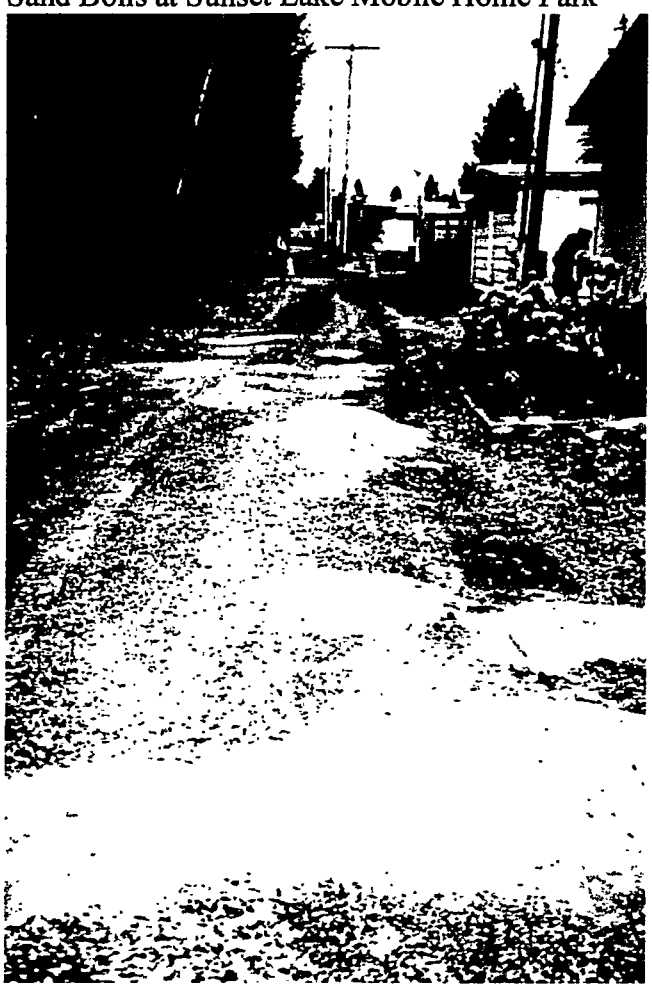
The team found lots of ground failures in the Seattle industrial district and on Harbor Island. The most spectacular example of liquefaction viewed by the team, though, was in Tumwater at the Sunset Lake Mobile Home Park. Sand boils had occurred in many areas of this park, and one of the streets had broken apart and slid into the lake. This area had been a natural spring and peat bog until the mobile home park was developed. Natural soil horizons could be viewed below the cracked pavement of the street.

Few landslides occurred as a result of the earthquake. The team observed a landslide on a very steep hillside in West Seattle. The dry weather conditions prior to the earthquake were the reason for such few landslides. Had normal winter (rainy) conditions been in effect, the number of landslides would have been orders of magnitudes higher.

In conclusion, the DOGAMI team viewed damage from the Nisqually earthquake, both of buildings and ground failures. The team observed that all of the damage was closely related to the soil conditions. You can see some of the team's photos on the following page.

Lateral Spreading at Sunset Lake Mobile Home Park

Sand Boils at Sunset Lake Mobile Home Park



THE GEOLOGICAL NEWSLETTER

GSOC

MAY 2001

GEOLOGICAL SOCIETY
OF THE OREGON
COUNTRY
P.O. BOX 907
PORTLAND, OR 97207

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Bruce and Marianne Skerry
Denise Cramer
Robert Ellis
Brad Yazzolino
Nadine Fiedler
Shirley Paulson
Robert Bogar

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April 13, 2001
Dan Braden, speaker

The past couple of months should have been great for GSOC members who also happen to be archaeology buffs! First, we had that excellent talk by Dr. James Chatters on Kennewick Man. Then, last month's excellent talk by Dan Braden of the Oregon Archaeology Society!

Braden is a self-styled "dig bum" who travels around working on various archaeology projects. He and his wife Diane have worked on the eastern Oregon site near Steens Mountain and a host of other sites in Oregon. The eastern Oregon site is a non-intrusive study which is being conducted under the supervision of Dr. Lyle Hubbard of Portland Community College.

The project near Steens Mountain has been in process for about five years. The team includes Dr. Hubbard, his wife and team coordinator Charlie, Diane, and Dan Braden. The work consists of finding artifacts or anomalies which may be artifacts on the site, cataloging the finds and leaving the site "as is".

The site geology is an ancient lakebed in the northwestern most tip of the American Great Basin. The oldest date of the site is between the time that water occupied the lake in the Ice Age and 1300 years ago, when the Paiute, Shoshonean, and Ute ("Numic") peoples are believed to have begun living in the area. According to Braden, the Paiute have an oral history which indicates the presence of a different group using the region in antiquity.

The **artifacts** found on the site include:

- Many obsidian **biface points and projectile points**. There is a nearby source of obsidian, and many cobbles in a local stream are obsidian.
- The site contains many **petroglyphs** (ancient picture art which has been incised into the rocks). Braden also had a slide of a rock painting (pictograph) found at the site.
- Rock walls and **caves** are found on the slopes of hills above the ancient lakebed. An exceptional petroglyph was found in the largest of the caves.
- **Rock crosses** are formed in the paths below the caves.
- Several "**rock cairn**" anomalies which may be caches or graves.
- **Seed grinding equipment** including several patates which were used by the Paiutes and also a mortar that presumably predates the Paiutes.

One subject discussed frequently by Braden was the difficulty faced by archaeologists in dating sites of this type. Often dates are associative with types of stone tools used by the occupants. Three different types of projectile points were found on the site. There were stemmed points with a straight stem, split stemmed points in which the base of the point flares into lobes on either side of the stem, and the "desert side notch" which has an asymmetrical stem.

The other discussion on dating involved dating the petroglyphs. A reliable method of dating these is yet to be found, although a promising method involves dating the "desert varnish", which is actually a microbial secretion on the rock surface. There is a current controversy in using the method as to whether the specimens are contaminated by other organic material.

In addition to the dating problems, Braden discussed the possible interpretations that could be given to the petroglyph forms. Several of the petroglyphs are examples of what is known as the Great Basin abstract curvilinear style. The designs are circles, dots and similar curvy abstract forms with an occasional anthropomorphic (man-like) figure. This is a good lead-in for this month's web teasers...so signing off...

Carol Hasenberg

Want to learn more about petroglyphs, desert varnish and other cool archaeological stuff? I suggest you check out these web sites:

The rock art dating controversy:
http://rockart.esmartweb.com/general.html

A general article on desert varnish:
http://www.desertusa.com/magdec97/varnish/dec_varnish.html

A rock art article with some nice photos:
http://www.artifaqs.org/rock_art_and_petroglyphs.htm

300 Petroglyph links – have fun!
http://www.mysteries-megasite.com/main/bigsearch/petro.html

Conference on Numic Peoples:
http://www.library.arizona.edu/users/jlcox/fall99/421-521/insitu.htm

More on Great Basin abstract curvilinear petroglyphs:
http://www.jimpowers.com/petro.htm
http://www.geocities.com/Athens/Acropolis/5579/utahrockart.html

VOLUNTEERING OPPORTUNITY!!!

Cecelia Crater has been setting up our noon meetings for a number of years now, and she plans to retire after the May 2001 noon meeting. She has done a terrific job for GSOC. **Thank you, Cecelia!**

The noon meeting coordinator position is critical, and we really do need a new active person to help with this. All of us GSOC linch-pins are booked to the hilt! If **YOU COULD HELP** by doing this job, you would be performing an excellent service!

The noon meeting coordinator does the following:

- **Reserves the room** at the library for eight or nine meetings a year.
- **Lines up speakers** for the meetings. Our noon meeting speakers are often GSOC members with slides of local geology or geology from their travels.
- **Special Bonus** – Your fearless newsletter editor, Carol S Hasenberg, is volunteering to give a noon talk next fall, of the slides she took of the Nisqually earthquake. One speaker lined up!!!

Radiometric Dating

Adapted from the USGS publication, "Geologic Time"

A chemical element consists of atoms with a specific number of protons in their nuclei but different atomic weights owing to variations in the

number of neutrons. Atoms of the same element with differing atomic weights are called isotopes. Radioactive decay is a spontaneous process in which an isotope (the parent) loses particles from its nucleus to form an isotope of a new element (the daughter). The rate of decay is conveniently expressed in terms of an isotope's half-life, or the time it takes for one-half of a particular radioactive isotope in a sample to decay. Most radioactive isotopes have rapid rates of decay (that is, short half-lives) and lose their radioactivity within a few days or years. Some isotopes, however, decay slowly, and several of these are used as geologic clocks. The parent isotopes and corresponding daughter products most commonly used in radiometric dating are listed below:

Parent Isotope	Stable Daughter Product	Currently Accepted Half-Life Values
Uranium-238	Lead-206	4.5 billion years
Uranium-235	Lead-207	704 million years
Thorium-232	Lead-208	14.0 billion years
Rubidium-87	Strontium-87	48.8 billion years
Potassium-40	Argon-40	1.25 billion years
Samarium-147	Neodymium-143	106 billion years
Carbon-14	Nitrogen-14	5730 years

The mathematical expression that relates radioactive decay to geologic time is called the age equation and is:

$$t = \frac{1}{\lambda}\ln\left(1+\frac{D}{P}\right)$$

Where t is the age of the rock or mineral specimen,
D is the number of atoms of a daughter product today,
P is the number of atoms of the parent isotope today,
ln is the natural logarithm of the expression in parentheses,
and λ is the appropriate decay constant.

The decay constant for each parent isotope is related to its half-life, $t^{1/2}$, by the following expression:

$$t^{1/2} = \frac{\ln 2}{\lambda}.$$

Dating rocks by these radioactive timekeepers is simple in theory, but the laboratory procedures are complex. The numbers of parent and daughter isotopes in each specimen are determined by various kinds of analytical methods. The principal difficulty lies in measuring precisely very small amounts of isotopes.

The potassium-argon method can be used on rocks as young as a few thousand years as well as on the oldest rocks known. Potassium is found in most rock-forming minerals, the half-life of its radioactive isotope potassium-40 is such that measurable quantities of argon (daughter) have accumulated in potassium-bearing minerals of nearly all ages, and the amounts of potassium and argon isotopes can be measured accurately, even in very small quantities. Where feasible, two or more methods of analysis are used on the same specimen of rock to confirm the results.

Another important atomic clock used for dating purposes is based on the radioactive decay of the isotope carbon-14, which has a half-life of 5,730 years. Carbon-14 is produced continuously in the Earth's upper atmosphere as a result of the bombardment of nitrogen by neutrons from cosmic rays. This newly formed radiocarbon becomes uniformly mixed with the non-radioactive carbon in the carbon dioxide of the air, and it eventually finds its way into all living plants and animals. In effect, all carbon in living organisms contains a constant proportion of radiocarbon to non-radioactive carbon. After the death of the organism, the amount of radiocarbon gradually decreases as it reverts to nitrogen-14 by radioactive decay. By measuring the amount of radioactivity remaining in organic materials, the amount of carbon-14 in the materials can be calculated and the time of death can be determined. For example, if carbon from a sample of wood is found to contain only half as much carbon-14 as that from a living plant, the estimated age of the old wood would be 5,730 years.

The radiocarbon clock has become an extremely useful and efficient tool in dating the important episodes in the recent prehistory and history of man, but because of the relatively short half-life of carbon-14, the clock can be used for dating events

that have taken place only within the past 50,000 years.

GEOQUIZ

Congradulations to Geoquiz 1 winner **Linda Wilson!** Linda got 4 out of 5 correct on the first Geoquiz. She wins a piece of Arkansas quartz. Linda, contact Taylor Hunt to get your prize!!!

We're still looking for more entries for last month's quiz so send them to Taylor!!!

This month's quiz - **everybody can play**!!!

Taylor Hunt is offering a **Cambrian age fossil** for a GSOC member who can get the most correct. Send your answers to Taylor Hunt or e-mail him at: hunt6422@e-mail.msn.com

1. What proportion of geologic time is Precambrian?
2. If you have two sedimentary layers, one is green and one is red, without an unconformity, what is the cause of the color difference? Hint – this occurs in Glacier National Park.
3. For what economic product is the Pennsylvanian period noted for?
4. Give the type section (typical sequence of rock layers) for the Mississipian period?
5. What is the difference between soil formed from basaltic rock versus the soil formed from rhyolitic rock?

Don't be afraid to look up the answers!

UPDATE ON THE PRESIDENT'S FIELD TRIP

Look for a schedule and itenerary for the trip in next month's newsletter. An application form will also be printed in next month's newsletter.

The current plans for the trip are to do a five day tour of the Willamette Valley with emphasis on the geology of the Oregon Wine Country. Fellow GSOC'er and wine enthusiast Dr. Scott Burns will be leading the trip for one of the days. The trip is planned to occur on or near the Labor Day weekend.

Keep you posted!

GEOLOGICAL TIME CHART

Rusty on your geological time chart? Here's the latest version from the USGS web site:

Phanerozoic Eon (544 ma to present)
- Cenozoic Era (65 ma to present)
  - Quaternary Period (1.8 ma to present)
    - Holocene Epoch (8,000 years ago to present)
    - Pleistocene Epoch (1.8 ma to 8,000 years ago)
  - Tertiary Period (65 to 1.8 ma)
    - Pliocene Epoch (5.3 to 1.8 ma)
    - Miocene Epoch (23.8 to 5.3 ma)
    - Oligocene Epoch (33.7 to 23.8 ma)
    - Eocene Epoch (55.5 to 33.7 ma)
    - Paleocene Epoch (65 to 55.5 ma)
- Mesozoic Era (248 to 65 ma)
  - Cretaceous Period (145 to 65 ma)
  - Jurassic Period (213 to 145 ma)
  - Triassic Period (248 to 213 ma)
- Paleozoic Era (544 to 248 ma)
  - Permian Period (286 to 248 ma)
  - Carboniferous Period (360 to 286 ma)
    - Pennsylvanian Period (325 to 286 ma)
    - Mississippian Period (360 to 325 ma)
  - Devonian Period (410 to 360 ma)
  - Silurian Period (440 to 410 ma)
  - Ordovician Period (505 to 440 ma)
  - Cambrian Period (544 to 505 ma)

Precambrian Time (4500 to 544 ma)
- Proterozoic Era (2500 to 544 ma)
  - Vendian Period (544 to 650 ma)
- Archaean Era (3800 to 2500 ma)
- Hadean Time (4500 to 3800 ma)

For more info on geological time, visit the USGS web site at:
http://geology.er.usgs.gov/paleo/geotime.shtml
http://pubs.usgs.gov/gip/geotime/

or, try the University of California (Berkeley) Museum of Paleontology's excellent Web Geological Time Machine:
http://www.ucmp.berkeley.edu/help/timeform.html

or this one:
Do you keep forgetting the geo time chart? Read some hilarious pneumonic sayings on Dr. Bob's Geologic Time Page:
http://oldsci.eiu.edu/geology/jorstad/geoltime.html
One of my favorites was "Quit Telling Crazy Jack That Perry Como Died Slowly Over Coals"!!!

2001 GSOC ROSTER ANNOUNCEMENT

This year, we've got some **GOOD NEWS** and some **BAD NEWS!!!**

☺☺☺☺☺☺☺☺☺☺ Here's the **GOOD NEWS** ☺☺☺☺☺☺☺☺☺☺

2001 GSOC Rosters are available starting in May! The roster lists the names, addresses, and phone numbers for our 140 members. This is a handy way to communicate with your fellow GSOC'ers.

☹☹☹☹☹☹☹☹☹☹ Here's the **BAD NEWS** ☹☹☹☹☹☹☹☹☹☹

Because we're getting so many new members, our roster is getting bigger! So big we cannot mail it with the newsletter! So, we are asking members to pick up a copy of the roster at any GSOC meeting (Friday evening, Noon meeting, or Seminar) from Rosemary Kenney, starting in May. If you cannot make a meeting and want your roster right away, then send a check for $2.00 to:

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- Several "**rock cairn**" anomalies which may be caches or graves.
- **Seed grinding equipment** including several patates which were used by the Paiutes and also a mortar that presumably predates the Paiutes.

One subject discussed frequently by Braden was the difficulty faced by archaeologists in dating sites of this type. Often dates are associative with types of stone tools used by the occupants. Three different types of projectile points were found on the site. There were stemmed points with a straight stem, split stemmed points in which the base of the point flares into lobes on either side of the stem, and the "desert side notch" which has an asymmetrical stem.

The other discussion on dating involved dating the petroglyphs. A reliable method of dating these is yet to be found, although a promising method involves dating the "desert varnish", which is actually a microbial secretion on the rock surface. There is a current controversy in using the method as to whether the specimens are contaminated by other organic material.

In addition to the dating problems, Braden discussed the possible interpretations that could be given to the petroglyph forms. Several of the petroglyphs are examples of what is known as the Great Basin abstract curvilinear style. The designs are circles, dots and similar curvy abstract forms with an occasional anthropomorphic (man-like) figure. This is a good lead-in for this month's web teasers...so signing off...

Carol Hasenberg

Want to learn more about petroglyphs, desert varnish and other cool archaeological stuff? I suggest you check out these web sites:

The rock art dating controversy:
http://rockart.esmartweb.com/general.html

A general article on desert varnish:
http://www.desertusa.com/magdec97/varnish/dec_varnish.html

A rock art article with some nice photos:
http://www.artifaqs.org/rock_art_and_petroglyphs.htm

300 Petroglyph links – have fun!
http://www.mysteries-megasite.com/main/bigsearch/petro.html

Conference on Numic Peoples:
http://www.library.arizona.edu/users/jlcox/fall99/421-521/insitu.htm

More on Great Basin abstract curvilinear petroglyphs:
http://www.jimpowers.com/petro.htm
http://www.geocities.com/Athens/Acropolis/5579/utahrockart.html

VOLUNTEERING OPPORTUNITY!!!

Cecelia Crater has been setting up our noon meetings for a number of years now, and she plans to retire after the May 2001 noon meeting. She has done a terrific job for GSOC. **Thank you, Cecelia!**

The noon meeting coordinator position is critical, and we really do need a new active person to help with this. All of us GSOC linch-pins are booked to the hilt! If **YOU COULD HELP** by doing this job, you would be performing an excellent service!

The noon meeting coordinator does the following:

- **Reserves the room** at the library for eight or nine meetings a year.
- **Lines up speakers** for the meetings. Our noon meeting speakers are often GSOC members with slides of local geology or geology from their travels.
- **Special Bonus** – Your fearless newsletter editor, Carol S Hasenberg, is volunteering to give a noon talk next fall, of the slides she took of the Nisqually earthquake. One speaker lined up!!!

Radiometric Dating

Adapted from the USGS publication, "Geologic Time"

A chemical element consists of atoms with a specific number of protons in their nuclei but different atomic weights owing to variations in the

number of neutrons. Atoms of the same element with differing atomic weights are called isotopes. Radioactive decay is a spontaneous process in which an isotope (the parent) loses particles from its nucleus to form an isotope of a new element (the daughter). The rate of decay is conveniently expressed in terms of an isotope's half-life, or the time it takes for one-half of a particular radioactive isotope in a sample to decay. Most radioactive isotopes have rapid rates of decay (that is, short half-lives) and lose their radioactivity within a few days or years. Some isotopes, however, decay slowly, and several of these are used as geologic clocks. The parent isotopes and corresponding daughter products most commonly used in radiometric dating are listed below:

Parent Isotope	Stable Daughter Product	Currently Accepted Half-Life Values
Uranium-238	Lead-206	4.5 billion years
Uranium-235	Lead-207	704 million years
Thorium-232	Lead-208	14.0 billion years
Rubidium-87	Strontium-87	48.8 billion years
Potassium-40	Argon-40	1.25 billion years
Samarium-147	Neodymium-143	106 billion years
Carbon-14	Nitrogen-14	5730 years

The mathematical expression that relates radioactive decay to geologic time is called the age equation and is:

$$t = \frac{1}{\lambda} \ln\left(1 + \frac{D}{P}\right)$$

Where t is the age of the rock or mineral specimen,
D is the number of atoms of a daughter product today,
P is the number of atoms of the parent isotope today,
ln is the natural logarithm of the expression in parentheses,
and λ is the appropriate decay constant.

The decay constant for each parent isotope is related to its half-life, $t^{1/2}$, by the following expression:

$$t^{1/2} = \frac{\ln 2}{\lambda}.$$

Dating rocks by these radioactive timekeepers is simple in theory, but the laboratory procedures are complex. The numbers of parent and daughter isotopes in each specimen are determined by various kinds of analytical methods. The principal difficulty lies in measuring precisely very small amounts of isotopes.

The potassium-argon method can be used on rocks as young as a few thousand years as well as on the oldest rocks known. Potassium is found in most rock-forming minerals, the half-life of its radioactive isotope potassium-40 is such that measurable quantities of argon (daughter) have accumulated in potassium-bearing minerals of nearly all ages, and the amounts of potassium and argon isotopes can be measured accurately, even in very small quantities. Where feasible, two or more methods of analysis are used on the same specimen of rock to confirm the results.

Another important atomic clock used for dating purposes is based on the radioactive decay of the isotope carbon-14, which has a half-life of 5,730 years. Carbon-14 is produced continuously in the Earth's upper atmosphere as a result of the bombardment of nitrogen by neutrons from cosmic rays. This newly formed radiocarbon becomes uniformly mixed with the non-radioactive carbon in the carbon dioxide of the air, and it eventually finds its way into all living plants and animals. In effect, all carbon in living organisms contains a constant proportion of radiocarbon to non-radioactive carbon. After the death of the organism, the amount of radiocarbon gradually decreases as it reverts to nitrogen-14 by radioactive decay. By measuring the amount of radioactivity remaining in organic materials, the amount of carbon-14 in the materials can be calculated and the time of death can be determined. For example, if carbon from a sample of wood is found to contain only half as much carbon-14 as that from a living plant, the estimated age of the old wood would be 5,730 years.

The radiocarbon clock has become an extremely useful and efficient tool in dating the important episodes in the recent prehistory and history of man, but because of the relatively short half-life of carbon-14, the clock can be used for dating events

that have taken place only within the past 50,000 years.

GEOQUIZ

Congradulations to Geoquiz 1 winner **Linda Wilson!** Linda got 4 out of 5 correct on the first Geoquiz. She wins a piece of Arkansas quartz. Linda, contact Taylor Hunt to get your prize!!!

We're still looking for more entries for last month's quiz so send them to Taylor!!!

This month's quiz - **everybody can play**!!!

Taylor Hunt is offering a **Cambrian age fossil** for a GSOC member who can get the most correct. Send your answers to Taylor Hunt or e-mail him at: hunt6422@e-mail.msn.com

1. What proportion of geologic time is Precambrian?
2. If you have two sedimentary layers, one is green and one is red, without an unconformity, what is the cause of the color difference? Hint – this occurs in Glacier National Park.
3. For what economic product is the Pennsylvanian period noted for?
4. Give the type section (typical sequence of rock layers) for the Mississipian period?
5. What is the difference between soil formed from basaltic rock versus the soil formed from rhyolitic rock?

Don't be afraid to look up the answers!

UPDATE ON THE PRESIDENT'S FIELD TRIP

Look for a schedule and itenerary for the trip in next month's newsletter. An application form will also be printed in next month's newsletter.

The current plans for the trip are to do a five day tour of the Willamette Valley with emphasis on the geology of the Oregon Wine Country. Fellow GSOC'er and wine enthusiast Dr. Scott Burns will be leading the trip for one of the days. The trip is planned to occur on or near the Labor Day weekend.

Keep you posted!

GEOLOGICAL TIME CHART

Rusty on your geological time chart? Here's the latest version from the USGS web site:

Phanerozoic Eon (544 ma to present)
- Cenozoic Era (65 ma to present)
  - Quaternary Period (1.8 ma to present)
    - Holocene Epoch (8,000 years ago to present)
    - Pleistocene Epoch (1.8 ma to 8,000 years ago)
  - Tertiary Period (65 to 1.8 ma)
    - Pliocene Epoch (5.3 to 1.8 ma)
    - Miocene Epoch (23.8 to 5.3 ma)
    - Oligocene Epoch (33.7 to 23.8 ma)
    - Eocene Epoch (55.5 to 33.7 ma)
    - Paleocene Epoch (65 to 55.5 ma)
- Mesozoic Era (248 to 65 ma)
  - Cretaceous Period (145 to 65 ma)
  - Jurassic Period (213 to 145 ma)
  - Triassic Period (248 to 213 ma)
- Paleozoic Era (544 to 248 ma)
  - Permian Period (286 to 248 ma)
  - Carboniferous Period (360 to 286 ma)
    - Pennsylvanian Period (325 to 286 ma)
    - Mississippian Period (360 to 325 ma)
  - Devonian Period (410 to 360 ma)
  - Silurian Period (440 to 410 ma)
  - Ordovician Period (505 to 440 ma)
  - Cambrian Period (544 to 505 ma)

Precambrian Time (4500 to 544 ma)
- Proterozoic Era (2500 to 544 ma)
  - Vendian Period (544 to 650 ma)
- Archaean Era (3800 to 2500 ma)
- ~~Hadean Time (4500 to 3800 ma)~~

For more info on geological time, visit the USGS web site at:
http://geology.er.usgs.gov/paleo/geotime.shtml
http://pubs.usgs.gov/gip/geotime/

or, try the University of California (Berkeley) Museum of Paleontology's excellent Web Geological Time Machine:
http://www.ucmp.berkeley.edu/help/timeform.html

or this one:
Do you keep forgetting the geo time chart? Read some hilarious pneumonic sayings on Dr. Bob's Geologic Time Page:
http://oldsci.eiu.edu/geology/jorstad/geoltime.html
One of my favorites was "Quit Telling Crazy Jack That Perry Como Died Slowly Over Coals"!!!

2001 GSOC ROSTER ANNOUNCEMENT

This year, we've got some **GOOD NEWS** and some **BAD NEWS!!!**

☺☺☺☺☺☺☺☺☺☺ Here's the **GOOD NEWS** ☺☺☺☺☺☺☺☺☺☺

2001 GSOC Rosters are available starting in May! The roster lists the names, addresses, and phone numbers for our 140 members. This is a handy way to communicate with your fellow GSOC'ers.

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Because we're getting so many new members, our roster is getting bigger! So big we cannot mail it with the newsletter! So, we are asking members to pick up a copy of the roster at any GSOC meeting (Friday evening, Noon meeting, or Seminar) from Rosemary Kenney, starting in May. If you cannot make a meeting and want your roster right away, then send a check for $2.00 to:

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THE GEOLOGICAL NEWSLETTER

GSOC

JUNE 2001

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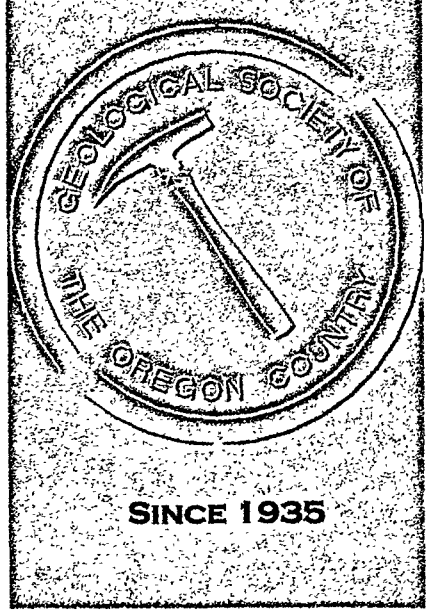

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Evelyn Pratt – 503/223-2601

Business Manager:
Rosemary Kenney – 503/892-6514
Assistant Business Manager:
Cecelia Crater – 503/235-5158

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.
FIELD TRIPS: Usually one per month. Fees: Members, $1.00, Non-members, $3.00. See calendar next page.
GEOLOGY SEMINAR: Third Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.
GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Consult current calendar (next page) or verified by phone: 503/235-5158 or 503/892-6514.
MEMBERSHIP: Per year from January 1: Individual--$20.00, Family--$30.00, Junior (under 18)/Student--$10.00.
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Phone (____**)**____-_____ **Email address**_____

Geologic Interests and Hobbies_____
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Please indicate Membership type and include check for appropriate amount:
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INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 6
JUNE 2001

JUNE ACTIVITIES

Fri. June 8, 8:00 PM: **Axial Volcano.** Speaker: Mike Goodrich, ret. Lake Oswego H. S. teacher; instructor at PSU, PCC Rock Creek. Rm. 371 Cramer Hall, PSU.

Cecelia Crater, thanks so much for running the noon meetings during past years – we really appreciate it! Bob Strebin has agreed to co-chair noon meetings in fall, but ***he needs help*** from someone who has e-mail. Call him at 503-665-2756.

No Friday noon meetings or seminars during the summer. Next seminar will be Wed., Sept. 19: Richard Bartels will discuss the Columbia River Basalts. Rm. S-17 Cramer Hall, PSU.

Marys Peak revisited - Field trip by bus: Sat. 6/23. Leader: Taylor Hunt. Bring lunch, fluids, rock tools, camera, binoculars for views and/or birdwatching. Cost will be about $20/person. He wants to keep the trip to about 25 people, so call **early** to reserve your spot! Start 9 AM to approx. 5 PM. Call 503-662-4790.

****

Preview of coming attractions:
Fri. July 13, 8:00 PM: To be announced. Rm. 371 Cramer Hall, PSU. **Field trip** Sat. 7/28: Bus trip to the south side of Mt. St. Helens. Sign up early!
Picnic Sun., Aug. 12: Something different is in the works – more about this later.
President's Field Trip Sept. 4-8, Tue.-Sat.: **GEOLOGICAL TOUR OF THE OREGON WINE COUNTRY: The Importance of Soils.**

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Amberlee Moore

WEB TEASERS

This month we are preparing you for the Mike Goodrich talk on the Axial seamount volcano (June 8 – see schedule). Check out these web sites for lots of cool 3-D maps and such:

Gorda Ridge Volcano Information - NOAA Vents Program
http://www.pmel.noaa.gov/vents/acoustics/seismicity/nepac/gordaridge01.html

More Info on Axial Volcano
http://secchi.hmsc.orst.edu/education/relatedinfo/axial.html

Still more Info! NEMO Observatory
http://newport.pmel.noaa.gov/nemo1999/

These links are also available on our website on the schedule of activities page, if you just want to click!

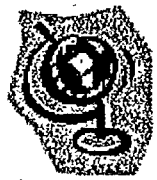
VOLUNTEERING OPPORTUNITIES!!!

YOU COULD HELP

GSOC by volunteering for the following items:

- Assistant noon meeting planner
- Refreshment caretaker for the Friday night meetings

We'd appreciate any help you could offer on these positions! Please call Sandra Adamson or Tom Gordon for more information.



GEOQUIZ

This geoquiz is still open!!!

Taylor Hunt is offering a **Cambrian age fossil** for a GSOC member who can get the most correct. Send your answers to Taylor Hunt or e-mail him at: hunt6422@e-mail.msn.com

1. What proportion of geologic time is Precambrian?
2. If you have two sedimentary layers, one is green and one is red, without an unconformity, what is the cause of the color difference? Hint – this occurs in Glacier National Park.
3. For what economic product is the Pennsylvanian period noted for?
4. Give the type section (typical sequence of rock layers) for the Mississipian period?
5. What is the difference between soil formed from basaltic rock versus the soil formed from rhyolitic rock?

Don't be afraid to look up the answers!

UPDATE ON THE PRESIDENT'S FIELD TRIP

"A Geological Tour of Oregon's Wine Country"

September 3 or 4 through September 7 or 8 (five days/four nights)

Tour the Gaston-Dundee, Corvallis, Eugene, Medford, and Ashland area wineries to discover the importance of soil and geology in making great wines. We'll stop at a couple of wineries per day, with lectures on soil and geology from local experts (geologists, viticulturalists, and vintners). We'll spend an evening attending a Shakespearean play in Ashland (depending upon seat availability).

Early bird registration by no later than July 15!

Secure your place with a $350 deposit now (total cost of trip will be between $600 and $700). The remainder will be due no later than August 15. Only 28 spaces available. Costs will cover transportation, lodging, breakfast and lunch, and winery admission fees.

This trip is intended for GSOC members. If you're not currently a member and wish to go on the trip, join GSOC now for $20 ($30 family).

Please contact Sandy Adamson for details:

- phone: (503)748-1181 days until June 29, (503)667-6287 evenings and weekends
- email: sla757927@aol.com

Oregon viticulture and soil info available on the web:

Northwest Berry and Grape Information Network, a joint project of Oregon, Washington, and Idaho Universities, and the USDA-ARS:
http://berrygrape.orst.edu/fruitgrowing/soils.htm

Oregon Low Input Viticulture and Enology
http://berrygrape.orst.edu/LIVE/

USDA Natural Resources Conservation Service (NRCS) has a website where you can get soil info/maps for Oregon:
ftp://soils.css.orst.edu/pub/webdocs/ssurgo.html

Gotta Have Loupe!!!

A GSOC'er on the April field trip asked me where you can get a loupe. Here's the info!!!

A loupe, (otherwise known as pocket magnifier or hand lens), is used by geologists to closely inspect small but visible objects. Loupes are handy for GSOC'ers to observe rock crystals and other small details when on a GSOC field trip. But before you rush out to get one for this month's exciting field trip on the Clackamas river, do a little research so that you get the right lens for you.

First, you should know that there are three basic lens configurations for the lenses in a loupe. They are:

- A coddington, or **single** lens, which is more rugged (especially in watery environments), needs to be larger in diameter due to the fact that the edges are visually distorted.
- A **doublet**, with two lenses separated by an air space, provides less visual distortion (slight distortion at the edges) than the single lens and is usually very reasonable in price.
- The **triplet** is the highest quality of lens, and thus is the highest in price. A Hastings triplet has three lenses cemented together in an achromatic configuration (all lenses focus on the same point). Triplets also have the least distortion of the image, and are the standard lens used to grade diamonds.

In addition to the lens configuration, each loupe will have a **power specification** (10X, meaning 10 times larger than "real life", etc.) and a lens size in diameter. In general, the higher the power, the smaller in diameter the lens will be. Also, the higher the power the lens, the less **depth of field** you will have. For rock crystal viewing, power in the range of 10X to 15X is generally sufficient. Make sure you bring along a sample to inspect if buying your loupe locally.

Last but not least, make sure you purchase or make a **lanyard** for your lens. My old hand lens is now rusting at the top of Steens Mountain!!! It is so easy to put the lens down and walk away from it – you won't if it's hanging around your neck.

So, where are you going to get that loupe? Some local places that carry a selection are:

- Ed's House of Gems on NE Sandy Blvd.
- Handley Rock and Jewelry Supply on Hwy 99 in Vancouver, WA

Also check out the following web sites for more info about loupes:

http://www.kooters.com/handlens.html
http://www.ascsci.com/geotools/lens.html
http://www.indigo.com/magnify/mgfyfold.html
http://www.allensinc.com/coins/supplies/magloupe.htm
http://www.kassoy.com/loupes01.htm
http://www.frostproof.com/catalog/m37.html
http://www.frostproof.com/catalog/meas02.html

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MEMBERSHIP DIRECTORY UPDATES

Additions:

Amberlee Moore, PO Box 2125, Oregon City 97045-0125 ..... 503.631.4235
Elizabeth Schellberg, 2832 NE 55TH Ave, 97213-3440 ..... 503.282.4115
Mary E. Stolt, 4437 NE 64th Ave., 97218-3223 ..... 503.287.0908

Correction:

Brad Yazzolino, 6451 SE Morrison Ct., 97215-1949 ..... 503.238.3776

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JULY 2001

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Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 7
JULY 2001

JULY ACTIVITIES

Fri. July 13, 8:00 PM: Impact Craters on Earth: Chixulub, Chesapeake Bay, and Others. Melinda Hutson, Portland Community College Instructor. Rm. 371 Cramer Hall, PSU.

No Friday noon meetings or seminars during the summer. Next seminar will be Wed., Sept. 19: Richard Bartels will discuss the Columbia River Basalts. Rm. S-17 Cramer Hall, PSU.

Sat. 7/28: South Side of Mt. St. Helens – Field trip by bus. Lava tubes, a lava-covered forest, a spectacular mudflow, a suspension bridge, and more. Leader: Taylor Hunt. Bring lunch, fluids, camera, binoculars, & dress for weather. Call early; Mary's Peak trip filled up fast. Will be $22/person. 8:30 AM-approx. 5 PM. Call 503-662-4790.

****

ANNUAL PICNIC

After careful review, we decided that the Rice Museum with its new exhibits couldn't be beat. The picnic will be **Sunday, August 12, 11:00 AM-2:30 PM.** Coffee, tea, and punch will be provided. $3 donation is required on arrival, and admittance to the museum is free. If possible, e-mail Taylor Hunt at hunt6422@email.msn.com, or call 503-662-4790, for directions to the Rice Museum and to let him know how many will be there. **COME ONE, COME ALL! WE'RE GOING TO HAVE A GREAT TIME!**

****

Preview of coming attractions:

President's Field Trip Sept. 4-8, Tue.-Sat.: **GEOLOGICAL TOUR OF THE OREGON WINE COUNTRY: The Importance of Soils.**

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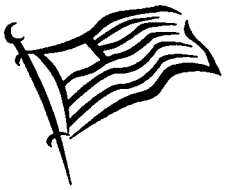
Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.



UPDATE ON THE 2001 GSOC PRESIDENT'S FIELD TRIP

"A Geological Tour of Oregon's Wine Country"

September 4 through September 8 (five days/four nights)

Tour Highlights include:

- **Guest speakers** who are local authorities on wine-growing soils and viticulture:
  - Dr. Scott Burns, Portland State University
  - other experts from Chemeketa Community College and/or Oregon State University
- **Winery tours** in the Willamette Valley, Umpqua , Rogue and the Applegate Valley appellations, each a distinct and different wine growing region.
- **Shakespearean play** in Ashland (depending upon seat availability).

Be sure to **fill out a registration form** available on the back of the newsletter. Early bird registration by no later than July 15!

Secure your place with a $350 deposit now (total cost of trip will be between $600 and $700). The remainder will be due no later than August 15. Only 20 spaces remaining! Costs will cover transportation, lodging, breakfast and lunch, and winery admission fees.

This trip is intended for GSOC members. If you're not currently a member and wish to go on the trip, join GSOC now! **Membership form** is on the title page of this newsletter.

Please contact Sandy Adamson for details:

- phone: (503)748-1181 days until June 29, (503)667-6287 evenings and weekends
- email: sla757927@aol.com

Oregon viticulture and soil info available on the web:

Northwest Berry and Grape Information Network, a joint project of Oregon, Washington, and Idaho Universities, and the USDA-ARS:
http://berrygrape.orst.edu/fruitgrowing/soils.htm

Oregon Low Input Viticulture and Enology
http://berrygrape.orst.edu/LIVE/

USDA Natural Resources Conservation Service (NRCS) has a website where you can get soil info/maps for Oregon:
ftp://soils.css.orst.edu/pub/webdocs/ssurgo.html

SOILS AND VITICULTURE

An article on soils and viticulture appeared in the Food Day section of the May 29, 2001, Oregonian, by Amy Martinez Starke. In the article Ms. Starke and Dr. Scott Burns discuss the predominant soil types preferred by wine grape growers in the region. Basically, the preferred soil profiles are heavily weathered, nutrient-poor soils. Traditional wineries in the Willamette Valley are situated in the Jory soil profile on **weathered Columbia River Basalt**. Some newer wineries are located in Willakenzie soils on **weathered marine sedimentary rocks**.

Some of the exhibits we will be doing for the wine tour will be to plot the wineries we are planning to visit on a geological map of Oregon. It is also possible to get detailed soils maps (downloadable in GIS format) of the counties of Oregon and we also hope to map our wineries on those.

Museum Freebies

The **Maryhill Musseum**, located just east of the Dalles on the Washington side of the Columbia Gorge, has free admission for two counties in

Washington and Oregon each month. Residents of Multnomah and Clackamas counties in Oregon may go through the museum for free during the month of October. Clark County, Washington residents may go free in September. For other counties, contact Maryhill Museum, 509.773.3733.

The **National Historic Oregon Trail Interpretive Center** near Baker City, Oregon, has free admission days during the year. For the year 2001, the free days are July 3, August 15, September 22, October 20, November 22, and December 7.

WEBSITE CHANGES

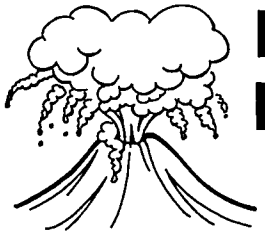
Attention GSOC'ers –
If you have been unable to access the GSOC website lately, don't despair!!! GSOC has been in the process of changing Internet Service Providers (ISP's for you computer geeks out there). Until the domain park changes take effect, you won't be able to get onto the GSOC website by our usual handle, www.gsoc.org. This is only **temporary**, and by the time this newsletter is published the domain should be back in business. Meanwhile, you can access the GSOC website from our new ISP's server, with this URL:
http://www.spiritone.com/~gsoc/

Also, our GSOC email address will be **permanently** changing with the new ISP. The new GSOC mail address will be gsoc@spiritone.com.

FIELD GUIDES

If you feel like studying geology at home, or making your own field trip excursions, you can purchase the following GSOC field trip guides from years gone by:
price includes postage

Geologic Trip Log through Eastern Foothills of Oregon Coast Range between Vernonia and Banks, 1964 .....$0.75
Columbia River Gorge and Grand Canyon of the Deschutes River, 1964 .....0.75
Geological Guide Book for Central Oregon, Prineville, Paulina, Suplee, Delintment Lake, 1965 .....0.75
Geologic Trips in the Mitchell-John Day area, 1969 .....1.75
Condon's First Island, Geological Trips in the Siskiyous and along the Rogue River, 1970.....1.25
Field Trips along the Oregon Coast in Lincoln County, 1974.....2.25
Field Guide to Geologic Sites in the Newberry Crater Area, 1976.....2.00
Investigating the Geology of the North Cascades, Washington state, 1977.....2.25
Sawtooth Mountains and the Stanley Basin, Idaho, 1978 .....1.75
Central Oregon's Volcanic Wonderland and How it Came to Be, 1982 .....1.75
Lewiston, Idaho, 1984 .....3.50
Northern Idaho and Montana, 1988.....6.50
Vancouver Island, British Columbia, 1989 .....7.00
Cascadia Subduction Zone, 1992 .....7.00
The Missoula Floods, 2000.....15.00



IGNEOUS ROCKS, PHASE DIAGRAMS, AND BOWEN'S REACTION SERIES

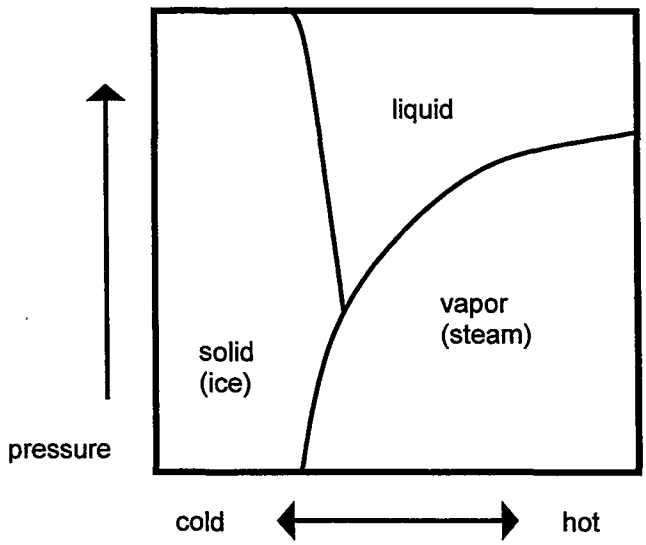
There is an excellent site on the internet about igneous rocks, mineral solutions, and phase diagrams. The author, Dr. Lynn S Fichter (email fichtels@jmu.edu), from the Dept. of Geology & Environmental Science, James Madison University, is permitting us to publish some extracts from the site, (http://geollab.jmu.edu/Fichter/Fichter/Fichterls.html) in this month's newsletter.

Why study mineral solutions and phase diagrams? This branch of geology, in which the minerals themselves are studied, explains the processes which produce rocks of various mineral compositions. Knowing the processes which produce minerals can give clues as to the tectonic settings which created the rocks. The famous

pioneer in this work was Norman L. Bowen, who performed experiments on the crystallization of silicate liquids in the early 20th century.

What is a mineral phase? According to Dr. Fichter's site, "A phase is anything that can be mechanically separated. For example, minerals in a rock are each different phases, and liquid and vapor are different phases. More importantly here, in a partially, or fractionally, melted rock the melt portion is one phase and the unmelted residue is a second phase."

A very simplified phase diagram for water is shown below. This diagram shows the phases of water dependent on the environmental temperature and pressure.



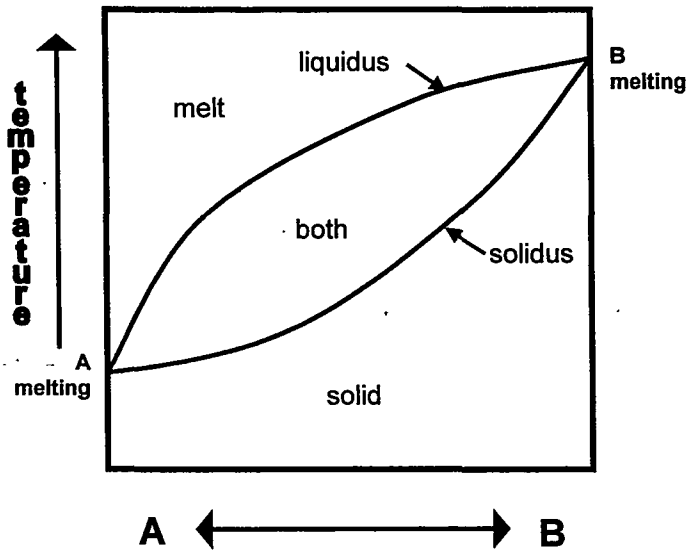
Mineral phase diagrams can be like the above diagram for water, with a single composition at different temperature and pressure; however minerals are generally mixed in the real world and diagrams showing the behavior of mixtures are common. Dr. Fichter's site discusses solid solution and binary eutectic phase diagrams:

"The **solid solution phase diagram**...shows two phases: crystal and melt...one variable - temperature plotted along the vertical axis...Pressure is held constant...complete miscibility (mixability) in both liquid (magma) and crystal phases...demonstrates how the metallic cations in a mineral can be partitioned into fractions. For example, all the ferromagnesium minerals (olivine, pyroxene, amphibole, biotite) are solid solutions of Mg and Fe. High temperature crystallization species are Mg rich, intermediate temperature species mixed Mg and Fe, and low temperature species Fe rich."

" The **binary eutectic phase diagram** explains the chemical behavior of two immiscible (unmixable) crystals from a completely miscible (mixable) melt, such as olivine and pyroxene, or pyroxene and Ca plagioclase. The binary eutectic phase diagram demonstrates how two mixed and unrelated minerals can be fractionated. For example, amphibole and plagioclase are both found in diorite, but can be at least partially separated by fractionation."

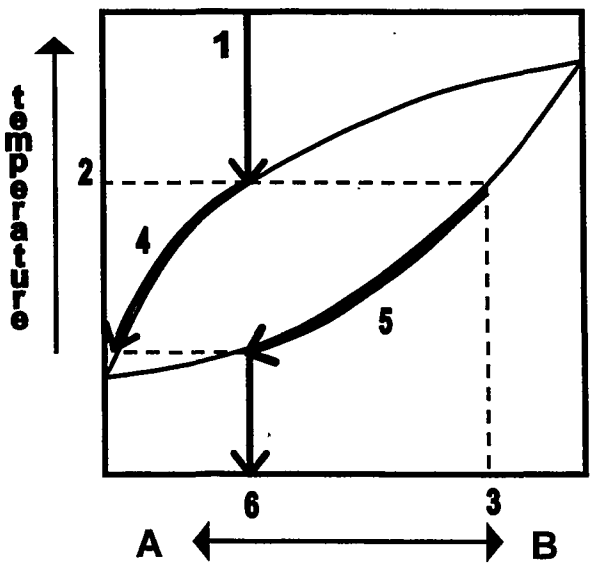
Fractionation occurs when early forming minerals have a different composition than the magma. If these are removed from the magma before crystallization is complete, then the magma is changed in composition from the original.

Here we have a very simple example of a solid solution phase diagram. On the website, Dr. Fichter shows the interaction between sodic and calcic plagioclase, rather than mineral A and B.

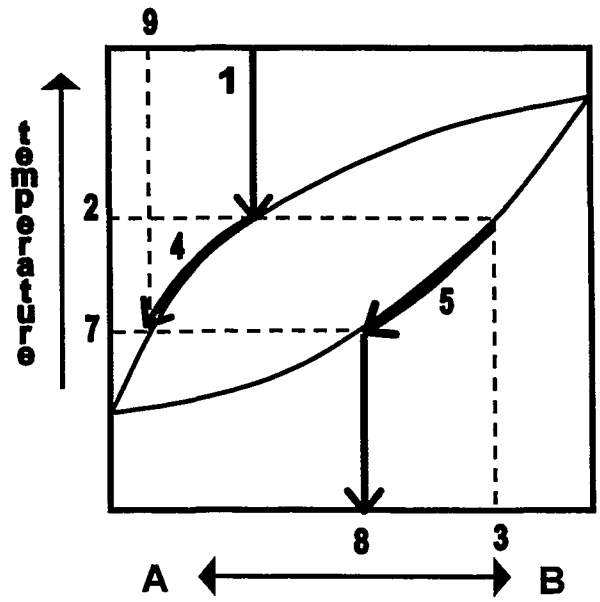


The solid solution diagram shown here describes the interaction between generic minerals A and B. The liquidus line shows the temperature of the first solid crystal of melts of various compositions. The solidus line shows the temperature of the first drop of melt for a solid crystal solution of various compositions.

Now we can find out what happens to the melt as it cools and solidifies. If the melt starts at 30% composition of B and 70% of A at **1**, the temperature of the first crystal is **2**, and the composition of the first crystal is **3**. As the melt continues to solidify, its composition is given by the liquidus **4**. The crystal composition of the solid solution follows the solidus **5**. If the mixture cools slowly without separation, the final composition of the solid solution will be the same as the original melt **6**.



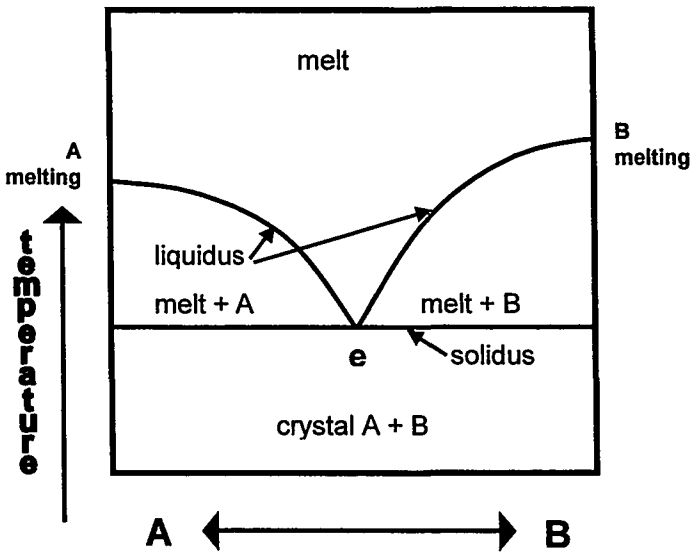
If the process gets interrupted, say for example that the early forming crystals get separated from the melt, then the melt composition will be richer in mineral A and the crystal composition will be richer in mineral B than the original mix.



The final solid solution phase diagram shows a cooling process interrupted at the temperature at **7**; the crystal composition at point **8** and the melt composition at point **9**.

Melting processes can separate minerals in a similar manner when interrupted, as shown on the website.

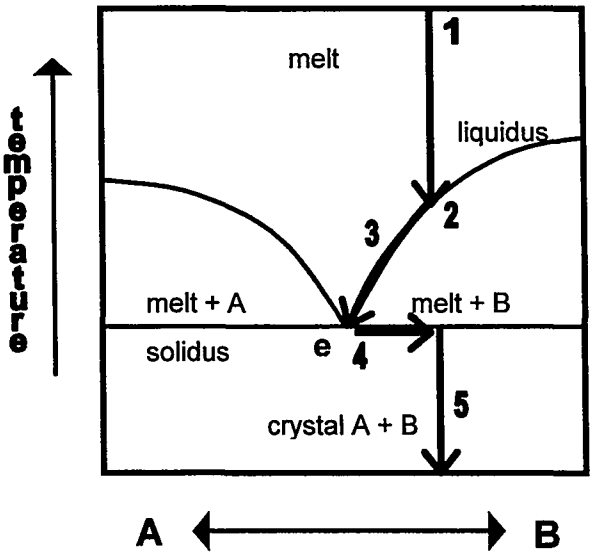
Now we will introduce the binary eutectic phase diagram for two hypothetical substances A and B:



Dr. Fichter's notes on the binary eutectic diagram:

- The liquidus line separates the all melt phase from the melt+crystal phase.
- The solidus line separates the melt+crystal phase from the all crystal phase. NOTE that the solidus and liquidus lines are experimental, they have been determined by melting and cooling many melts at different percent compositions.
- The eutectic (e) is the point at which all three phases can exist simultaneously, A, B, and melt. The eutectic here is 50% B, but can be any percent depending on the minerals involved.
- If we add some B to a melt of A (say 20% B; red arrow) the temperature of melting (crystallization) is lowered. The more B we add the lower the melting temperature becomes; that is, it moves down the liquidus line toward the eutectic. Any mixture of A and B lowers the melting (crystallizing) temperature down the liquidus.

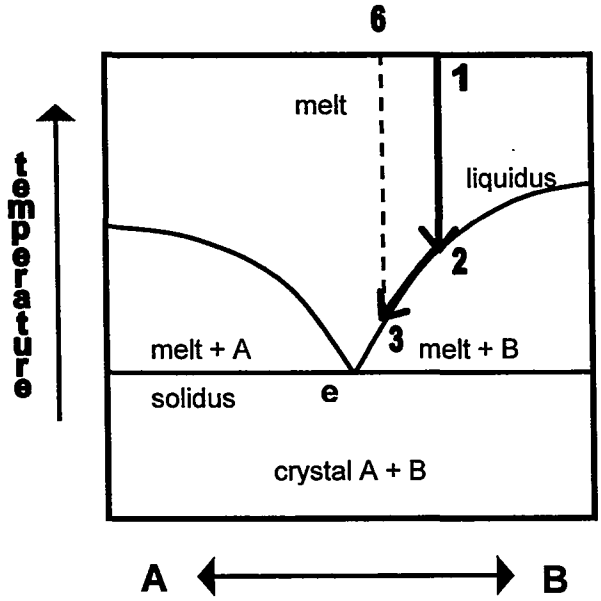
An Example of Equilibrium Crystallization From a Melt With a 50/50 Eutectic:



The First Crystal (numbers on phase diagram correspond with numbers below)

1. Assume a melt composition of 70% B and 30% A.
2. Cool melt to liquidus line along red arrow. Only B crystals form...because we are on the Melt+B liquidus line; no A can crystallize until the eutectic is reached.
3. Removing (crystallizing) B changes the melt composition making in richer in A. Therefore the melt composition begins to migrate to the left, but down the liquidus line toward the eutectic point. The system must stay on the liquidus line since going above it would raise the temperature high enough to melt everything.
4. At the eutectic point, and only at the eutectic point, can A finally begin to crystallize out of the melt, and A and B now crystallize out together at a ratio of 50/50 until all the melt is gone.
5. Finally after all the melt is gone the two crystals A+B can leave the eutectic. Since the original composition of 70% B has not changed we therefore shift the path right to the 70% point, and continue to drop the temperature straight down. This path is the same any time the composition of B is greater than the eutectic value. If the composition is less than the eutectic, the path is similar, but a mirror image.

If this process is interrupted while the melt is solidifying, the melt composition can be read by projecting straight up from the liquidus (6), and the crystal composition will be pure B.



We will conclude next month with a discussion of Bowen's reaction series.

Geological Society of the Oregon Country
PO Box 907
Portland, OR 97207-0907

GSOC Wine Tour 2001 September 4 – September 8

1. Complete this form AND the waiver form on the back:

Number of people in your party:_____

Name(s): _____ **Address:** _____

_____ **City/State:** _____

Name of person with whom who wish to share lodging (not otherwise listed): _____ **Zip:**_____

Phone:_____

E-mail:_____

2. Send Form, completed Waiver, and Payment to address below ($350 deposit to reserve your seat, the remainder will be due on August 15 – approximate total cost $700):

__Check enclosed. **Make check payable to *Northwest Gold Tours***
Indicate that it is for the "GSOC Wine Tour"
Mail to: Northwest Gold Tours
13195 SW Oakwood Street
Beaverton, OR 97005

__Credit card: **Mastercard** **Visa** (circle one) Amount $_____
Number:
Expiration date:
Signature of card holder_____

3. Or call Northwest Gold Tours at (503)672-9985 or fax (503)672-7565.

4. This tour is for GSOC members. If you are not currently a member. Dues are $20 for an individual, $30 for a family. Please mail your membership dues to:
The Geological Society of the Oregon Country
PO Box 907
Portland, OR 97207

5. If you're traveling as a single and would like to possibly share lodging with someone else, may your phone number and/or e-mail address be shared with someone else who is also traveling as a single and seeking shared lodging? If yes, circle one:
phone_____ or **e-mail** _____

6. You'll be limited to one carry-on bag, plus one additional bag. Baggage handling gratuities are not included, but will be available at our places of lodging.

7. For additional information, please call Sandy Adamson, (503)667-6287 or e-mail at sla757927@aol.com

Geological Society of the Oregon Country
PO Box 907
Portland, OR 97207-0907

President's Annual Field Trip - 2001
GSOC WINE TOUR - Waiver

In consideration of the Geological Society of the Oregon Country providing this trip, I, _____,

hereby waive any claim that I might have against the Geological Society of the Oregon Country, its Board of Directors and trip leaders, jointly and individually, for injuries or loss to me as a result of any accident or incident which may occur on this trip.

Dated: _____

Signed: _____

Please sign and return with your final payment

MEDICAL INFORMATION

Name: _____

Telephone Number: _____

Name of Physician: _____

Telephone Number: _____

Allergies: _____

Special Medications: _____

Special Medical Conditions: _____

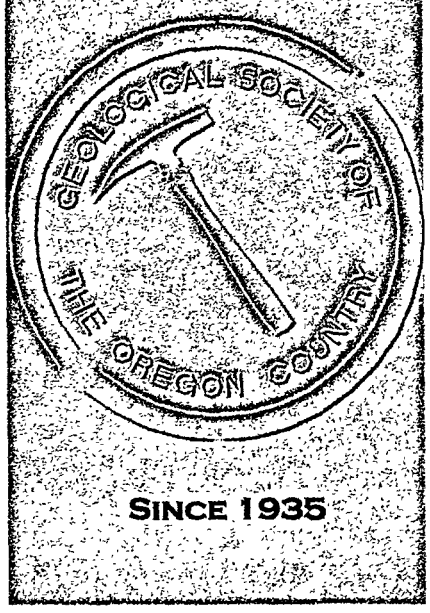
In Case of an Emergency Call: _____

THE GEOLOGICAL NEWSLETTER

GSOC

JUNE 2001

GEOLOGICAL SOCIETY
OF THE OREGON
COUNTRY
P. O. BOX 907
PORTLAND, OR 97207



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THE GEOLOGICAL NEWSLETTER

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Calendar:
Evelyn Pratt – 503/223-2601

Business Manager:
Rosemary Kenney – 503/892-6514
Assistant Business Manager:
Cecelia Crater – 503/235-5158

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.
FIELD TRIPS: Usually one per month. Fees: Members, $1.00, Non-members, $3.00. See calendar next page.
GEOLOGY SEMINAR: Third Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.
GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Consult current calendar (next page) or verified by phone: 503/235-5158 or 503/892-6514.
MEMBERSHIP: Per year from January 1: Individual--$20.00, Family--$30.00, Junior (under 18)/Student--$10.00.
PUBLICATIONS: THE GEOLOGICAL NEWSLETTER (ISSN 0270 5451), published monthly and mailed to each member. Subscriptions available to libraries and organizations at $10.00 per year. Individual Subscriptions $13.00 per year. Single Copies: $1.00. 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.
WEBSITE: www.gsoc.org. Email address: gsoc@teleport.com.

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 $20.00 _____ **Family $30.00** _____ **Student $10.00** _____

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

GEOLOGICAL NEWSLETTER

THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
P.O. BOX 907, PORTLAND, OR 97207

VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 6
JUNE 2001

JUNE ACTIVITIES

Fri. June 8, 8:00 PM: **Axial Volcano.** Speaker: Mike Goodrich, ret. Lake Oswego H. S. teacher; instructor at PSU, PCC Rock Creek. Rm. 371 Cramer Hall, PSU.

Cecelia Crater, thanks so much for running the noon meetings during past years – we really appreciate it! Bob Strebin has agreed to co-chair noon meetings in fall, but ***he needs help*** from someone who has e-mail. Call him at 503-665-2756.

No Friday noon meetings or seminars during the summer. Next seminar will be Wed., Sept. 19: Richard Bartels will discuss the Columbia River Basalts. Rm. S-17 Cramer Hall, PSU.

Marys Peak revisited - Field trip by bus: Sat. 6/23. Leader: Taylor Hunt. Bring lunch, fluids, rock tools, camera, binoculars for views and/or birdwatching. Cost will be about $20/person. He wants to keep the trip to about 25 people, so call **early** to reserve your spot! Start 9 AM to approx. 5 PM. Call 503-662-4790.

****

Preview of coming attractions:
Fri. July 13, 8:00 PM: To be announced. Rm. 371 Cramer Hall, PSU. **Field trip** Sat. 7/28: Bus trip to the south side of Mt. St. Helens. Sign up early!
Picnic Sun., Aug. 12: Something different is in the works – more about this later.
President's Field Trip Sept. 4-8, Tue.-Sat.: **GEOLOGICAL TOUR OF THE OREGON WINE COUNTRY: The Importance of Soils.**

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Amberlee Moore

WEB TEASERS

This month we are preparing you for the Mike Goodrich talk on the Axial seamount volcano (June 8 – see schedule). Check out these web sites for lots of cool 3-D maps and such:

Gorda Ridge Volcano Information - NOAA Vents Program
http://www.pmel.noaa.gov/vents/acoustics/seismicity/nepac/gordaridge01.html

More Info on Axial Volcano
http://secchi.hmsc.orst.edu/education/relatedinfo/axial.html

Still more Info! NEMO Observatory
http://newport.pmel.noaa.gov/nemo1999/

These links are also available on our website on the schedule of activities page, if you just want to click!

VOLUNTEERING OPPORTUNITIES!!!

YOU COULD HELP

GSOC by volunteering for the following items:

- Assistant noon meeting planner
- Refreshment caretaker for the Friday night meetings

We'd appreciate any help you could offer on these positions! Please call Sandra Adamson or Tom Gordon for more information.

GEOQUIZ

This geoquiz is still open!!!

Taylor Hunt is offering a **Cambrian age fossil** for a GSOC member who can get the most correct. Send your answers to Taylor Hunt or e-mail him at: hunt6422@e-mail.msn.com

1. What proportion of geologic time is Precambrian?
2. If you have two sedimentary layers, one is green and one is red, without an unconformity, what is the cause of the color difference? Hint – this occurs in Glacier National Park.
3. For what economic product is the Pennsylvanian period noted for?
4. Give the type section (typical sequence of rock layers) for the Mississipian period?
5. What is the difference between soil formed from basaltic rock versus the soil formed from rhyolitic rock?

Don't be afraid to look up the answers!

UPDATE ON THE PRESIDENT'S FIELD TRIP

"A Geological Tour of Oregon's Wine Country"

September 3 or 4 through September 7 or 8 (five days/four nights)

Tour the Gaston-Dundee, Corvallis, Eugene, Medford, and Ashland area wineries to discover the importance of soil and geology in making great wines. We'll stop at a couple of wineries per day, with lectures on soil and geology from local experts (geologists, viticulturalists, and vintners). We'll spend an evening attending a Shakespearean play in Ashland (depending upon seat availability).

Early bird registration by no later than July 15!

Secure your place with a $350 deposit now (total cost of trip will be between $600 and $700). The remainder will be due no later than August 15. Only 28 spaces available. Costs will cover transportation, lodging, breakfast and lunch, and winery admission fees.

This trip is intended for GSOC members. If you're not currently a member and wish to go on the trip, join GSOC now for $20 ($30 family).

Please contact Sandy Adamson for details:
- phone: (503)748-1181 days until June 29, (503)667-6287 evenings and weekends
- email: sla757927@aol.com

Oregon viticulture and soil info available on the web:

Northwest Berry and Grape Information Network, a joint project of Oregon, Washington, and Idaho Universities, and the USDA-ARS:
http://berrygrape.orst.edu/fruitgrowing/soils.htm

Oregon Low Input Viticulture and Enology
http://berrygrape.orst.edu/LIVE/

USDA Natural Resources Conservation Service (NRCS) has a website where you can get soil info/maps for Oregon:
ftp://soils.css.orst.edu/pub/webdocs/ssurgo.html

Gotta Hava Loupe!!!

A GSOC'er on the April field trip asked me where you can get a loupe. Here's the info!!!

A loupe, (otherwise known as pocket magnifier or hand lens), is used by geologists to closely inspect small but visible objects. Loupes are handy for GSOC'ers to observe rock crystals and other small details when on a GSOC field trip. But before you rush out to get one for this month's exciting field trip on the Clackamas river, do a little research so that you get the right lens for you.

First, you should know that there are three basic lens configurations for the lenses in a loupe. They are:

- A coddington, or **single** lens, which is more rugged (especially in watery environments), needs to be larger in diameter due to the fact that the edges are visually distorted.
- A **doublet**, with two lenses separated by an air space, provides less visual distortion (slight distortion at the edges) than the single lens and is usually very reasonable in price.
- The **triplet** is the highest quality of lens, and thus is the highest in price. A Hastings triplet has three lenses cemented together in an achromatic configuration (all lenses focus on the same point). Triplets also have the least distortion of the image, and are the standard lens used to grade diamonds.

In addition to the lens configuration, each loupe will have a **power specification** (10X, meaning 10 times larger than "real life", etc.) and a lens size in diameter. In general, the higher the power, the smaller in diameter the lens will be. Also, the higher the power the lens, the less **depth of field** you will have. For rock crystal viewing, power in the range of 10X to 15X is generally sufficient. Make sure you bring along a sample to inspect if buying your loupe locally.

Last but not least, make sure you purchase or make a **lanyard** for your lens. My old hand lens is now rusting at the top of Steens Mountain!!! It is so easy to put the lens down and walk away from it – you won't if it's hanging around your neck.

So, where are you going to get that loupe? Some local places that carry a selection are:

- Ed's House of Gems on NE Sandy Blvd.
- Handley Rock and Jewelry Supply on Hwy 99 in Vancouver, WA

Also check out the following web sites for more info about loupes:

http://www.kooters.com/handlens.html
http://www.ascsci.com/geotools/lens.html
http://www.indigo.com/magnify/mgfyfold.html
http://www.allensinc.com/coins/supplies/magloupe.htm
http://www.kassoy.com/loupes01.htm
http://www.frostproof.com/catalog/m37.html
http://www.frostproof.com/catalog/meas02.html

2001 GSOC ROSTER ANNOUNCEMENTS

This year, we've got some **GOOD NEWS** and some **BAD NEWS!!!**

☺☺☺☺☺☺☺☺☺☺ Here's the **GOOD NEWS** ☺☺☺☺☺☺☺☺☺☺

2001 GSOC Rosters are available starting in May! The roster lists the names, addresses, and phone numbers for our 140 members. This is a handy way to communicate with your fellow GSOC'ers.

☹☹☹☹☹☹☹☹☹☹ Here's the **BAD NEWS** ☹☹☹☹☹☹☹☹☹☹

Because we're getting so many new members, our roster is getting bigger! So big we cannot mail it with the newsletter! So, we are asking members to pick up a copy of the roster at any GSOC meeting (Friday evening, Noon meeting, or Seminar) from Rosemary Kenney, starting in May. If you cannot make a meeting and want your roster right away, then send a check for $2.00 to:

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

MEMBERSHIP DIRECTORY UPDATES

Additions:

Amberlee Moore, PO Box 2125, Oregon City 97045-0125 ..... 503.631.4235
Elizabeth Schellberg, 2832 NE 55TH Ave, 97213-3440 ..... 503.282.4115
Mary E. Stolt, 4437 NE 64th Ave., 97218-3223 ..... 503.287.0908

Correction:

Brad Yazzolino, 6451 SE Morrison Ct., 97215-1949 ..... 503.238.3776

THE GEOLOGICAL NEWSLETTER

GSOC

JULY 2001

GEOLOGICAL SOCIETY
OF THE OREGON
COUNTRY
P.O. Box 907
PORTLAND, OR 97207

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John Newhouse (3 years) – 503/224-2156
Taylor Hunt (2 years) – 503/662-4790
Archie Strong (1 year) – 503/244-1488

Immediate Past Presidents:
Ray Crowe – 503/640-6581
Carol Hasenberg - 503/282-0547

THE GEOLOGICAL NEWSLETTER

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Calendar:
Evelyn Pratt – 503/223-2601

Business Manager:
Rosemary Kenney – 503/892-6514
Assistant Business Manager:
Cecelia Crater – 503/235-5158

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.
FIELD TRIPS: Usually one per month. Fees: Members, $1.00, Non-members, $3.00. See calendar next page.
GEOLOGY SEMINAR: Third Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.
GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Consult current calendar (next page) or verified by phone: 503/235-5158 or 503/892-6514.
MEMBERSHIP: Per year from January 1: Individual--$20.00, Family--$30.00, Junior (under 18)/Student--$10.00.
PUBLICATIONS: THE GEOLOGICAL NEWSLETTER (ISSN 0270 5451), published monthly and mailed to each member. Subscriptions available to libraries and organizations at $10.00 per year. Individual Subscriptions $13.00 per year. Single Copies: $1.00. 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.
WEBSITE: www.gsoc.org. Email address: gsoc@spiritone.com.

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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 $20.00 _____ **Family $30.00** _____ **Student $10.00** _____

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

GEOLOGICAL NEWSLETTER

THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
P.O. BOX 907, PORTLAND, OR 97207

VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 7
JULY 2001

JULY ACTIVITIES

Fri. July 13, 8:00 PM: Impact Craters on Earth: Chixulub, Chesapeake Bay, and Others. Melinda Hutson, Portland Community College Instructor. Rm. 371 Cramer Hall, PSU.

No Friday noon meetings or seminars during the summer. Next seminar will be Wed., Sept. 19: Richard Bartels will discuss the Columbia River Basalts. Rm. S-17 Cramer Hall, PSU.

Sat. 7/28: South Side of Mt. St. Helens – Field trip by bus. Lava tubes, a lava-covered forest, a spectacular mudflow, a suspension bridge, and more. Leader: Taylor Hunt. Bring lunch, fluids, camera, binoculars, & dress for weather. Call early; Mary's Peak trip filled up fast. Will be $22/person. 8:30 AM-approx. 5 PM. Call 503-662-4790.

****

ANNUAL PICNIC

After careful review, we decided that the Rice Museum with its new exhibits couldn't be beat. The picnic will be **Sunday, August 12, 11:00 AM-2:30 PM.** Coffee, tea, and punch will be provided. $3 donation is required on arrival, and admittance to the museum is free. If possible, e-mail Taylor Hunt at hunt6422@email.msn.com, or call 503-662-4790, for directions to the Rice Museum and to let him know how many will be there. **COME ONE, COME ALL! WE'RE GOING TO HAVE A GREAT TIME!**

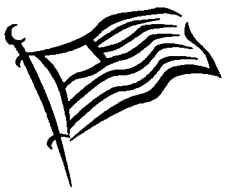
****

Preview of coming attractions:

President's Field Trip Sept. 4-8, Tue.-Sat.: **GEOLOGICAL TOUR OF THE OREGON WINE COUNTRY: The Importance of Soils.**

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.



UPDATE ON THE 2001 GSOC PRESIDENT'S FIELD TRIP

"A Geological Tour of Oregon's Wine Country"

September 4 through September 8 (five days/four nights)

Tour Highlights include:

- **Guest speakers** who are local authorities on wine-growing soils and viticulture:
  - Dr. Scott Burns, Portland State University
  - other experts from Chemeketa Community College and/or Oregon State University
- **Winery tours** in the Willamette Valley, Umpqua , Rogue and the Applegate Valley appellations, each a distinct and different wine growing region.
- **Shakespearean play** in Ashland (depending upon seat availability).

Be sure to **fill out a registration form** available on the back of the newsletter. Early bird registration by no later than July 15!

Secure your place with a $350 deposit now (total cost of trip will be between $600 and $700). The remainder will be due no later than August 15. Only 20 spaces remaining! Costs will cover transportation, lodging, breakfast and lunch, and winery admission fees.

This trip is intended for GSOC members. If you're not currently a member and wish to go on the trip, join GSOC now! **Membership form** is on the title page of this newsletter.

Please contact Sandy Adamson for details:

- phone: (503)748-1181 days until June 29, (503)667-6287 evenings and weekends
- email: sla757927@aol.com

Oregon viticulture and soil info available on the web:

Northwest Berry and Grape Information Network, a joint project of Oregon, Washington, and Idaho Universities, and the USDA-ARS:
http://berrygrape.orst.edu/fruitgrowing/soils.htm

Oregon Low Input Viticulture and Enology
http://berrygrape.orst.edu/LIVE/

USDA Natural Resources Conservation Service (NRCS) has a website where you can get soil info/maps for Oregon:
ftp://soils.css.orst.edu/pub/webdocs/ssurgo.html

SOILS AND VITICULTURE

An article on soils and viticulture appeared in the Food Day section of the May 29, 2001, Oregonian, by Amy Martinez Starke. In the article Ms. Starke and Dr. Scott Burns discuss the predominant soil types preferred by wine grape growers in the region. Basically, the preferred soil profiles are heavily weathered, nutrient-poor soils. Traditional wineries in the Willamette Valley are situated in the Jory soil profile on **weathered Columbia River Basalt**. Some newer wineries are located in Willakenzie soils on **weathered marine sedimentary rocks**.

Some of the exhibits we will be doing for the wine tour will be to plot the wineries we are planning to visit on a geological map of Oregon. It is also possible to get detailed soils maps (downloadable in GIS format) of the counties of Oregon and we also hope to map our wineries on those.

Museum Freebies

The **Maryhill Musseum**, located just east of the Dalles on the Washington side of the Columbia Gorge, has free admission for two counties in

Washington and Oregon each month. Residents of Multnomah and Clackamas counties in Oregon may go through the museum for free during the month of October. Clark County, Washington residents may go free in September. For other counties, contact Maryhill Museum, 509.773.3733.

The **National Historic Oregon Trail Interpretive Center** near Baker City, Oregon, has free admission days during the year. For the year 2001, the free days are July 3, August 15, September 22, October 20, November 22, and December 7.

WEBSITE CHANGES

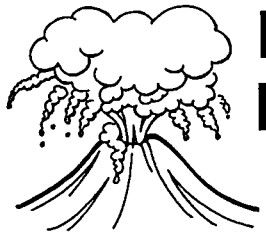
Attention GSOC'ers –
If you have been unable to access the GSOC website lately, don't despair!!! GSOC has been in the process of changing Internet Service Providers (ISP's for you computer geeks out there). Until the domain park changes take effect, you won't be able to get onto the GSOC website by our usual handle, www.gsoc.org. This is only **temporary**, and by the time this newsletter is published the domain should be back in business. Meanwhile, you can access the GSOC website from our new ISP's server, with this URL:
http://www.spiritone.com/~gsoc/

Also, our GSOC email address will be **permanently** changing with the new ISP. The new GSOC mail address will be gsoc@spiritone.com.

FIELD GUIDES

If you feel like studying geology at home, or making your own field trip excursions, you can purchase the following GSOC field trip guides from years gone by:
price includes postage

Geologic Trip Log through Eastern Foothills of Oregon Coast Range between Vernonia and Banks, 1964 .....$0.75
Columbia River Gorge and Grand Canyon of the Deschutes River, 1964 .....0.75
Geological Guide Book for Central Oregon, Prineville, Paulina, Suplee, Delintment Lake, 1965 .....0.75
Geologic Trips in the Mitchell-John Day area, 1969 .....1.75
Condon's First Island, Geological Trips in the Siskiyous and along the Rogue River, 1970.....1.25
Field Trips along the Oregon Coast in Lincoln County, 1974.....2.25
Field Guide to Geologic Sites in the Newberry Crater Area, 1976.....2.00
Investigating the Geology of the North Cascades, Washington state, 1977.....2.25
Sawtooth Mountains and the Stanley Basin, Idaho, 1978 .....1.75
Central Oregon's Volcanic Wonderland and How it Came to Be, 1982 .....1.75
Lewiston, Idaho, 1984 .....3.50
Northern Idaho and Montana, 1988.....6.50
Vancouver Island, British Columbia, 1989 .....7.00
Cascadia Subduction Zone, 1992 .....7.00
The Missoula Floods, 2000.....15.00



IGNEOUS ROCKS, PHASE DIAGRAMS, AND BOWEN'S REACTION SERIES

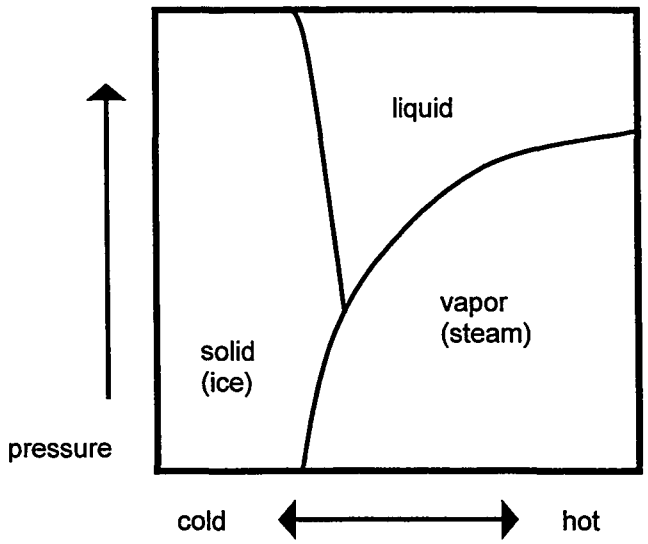
There is an excellent site on the internet about igneous rocks, mineral solutions, and phase diagrams. The author, Dr. Lynn S Fichter (email fichtels@jmu.edu), from the Dept. of Geology & Environmental Science, James Madison University, is permitting us to publish some extracts from the site, (http://geollab.jmu.edu/Fichter/Fichter/Fichterls.html) in this month's newsletter.

Why study mineral solutions and phase diagrams? This branch of geology, in which the minerals themselves are studied, explains the processes which produce rocks of various mineral compositions. Knowing the processes which produce minerals can give clues as to the tectonic settings which created the rocks. The famous

pioneer in this work was Norman L. Bowen, who performed experiments on the crystallization of silicate liquids in the early 20th century.

What is a mineral phase? According to Dr. Fichter's site, "A phase is anything that can be mechanically separated. For example, minerals in a rock are each different phases, and liquid and vapor are different phases. More importantly here, in a partially, or fractionally, melted rock the melt portion is one phase and the unmelted residue is a second phase."

A very simplified phase diagram for water is shown below. This diagram shows the phases of water dependent on the environmental temperature and pressure.



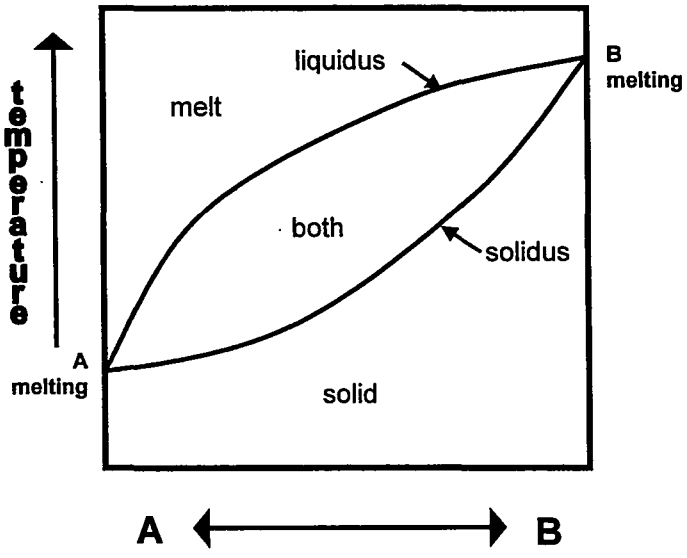
Mineral phase diagrams can be like the above diagram for water, with a single composition at different temperature and pressure; however minerals are generally mixed in the real world and diagrams showing the behavior of mixtures are common. Dr. Fichter's site discusses solid solution and binary eutectic phase diagrams:

"The **solid solution phase diagram**...shows two phases: crystal and melt...one variable - temperature plotted along the vertical axis...Pressure is held constant...complete miscibility (mixability) in both liquid (magma) and crystal phases...demonstrates how the metallic cations in a mineral can be partitioned into fractions. For example, all the ferromagnesium minerals (olivine, pyroxene, amphibole, biotite) are solid solutions of Mg and Fe. High temperature crystallization species are Mg rich, intermediate temperature species mixed Mg and Fe, and low temperature species Fe rich."

" The **binary eutectic phase diagram** explains the chemical behavior of two immiscible (unmixable) crystals from a completely miscible (mixable) melt, such as olivine and pyroxene, or pyroxene and Ca plagioclase. The binary eutectic phase diagram demonstrates how two mixed and unrelated minerals can be fractionated. For example, amphibole and plagioclase are both found in diorite, but can be at least partially separated by fractionation."

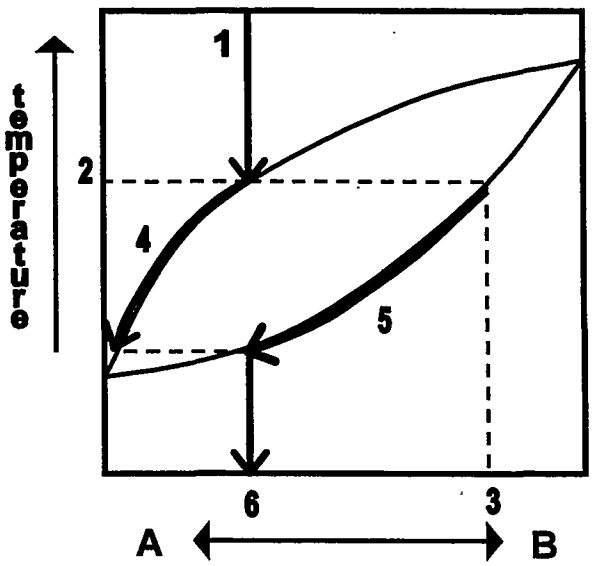
Fractionation occurs when early forming minerals have a different composition than the magma. If these are removed from the magma before crystallization is complete, then the magma is changed in composition from the original.

Here we have a very simple example of a solid solution phase diagram. On the website, Dr. Fichter shows the interaction between sodic and calcic plagioclase, rather than mineral A and B.

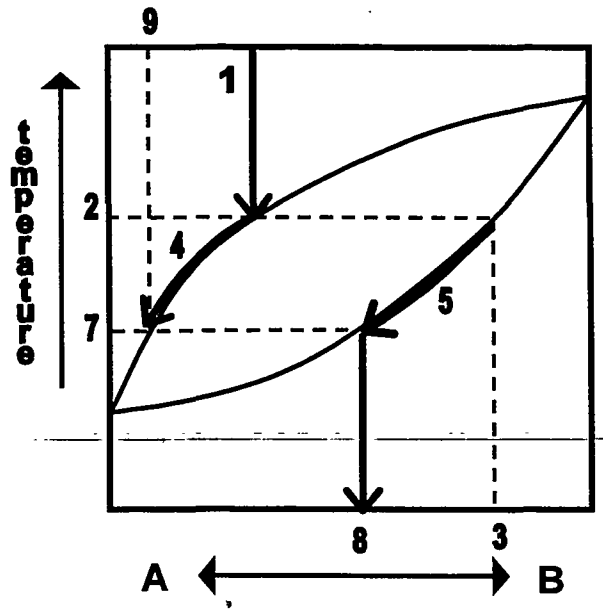


The solid solution diagram shown here describes the interaction between generic minerals A and B. The liquidus line shows the temperature of the first solid crystal of melts of various compositions. The solidus line shows the temperature of the first drop of melt for a solid crystal solution of various compositions.

Now we can find out what happens to the melt as it cools and solidifies. If the melt starts at 30% composition of B and 70% of A at **1**, the temperature of the first crystal is **2**, and the composition of the first crystal is **3**. As the melt continues to solidify, its composition is given by the liquidus **4**. The crystal composition of the solid solution follows the solidus **5**. If the mixture cools slowly without separation, the final composition of the solid solution will be the same as the original melt **6**.



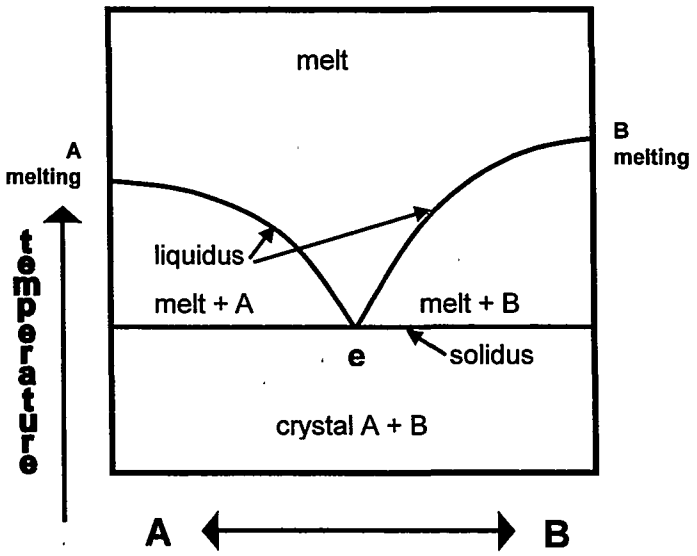
If the process gets interrupted, say for example that the early forming crystals get separated from the melt, then the melt composition will be richer in mineral A and the crystal composition will be richer in mineral B than the original mix.



The final solid solution phase diagram shows a cooling process interrupted at the temperature at **7**; the crystal composition at point **8** and the melt composition at point **9**.

Melting processes can separate minerals in a similar manner when interrupted, as shown on the website.

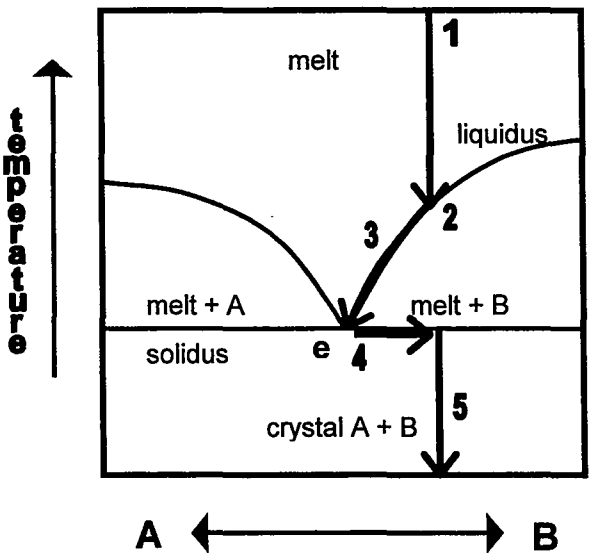
Now we will introduce the binary eutectic phase diagram for two hypothetical substances A and B:



Dr. Fichter's notes on the binary eutectic diagram:

- The liquidus line separates the all melt phase from the melt+crystal phase.
- The solidus line separates the melt+crystal phase from the all crystal phase. NOTE that the solidus and liquidus lines are experimental, they have been determined by melting and cooling many melts at different percent compositions.
- The eutectic (e) is the point at which all three phases can exist simultaneously, A, B, and melt. The eutectic here is 50% B, but can be any percent depending on the minerals involved.
- If we add some B to a melt of A (say 20% B; red arrow) the temperature of melting (crystallization) is lowered. The more B we add the lower the melting temperature becomes; that is, it moves down the liquidus line toward the eutectic. Any mixture of A and B lowers the melting (crystallizing) temperature down the liquidus.

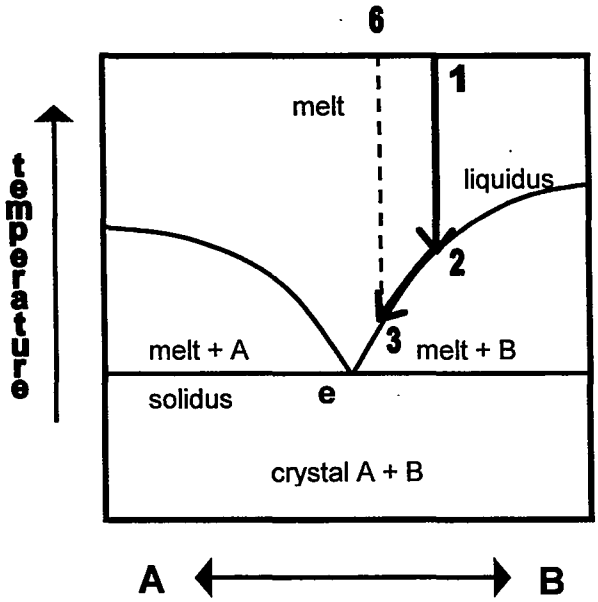
An Example of Equilibrium Crystallization From a Melt With a 50/50 Eutectic:



The First Crystal (numbers on phase diagram correspond with numbers below)

1. Assume a melt composition of 70% B and 30% A.
2. Cool melt to liquidus line along red arrow. Only B crystals form...because we are on the Melt+B liquidus line; no A can crystallize until the eutectic is reached.
3. Removing (crystallizing) B changes the melt composition making in richer in A. Therefore the melt composition begins to migrate to the left, but down the liquidus line toward the eutectic point. The system must stay on the liquidus line since going above it would raise the temperature high enough to melt everything.
4. At the eutectic point, and only at the eutectic point, can A finally begin to crystallize out of the melt, and A and B now crystallize out together at a ratio of 50/50 until all the melt is gone.
5. Finally after all the melt is gone the two crystals A+B can leave the eutectic. Since the original composition of 70% B has not changed we therefore shift the path right to the 70% point, and continue to drop the temperature straight down. This path is the same any time the composition of B is greater than the eutectic value. If the composition is less than the eutectic, the path is similar, but a mirror image.

If this process is interrupted while the melt is solidifying, the melt composition can be read by projecting straight up from the liquidus (6), and the crystal composition will be pure B.



We will conclude next month with a discussion of Bowen's reaction series.

Geological Society of the Oregon Country
PO Box 907
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GSOC Wine Tour 2001 September 4 – September 8

1. Complete this form AND the waiver form on the back:

Number of people in your party: _____

Name(s): _____ **Address:** _____

_____ **City/State:** _____

Name of person with whom who wish to share lodging (not otherwise listed): _____ **Zip:** _____

Phone: _____

E-mail: _____

2. Send Form, completed Waiver, and Payment to address below ($350 deposit to reserve your seat, the remainder will be due on August 15 – approximate total cost $700):

__Check enclosed. **Make check payable to *Northwest Gold Tours***
Indicate that it is for the "GSOC Wine Tour"
Mail to: Northwest Gold Tours
13195 SW Oakwood Street
Beaverton, OR 97005

__Credit card: **Mastercard** **Visa** (circle one) Amount $_____
Number:
Expiration date:
Signature of card holder_____

3. Or call Northwest Gold Tours at (503)672-9985 or fax (503)672-7565.

4. This tour is for GSOC members. If you are not currently a member. Dues are $20 for an individual, $30 for a family. Please mail your membership dues to:
The Geological Society of the Oregon Country
PO Box 907
Portland, OR 97207

5. If you're traveling as a single and would like to possibly share lodging with someone else, may your phone number and/or e-mail address be shared with someone else who is also traveling as a single and seeking shared lodging? If yes, circle one:
phone_____ or **e-mail** _____

6. You'll be limited to one carry-on bag, plus one additional bag. Baggage handling gratuities are not included, but will be available at our places of lodging.

7. For additional information, please call Sandy Adamson, (503)667-6287 or e-mail at sla757927@aol.com

Geological Society of the Oregon Country
PO Box 907
Portland, OR 97207-0907

President's Annual Field Trip - 2001
GSOC WINE TOUR - Waiver

In consideration of the Geological Society of the Oregon Country providing this trip, I, _____,

hereby waive any claim that I might have against the Geological Society of the Oregon Country, its Board of Directors and trip leaders, jointly and individually, for injuries or loss to me as a result of any accident or incident which may occur on this trip.

Dated: _____

Signed: _____

Please sign and return with your final payment

MEDICAL INFORMATION

Name: _____

Telephone Number: _____

Name of Physician: _____

Telephone Number: _____

Allergies: _____

Special Medications: _____

Special Medical Conditions: _____

In Case of an Emergency Call: _____

THE GEOLOGICAL NEWSLETTER

GSOC

AUGUST 2001

GEOLOGICAL SOCIETY
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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:
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GEOLOGICAL NEWSLETTER

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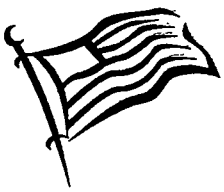

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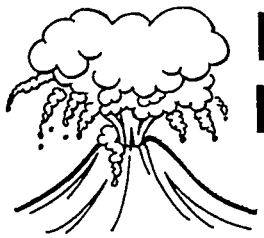

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During fractionation the mafic parent rock selectively melts producing two fractions. The first fraction is a melt whose composition is closer to the bottom of BRS (editor's note: Bowen's Reaction Series – see diagram at the end of the article) than the original rock. This melt is intermediate in composition. The second fraction is the unmelted crystal residue with a composition more mafic (i.e. ultramafic) than the original rock. That is, its composition is higher in BRS than the original rock.

"If time and conditions allow, the fractionation process can continue and the intermediate rock produced during the first fractionation can fractionate into a felsic magma, leaving behind a crystal residue more mafic than the intermediate rock." Dr. Fichter's page on Igneous Rock Evolution shows these fractionation relationships in terms of BRS.

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There are practical problems with fractional crystallization. For one, gravity settling is a slow process, and requires more time than is normally available. And two, for gravity settling to occur the cooling magma must remain still, a difficult state for a hot, turbulent melt. Nonetheless, field evidence indicates that gravity settling does occur, at least under some conditions, but it not as

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Additional reading:

Hamblin, Kenneth, The Earth's Dynamic Systems – A Textbook in Physical Geology, Burgess Publishing, 1985.

USGS Volcanic Rock Page
http://volcanoes.usgs.gov/Products/Pglossary/VolRocks.html

Jack M. Rice, Professor of Geological Sciences, University of Oregon, information for Earth Materials course:
http://www.uoregon.edu/~jrice/geol_311/Igneous.html

Michael J. Pidwirny, Ph.D., Department of Geography, Okanagan University College, information for Fundamentals of Physical Geography course:
http://www.geog.ouc.bc.ca/physgeog/contents/10e.html

Website with descriptions of igneous rocks and great pictures by Pamela J. W. Gore, Georgia Perimeter College:
http://www.dc.peachnet.edu/~pgore/geology/geo101/igneous.htm

More pictures, plus mineral content of magmas by Dr. Ralph R. B. von Frese, Associate Professor of Geophysics, Ohio State University:
http://www.geology.ohio-state.edu/~vonfrese/gs100/lect08/

Interactive crystallization/fractionation demonstration
http://gly1000-01.su00.fsu.edu/ig/Ig8.html#HERE

Test yourself!
John C. Butler, Professor and Associate Dean, Ohio State University:
http://www.uh.edu/~jbutler/physical/chap3mult.html

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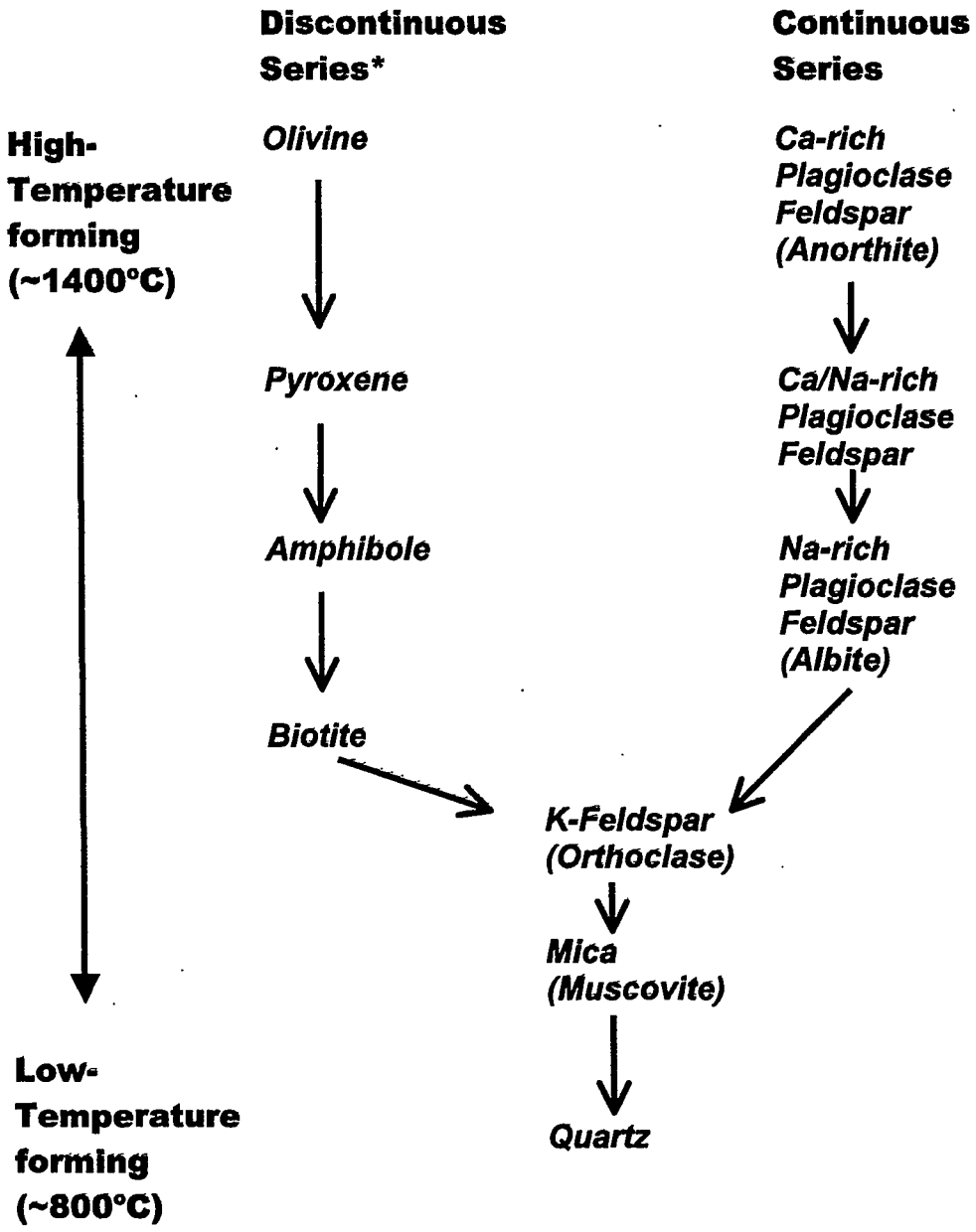

*Bowen found that minerals stable at progressively lower temperature would crystallize replacing the higher temperature minerals as the magma continued to cool.

Igneous Rock Properties Table

Magma Type	Felsic	Intermediate		Mafic	Ultramafic
Intrusive	***Granite****	*GranoDiorite*	*Diorite*	*Gabbro*	*Peridotite-Dunite*
Extrusive	*Rhyolite*	*Dacite*	*Andesite*	***Basalt****	**
Principal Mineral Contents	*Quartz Mica Biotite K-Felspar Na-Feldspar*	*Amphibole Biotite Quartz Na-Feldspar*	*Amphibole Pyroxene Biotite Ca/Na-Feldspar*	*Pyroxene Ca-Feldspar*	*Olivine Pyroxene*
Magma Temperature	*800-1000°C*	*1000-1100°C*		*1100-1200°C*	
Magma fluidity*	*Highly viscous*			*Very fluid*	
Silica Content from USGS by weight	*>68%*	*63-68%*	*52-63%*	*48-52%*	

*Magma fluidity is a direct result of silica content. Since felsic magma is so sticky, the intrusive form granite is far more common than rhyolite (Oregon being an exception to this rule). Also, fluid mafic magma produces more basalt than the intrusive gabbro.

**Since this magma is produced as a result of fractionation of mafic magma and with the high crystallization temperature of the mineral content, this type of magma is almost always intrusive.

FRIENDS OF THE PLEISTOCENE FIELD TRIP

The Friends of the Pleistocene Pacific NW cell will be meeting in the Summer Lake basin this September 28-30. The topic of the trip will be Pluvial Lake Chewaucan. One of our GSOC members, Bob Strebin, would like to know if there are other persons wishing to carpool in a rented SUV for the trip. Contact Bob Strebin at 503.665.2756 for carpool information, and for more general information about the trip and registration visit Dr. Rob Negrini's website at http://www.cs.csubak.edu/Geology/Faculty/Negrini/FOPDocs/NWFOP2001.html.

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GSOC

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THE GEOLOGICAL NEWSLETTER

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Calendar:
Evelyn Pratt – 503/223-2601

Business Manager:
Rosemary Kenney – 503/892-6514
Assistant Business Manager:
Cecelia Crater – 503/235-5158

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.
FIELD TRIPS: Usually one per month. Fees: Members, $1.00, Non-members, $3.00. See calendar next page.
GEOLOGY SEMINAR: Third Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.
GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Consult current calendar (next page) or verified by phone: 503/235-5158 or 503/892-6514.
MEMBERSHIP: Per year from January 1: Individual--$20.00, Family--$30.00, Junior (under 18)/Student--$10.00.
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Address _____ **City** _____ **State** ___ **Zip**_____-_____
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Geologic Interests and Hobbies_____
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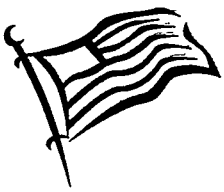

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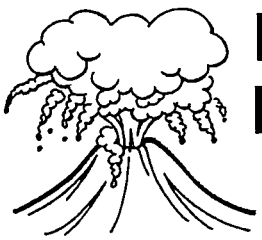

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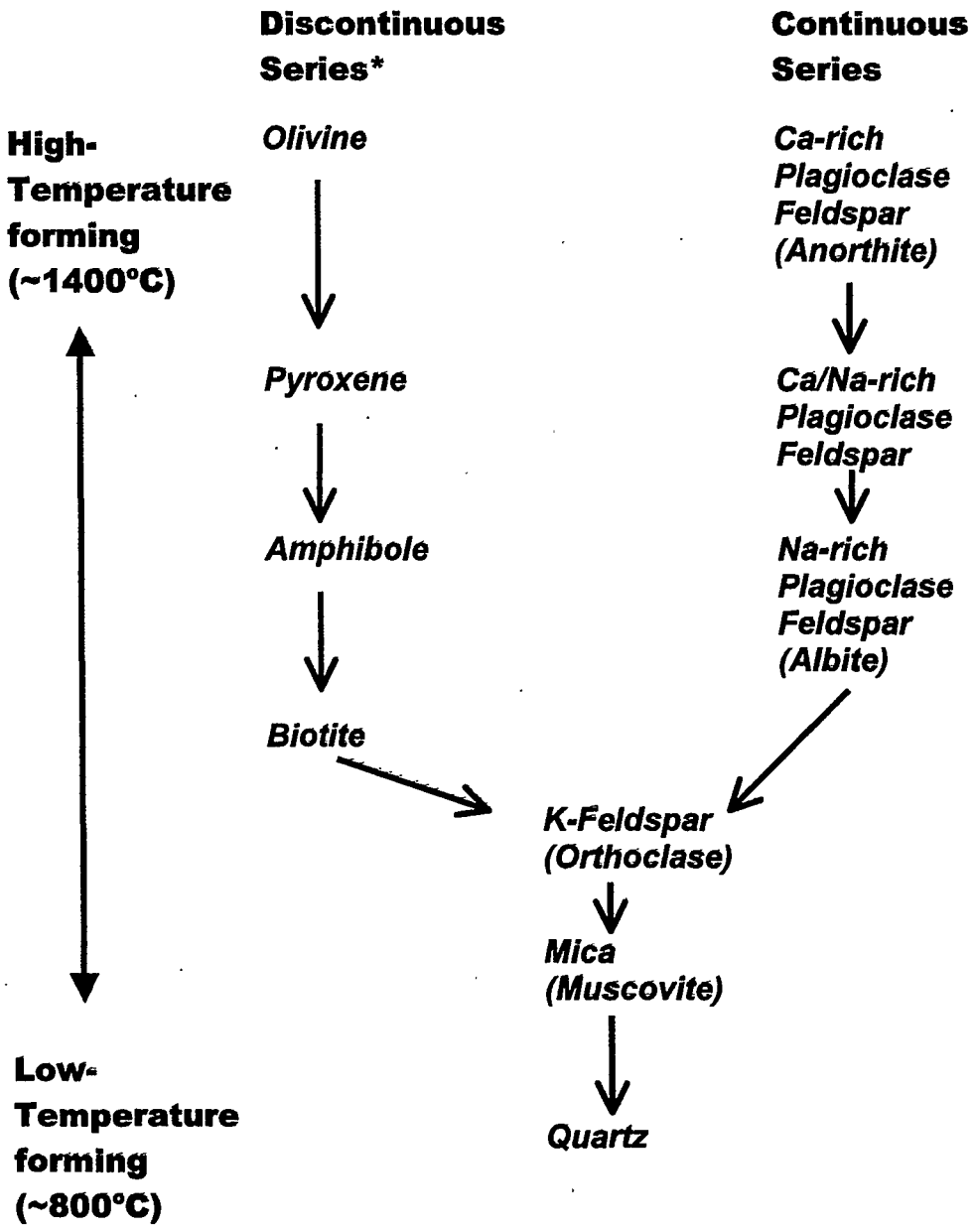
9. **Ocher**: an earthy, powdery red, yellow, or brown iron oxide used as a pigment.

Bowen's Reaction Series



*Bowen found that minerals stable at progressively lower temperature would crystallize replacing the higher temperature minerals as the magma continued to cool.

Igneous Rock Properties Table

Magma Type	Felsic	Intermediate		Mafic	Ultramafic
Intrusive	***Granite****	*GranoDiorite*	*Diorite*	*Gabbro*	*Peridotite-Dunite*
Extrusive	*Rhyolite*	*Dacite*	*Andesite*	***Basalt****	**
Principal Mineral Contents	*Quartz Mica Biotite K-Felspar Na-Feldspar*	*Amphibole Biotite Quartz Na-Feldspar*	*Amphibole Pyroxene Biotite Ca/Na-Feldspar*	*Pyroxene Ca-Feldspar*	*Olivine Pyroxene*
Magma Temperature	*800-1000°C*	*1000-1100°C*		*1100-1200°C*	
Magma fluidity*	*Highly viscous*			*Very fluid*	
Silica Content from USGS by weight	*>68%*	*63-68%*	*52-63%*	*48-52%*	

*Magma fluidity is a direct result of silica content. Since felsic magma is so sticky, the intrusive form granite is far more common than rhyolite (Oregon being an exception to this rule). Also, fluid mafic magma produces more basalt than the intrusive gabbro.

**Since this magma is produced as a result of fractionation of mafic magma and with the high crystallization temperature of the mineral content, this type of magma is almost always intrusive.

FRIENDS OF THE PLEISTOCENE FIELD TRIP

The Friends of the Pleistocene Pacific NW cell will be meeting in the Summer Lake basin this September 28-30. The topic of the trip will be Pluvial Lake Chewaucan. One of our GSOC members, Bob Strebin, would like to know if there are other persons wishing to carpool in a rented SUV for the trip. Contact Bob Strebin at 503.665.2756 for carpool information, and for more general information about the trip and registration visit Dr. Rob Negrini's website at http://www.cs.csubak.edu/Geology/Faculty/Negrini/FOPDocs/NWFOP2001.html.

THE GEOLOGICAL NEWSLETTER

GSOC

SEPTEMBER 2001

GEOLOGICAL SOCIETY
OF THE OREGON
COUNTRY
P. O. Box 907
PORTLAND, OR 97207

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ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.
FIELD TRIPS: Usually one per month. Fees: Members, $1.00, Non-members, $3.00. See calendar next page.
GEOLOGY SEMINAR: Third Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.
GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Consult current calendar (next page) or verified by phone: 503/235-5158 or 503/892-6514.
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Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 9
SEPTEMBER 2001

SEPTEMBER ACTIVITIES

PRESIDENT'S FIELD TRIP:

GEOLOGICAL TOUR of the OREGON WINE COUNTRY:

An examination of the soils that help create Oregon's fine wines. Sept. 4-8, Tue.-Sat. Bus trip will include lectures by Dr. Scott Burns, PSU geologist; Greg Jones, SOU geographer & climatologist; Taylor Hunt; David Buchanan, retired biologist/4th generation winemaker; and other experts in 13 wineries from the Willamette Valley to the Rogue River. Also, we might see a Shakespearean play in Ashland. To sign up, call Sandra Adamson at 503-667-6287, or e-mail her at SLA757927@aol.com.

Fri. Sept. 14, 8:00 PM: The Environmental Observation System with Application to the Columbia River Estuary. Dr. Arun Chawla, Center for Coastal & Land-Margin Research & specialist in wave action at entrances to river inlets. Rm. 371 Cramer Hall, PSU.

Seminar Wed. Sept. 19, 8:00 PM: Richard Bartels will discuss the Columbia River Basalts. Rm. S-17 Cramer Hall, PSU.

Preview of coming attractions:

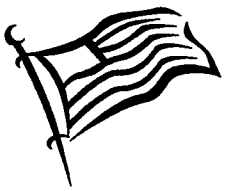
Fri. noon, Oct. 12(?): Building Damage & Soil Failure in the Nisqually Earthquake. Carol Hasenberg, structural engineer & past president of GSOC. Central Library, 801 SW 10th.

Fri. evening, Oct. 12: TBA.

Field Trip: Call Taylor Hunt, 503-662-4790, or Evelyn Pratt, 503-223-2601.
Oct. 27, Saturday. Geology of Longview-Kelso basin area

Bob Strebin & Tim Tolle now chair noon meetings.

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.



UPDATE ON THE 2001 GSOC PRESIDENT'S FIELD TRIP

"A Geological Tour of Oregon's Wine Country"

September 4 through September 8 (five days/four nights)

Tour Highlights include:

- **Guest speakers** who are local authorities on wine-growing soils and viticulture:
  - Dr. Scott Burns, Portland State University, geologist and expert in soils of viticulture.
  - Dr. Gregory Jones, Southern Oregon University, geographer/climatologist and second generation winemaker. (http://www.sou.edu/Geography/JONES/jones.htm).
  - Mr. David Buchannon, biologist from Oregon Department of Fisheries and Wildlife (retired) and winemaker, specializes in nutrient delivery in soil.
  - Tentative plans for Gerard Koschal, Oregon geologist.
  - Dr. Earl Jones, Abacela Vineyard and Winery, to discuss the fault which bisects his vineyard.
  - other viticulture experts
- **Winery tours** in the Willamette Valley, Umpqua, Rogue and the Applegate Valley appellations, each a distinct and different wine growing region. The winery list includes:
  - Kramer Vineyards
  - Erath Vineyards
  - Airlie Winery
  - Benton-Lane Winery
  - Tyee Wine Cellars
  - Abacela Vineyard and Winery
  - Valley View Winery
  - Foris Vineyards
  - Marquam Hill Vineyards
  - Champoeg Wine Cellars
  - wineries/vinevards in the Eola Hills area
- **Shakespearean play** in Ashland.

There are still a few spots available on the bus. Estimated cost of trip is between $600 and $700. Costs will cover transportation, lodging, breakfast and lunch, and winery admission fees.

This trip is intended for GSOC members. If you're not currently a member and wish to go on the trip, join GSOC now! **Membership form** is on the title page of this newsletter.

Please contact Sandy Adamson for details:

- phone: (503)667-6287
- email: sla757927@aol.com

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

John Farwell

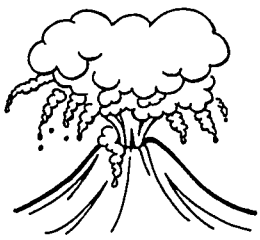
Robert Todd

COMPLETELY FRACTURED GEOLOGY

Answers on page 45.

1. **Orogeny**: refers to those little things on a chromosome which are responsible for making people produce Oreo cookies.
2. **Zeolite**: a low-calorie religious radical
3. **Overthrust**: (1) teeth before braces (2) in baseball, a fast ball thrown out at the strike zone (3) what a very buxom rock star has a lot of.
4. **Accrete**: native of a large Mediterranean island.
5. **Inundate**: (1) rendezvous at the local drive-in burger restaurant (2) a quiet night at home with one's sweetie.
6. **Micaceous**: as in, "Micaceous, you look lovely today!"

7. **Unconformity**: (1) refusal to wear the school uniform (2) what all those people who voted for Ralph Nader are guilty of.
8. **Dike**: (1) what the little Dutch boy put his finger in (2) (ask Taylor!).
9. **Diabase sill**: what you do when you want to tryout a new color at the bottom of your windows.
10. **Arkosic**: how Noah felt after 40 days.



MARY'S PEAK FIELD TRIP RECAP

SATURDAY, JUNE 23, 2001

Taylor Hunt, Trip Leader and Field Trip Director

22 people met at Portland State University for a day of geo-speak and field trip back in time to the Eocene Period.

Mary's Peak (4097 ft) is topped by an erosion-resistant sill which intrudes bedded sandstones of the middle Eocene Flournoy Formation which in turn overlie the early Eocene Siletz River Volcanics. The Corvallis fault at the base of the peak and the Kings Valley fault are crossed several times. The bulk of the peak is composed of Siletz River Volcanics. This trip traverses the structural grain of the area.

The rock units are of the Eocene and younger intrusions which make up the bulk of the exposed coast range. The oldest exposed unit, Siletz River Volcanics, is submarine pillow and massive basalt flows, basalt breccias and tuffs, and associated thin basaltic-sedimentary rocks. The unexposed base, by geophysical data, suggest sediments beneath it. The lower part is thought to be oceanic crust which accreted to the continental margin. Rocks of more varied composition in the upper part are seamounts. The unit is estimated at over 10,000 feet.

The upper part, the Kings Valley Siltstone Member, is 500 ft thick on Mary's Peak. It is mainly tuffaceous siltstones and minor tuffaceous sandstones of basaltic derivation. Locally white ash beds are present, some with fossils.

The Flournoy overlies the Kings Valley with no unconformity. It is a thick sequence of rhythmically bedded marine sandstones and siltstones of middle Eocene derived from the Klamath Mountains. The sandstone is arkosic and micaeous. Sedimentary structures indicative of turbidite deposition are common. The unit is 6000 feet thick west of Mary's Peak and thins rapidly to the east. The Flournoy is overlain unconformably by the late Eocene Spencer Formation, a series of thick-bedded basaltic, arkosic, and micaceous marine sandstones, deposited off the block west of the Corvallis fault during and after the early motion on the fault.

The Mary's Peak sill intruded between beds of the Flournoy Formation. It formed from a basaltic magma and developed a typical basalt differentiation sequence. The entire sill is about 1000 feet thick. It has chilled margins. A radiometric date of 29.9 m.y. gives an Oligocene age for the sill.

Before our 1st Mt. Stop we paused for coffee on the Corvallis Fault in the parking lot of Hoover Elementary.

Drive west from Philomath, following Hwy 34 to the Mary's Peak Park.

As we turned right on Mary's Peak Road, altered Siletz River volcanics in this area show ghostly outline of pillows in red soil.

Our first stop showed a relatively fresh outcrop of Siletz River Volcanics showing the contact between pyroclastics on the east and a columnar jointed flow on the west. Relatively steep northwest dip. A small low angle fault cuts the outcrop. Zeolite and calcite secondary mineralization are filling spaces in the rock.

At stop two, weather permitted at this overlook to view southwest along the Corvallis fault and east across the Willamette Valley. Southeast across the Corvallis fault Flat Mountain and Green Peak are supported by sill similar to that on Mary's Peak. Massive, jointed flows of Siletz River basalt in outcrop across road.

At stop three, a road cut, had excellent outcrop of Siletz River pillow basalts passing upward into massive basalt. This is topped by a thin bed of basaltic glass tuff over which there is another pillow basalt unit. Several small faults are present. The pillows are well preserved. Most are surrounded by a glassy rind and show a well-developed radial joint. Calcite and zeolites occur between pillows. The basalt is composed of labradorite, augite, titaniferous magnetite, and glass is commonly intensely layered.

Stop four, after turning left onto Harlan Road, going a short distance to Parker Creek. Outcrop of Flournoy sandstone about 150 feet below the base of the Mary's Peak sill. Here we were west of the Kings Valley fault in the down dropped block. We ate lunch by this beautiful tumbling creek and collected naturolite sprays in vugs. We returned to Mary's Peak Road, crossing Kings Valley fault again.

Stop five, after turning left to continue on Mary's Peak Road, to Parker Creek Waterfall, a roadside stop. The middle of Mary's Peak sill is seen here. It is a dark gray ultramafic rock.

Stop six, end of the road, and overlook to the west across the Coast Range. The parking lot and the walk up from the saddle to the top was fogged in, but on a clear day the bridge across the Yaquina estuary can be seen, even from the parking lot. Many of the huge rocks lining the parking lot are highly altered by zeolites. (Trip from park entrance to top is 9 ½ miles.) The group disbanded here for the return home.

TWO NOTEWORTHY GSOC MEMBERS DECEASED

Mrs. Mildred T. Phillips

We regret to say that we have lost our last GSOC charter member Mildred Phillips. Her daughter-in-law Jeannie Phillips graciously sent us this story of Mildred's life:

Thank you for asking about our Darling Mid! She was born in a snow storm near Marshaltown, Iowa on Feb. 11, 1905. She came West to attend Willamette University in 1923, where she became May Queen the year she graduated. She taught high school in Woodburn, Oregon.

Mildred Isadore Tomlinson married Clarence D. Phillips at the home of her Grandparents New Year's Eve, 1928. They had 2 children, Shirley and Jim. She always reminded everyone, Jim was born the year GSOC was chartered in 1935. Mildred's husband, Clarence was the GSOC President in 1936.

Mildred climbed Mt. Hood when she was 50 years old and was always active in many organizations. She enjoyed traveling with Clarence and in 1957, one of the highlights of her life was being introduced to the Queen of England at Buckingham Palace. She kept active and in her later years took classes in China painting and Calligraphy. She also taught several Vietnamese people English as a volunteer.

Mildred drove her own car until she was ninety. For her 95th Birthday we took her to Hawaii where she had a wonderful time touring around Oahu. She attended the 100th banquet of Sons and Daughters of Oregon Pioneers on her 96th Birthday where she was also the oldest guest. She was proud to be the last living Charter Member of the Geological Society of the Oregon Country and looked forward to the Banquet and getting "her rose". Mildred died July 30, 2001.

Dr. Donald Botteron

A memorial service was held for Dr. Donald Botteron Tuesday July 31, at Capitol Hill United Methodist Church. He died July 24, 2001 at the age of 84. Dr. Botteron was born July 29, 1916, in Columbus, Ohio. He was raised in Wood River Illinois, and graduated from the University of Illinois. He earned a doctorate in chemistry from Northwestern University. He was a professor of organic chemistry at Syracuse University, from 1943 until retiring in 1981, when he moved to Portland.

He was president of GSOC and Portland Astronomers (now Rose City Astronomers). He led GSOC on a trip with Ellen Morris Bishop to the Wallowa Mountains for the 1994 President's Campout. In 1941 he married Elizabeth Louise Lamb. Remembrances can be sent to the Oregon chapter of the Nature Conservancy.

Glossary of Volcano and Related Terminology

From the USGS Cascades Volcano Observatory website:
http://vulcan.wr.usgs.gov

Aa:
Aa (pronounced "ah-ah" - a Hawaiian term), is lava that has a rough, jagged, spiny, and generally clinkery surface. In thick aa flows, the rubbly surface of loose clinkers and blocks hides a massive, relatively dense interior. (Tilling, Heliker, and Wright, 1987)

Active volcano:
A volcano that is currently erupting, or has erupted during recorded history.
A volcano that is erupting. Also, a volcano that is not presently erupting but that has erupted within historical time and is considered likely to do so in the future (there is no distinction between "active" and "dormant" in this sense). (Foxworthy and Hill, 1982)

Aerosol: Fine liquid or solid particles suspended in the atmosphere. Aerosols resulting from volcanic eruptions are tiny droplets of sulfuric acid -- sulfur dioxide that has picked up oxygen and water.

Airfall:
Ash falling from an eruption column or ashcloud. (Miller, 1989)
Volcanic ash that has fallen through the air from an eruption cloud. A deposit so formed is usually well sorted and layered. (Foxworthy and Hill, 1982)
Also called: ashfall.

Andesite:
A medium-colored dark gray volcanic rock containing 53-63 percent silica with a moderate viscosity when in a molten state. Intermediate in color, composition, and eruptive character between basalt and dacite.

Ash (volcanic):
Fragments less than 2 millimeters (about 1/8 inch) in diameter of lava or rock blasted into the air by volcanic explosions.
Fragments of lava or rock smaller than 2 millimeters in size that are blasted into the air by volcanic explosions. (Miller, 1989)
Fine pyroclastic material in fragments less than 4.0 millimeters in diameter. "Ash" in this sense is quite distinct from the ash produced by common combustion because the rocks do not catch fire and burn during a volcanic event. (Foxworthy and Hill, 1982)

Ash cloud:
The fine material that is generated by a pyroclastic flow and rises above it. (Gardner, et.al., 1995)
Cloud of ash formed by volcanic explosions or derived from a pyroclastic flow. (Miller, 1989).

Ashfall:
See: Airfall.

Ash flow:
A pyroclastic flow consisting predominantly of ash-sized (less than 4 millimeters in diameter) particles. Also called a glowing avalanche if it is of very high temperature. (Foxworthy and Hill, 1982)

Atmospheric shock wave:
Strong compressive atmospheric wave driven by volcanic ejecta.

Avalanche:
A large mass of material or mixtures of material falling or sliding rapidly under the force of gravity. Avalanches often are classified by their content, such as snow, ice, soil, or rock avalanches. A mixture of these materials is a debris avalanche. (Foxworthy and Hill, 1982)
See also: Debris avalanche

Ballistic fragment:
An explosively ejected rock fragment that follows a ballistic trajectory.

Basalt:
Dark-colored, low-silica (less than 53 percent SiO2), low viscosity volcanic rock that is relatively fluid when molten; eruptions of basalt are generally nonexplosive and tend to produce relatively long thin lava flows like those common in Hawaii.

Base surge:
Turbulent, low-density cloud of rock debris and water and (or) steam that moves over the ground surface at high speed. Base surges are generated by explosions. (Miller, 1989)

Blocks:
Tephra is the general term now used by volcanologists for airborne volcanic ejecta of any size. Historically, however, various terms have been used to describe ejecta of different sizes. ... Fragments larger than about 2.5 inches are called blocks if they were ejected in a solid state and volcanic bombs if ejected in semi-solid, or plastic, condition. (Tilling, Heliker, and Wright, 1987)
Fragments of lava or rock larger than 64 millimeters in size that are blasted into the air by volcanic explosions. (Miller, 1989)
See: Tephra.

Blowdown: Trees felled by a volcanic blast.

COMPLETELY FRACTURED GEOLOGY

Correct definitions for COMPLETELY FRACTUREDGEOLOGY, mostly adapted from AGI
Dictionary of Geological Terms, 3rd Ed., Bates & Jackson, by E. Pratt.

1. **Orogeny**: the process of forming mountains.
2. **Zeolite**: a large group of aluminum silicates similarto feldspar, found as crystals in holes in basalt and in beds of tuff. Zeolites lose or gain water molecules easily, swell when heated, and are used to soften water, to absorb gases, and as drying agents.
3. **Overthrust**: a large, low-angle thrust fault.
4. **Accrete**: in plate tectonics, refers to the way new land is shoved onto a continent and adheres to it (EP)
5. **Inundate**: (Amer. Heritage Dictionary) to cover or to overwhelm with a flood.
6. **Micaceous**: consisting of, containing, pertaining to, or resembling mica, that group of thin easily-split minerals used in electric insulators, paint, and sparkling sidewalks.
7. **Unconformity**: a break or gap in the geologic record, shown by a rock sequence that has been interrupted. Usually the rock surface below the break was eroded, then new sediments or igneous rocks were put in place on top of the old surface.
8. **Dike**: a tabular-shaped body of igneous rock that cuts across the structure of the surrounding rocks.
9. **Diabase sill**: an intrusion made of cooled magma high in the minerals labradorite and pyroxene, with lath-shaped plagioclase crystals included in augite crystals.
10. **Arkosic**: a term pertaining to coarse-grained, feldspar-rich, typically pink or red sandstone.

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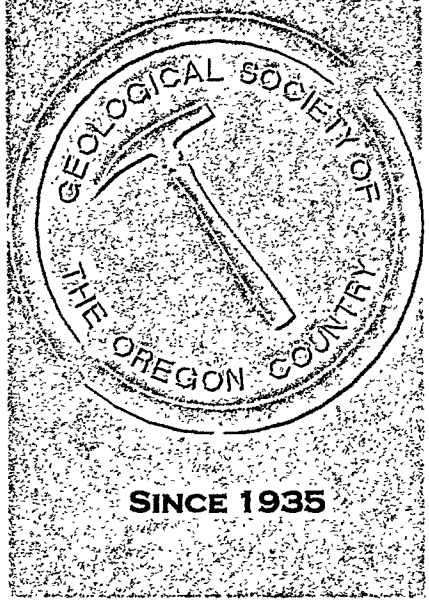

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Geologic Interests and Hobbies_____
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Please indicate Membership type and include check for appropriate amount:
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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 10
OCTOBER 2001

OCTOBER ACTIVITIES

Fri. noon Oct. 12: Building Damage & Soil Failure in the Nisqually Earthquake. Carol Hasenberg, structural engineer & past president of GSOC. Central Library, 801 SW 10th.

Fri. 8 PM Oct. 12: What's Cooking in the Cascades These Days: Ground Deformation of South Sister and Lahar on Mt. Rainier. Ed Klimasauskas, USGS, Cascades Volcano Observatory. Rm. 371 Cramer Hall, PSU.

Seminar Wed. Oct. 17, 8:00 PM: Richard Bartels, "Geology of Portland: From the Columbia River Basalt Group up to the Ice Age Floods". Rm. S-17 Cramer Hall, PSU.

Field Trip Sat. Oct. 27: Geology of Kelso, Longview, & Lower Columbia Basin. See basalt flows from early Eocene to CRB; walk on top of CRB columns; check reverse topography of Columbia River; find amygdules, fossilized Eocene tree roots. Meet 9am at Sylvan Exit 26, parking lot by Standard gas station. Taylor Hunt, 503-662-4790. Fee schedule – members $1.00, non-members $3.00.

Preview of coming attractions:

Fri. Nov. 2, 2-3:30 PM: Mojave Desert Geology and Wildflowers. Don Barr, GSOC past president. Central Library, 801 SW 10th.

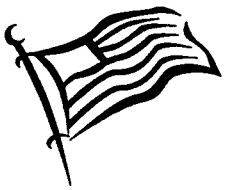
Fri. Nov. 9, 8:00 PM: TBA. Rm. 371 Cramer Hall, PSU.

No seminars in Nov. or Dec. due to holidays.

Field Trip Sat. Nov. 17: Geology of Oregon City Area. Best views require walking on forest trail. See 30'-tall Boring lava columns; CRB, Troutdale Fms.; 1 vent or 2? Meet 9am at Oregon City's cliffside elevators. Taylor Hunt, 503-662-4790. Fee schedule – members $1.00, non-members $3.00.

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.



UPDATE ON THE 2001 FIELD TRIP

"A Geological Tour of Oregon's Wine Country"

We are sorry to report that the trip was cancelled. However, some GSOC members did make it down to Abacela Winery near Roseburg in the Umpqua Valley. A fault runs through the vineyard and soil samples were taken. The soil south of the fault is 225 million year old Klamath mountain bed rock from the Jurassic period, characterized by shallow rocky clay-loam containing serpentine, quartz, jasper, blueshist, sandstone, and conglomerate. North of the fault lies younger soil which is about 25 millian years old and originated in the Miocene. It was formed from sea floor volcanics and is characterized as highly porous sandy loam, laced with round stones, smooth, "tumbled" stones. The first wines produced from grapes grown north of the vault may be available for tasting some time next Spring. Hopefully, we will be able to report on the difference in the wine grown on either side of the fault.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Charles Carter
Loren Jolley
Hal Hewett

BOARD MEETING NOTES

Summary of September 15 Board Meeting

The GSOC Board met September 15 at the home of Rosemary Kenney. Minutes of the previous meeting were approved. The treasurer reported that the Society has a balance of $4,619.27 in the checking account.

Major topics of discussion included the following:

· Two **President's Field Trips** have been cancelled in recent years because not enough people signed up to cover the cost of the trip. Several board members will do research on reasons why this has happened, and next meeting will include a discussion of reasons for lower attendance and possible alternatives for the traditional trip.

· Taylor Hunt has discovered that running **monthly field trips** takes more time than he has. He needs an assistant to help him do research, scout, prepare materials, and help run his field trips. Anyone interested in helping him should contact Taylor at 503-662-4790 or by email at hunt6422@msn.com.

· The new **Nominating Committee** consists of Bev Vogt as chair, along with Cecelia Crater and Richard Bartels. Anyone who is interested in serving as a new Vice President or Board Member should contact Bev at 503-292-6939 or by email at bevfrob@teleport.com.

The next board meeting will be 10:00, Saturday November 3, at Rosemary Kenney's house.

COMPLETELY FRACTURED GEOLOGY

We owe last month's COMPLETELY FRACTURED GEOLOGY to Taylor & Jean Hunt, Merry MacKinnon, Marlene Adams, Linda Wilson, Fran Pearson, Duane Diller, and others on the Mary's Peak Field Trip – thanks! EP

Answers on page 50.

1. **Washover**: what you take your Toyota to the carwash for.
2. **Teilzone**: part of an animal such as a sheep that goes over the fence last.

3. **Lysocline**: a line showing how far up the lye soaked.
4. **Pinacoid**: what the Brooklyn wrestler threatened to do before he got into the ring with a wrestler from Kurdistan: "I'm gonna pinacoid to da mat!"
5. **Underhandstoping**: sneaky way of causing the cessation of an action.
6. **Acousticlog**: the best kind of wood with which to make a drum.
7. **Serpentine**: paint thinner made of ground-up snakeskins.
8. **Labile**: a small piece of paper or cloth attached to something, describing what it is or who owns it.
9. **Truncation**: taking a pleasure trip with really heavy luggage.
10. **Anhydrite**: as in, "Ann, hide right here behind the sofa!"

Glossary of Volcano and Related Terminology

From the USGS Cascades Volcano Observatory website:
http://vulcan.wr.usgs.gov

Bombs:
Tephra is the general term now used by volcanologists for airborne volcanic ejecta of any size. Historically, however, various terms have been used to describe ejecta of different sizes.

- Fragments larger than about 2.5 inches are called blocks if they were ejected in a solid state and volcanic bombs if ejected in semi-solid, or plastic, condition.
- Volcanic bombs undergo widely varying degrees of aerodynamic shaping, depending on their fluidity, during the flight through the atmosphere. Based on their shapes after they hit the ground, bombs are variously described, in graphic terms, as "spindle or fusiform,", "ribbon", "bread-crust", or "cow-dung". (Tilling, Heliker, and Wright, 1987)

See: Tephra.

Caldera:
A large volcanic collapse depression, commonly circular or elliptical when seen from above.

Cinders:
Cinders are lava fragments about 1 centimeter (about 1/2 inch) in diameter.

Cinder cone:
A steep-sided volcano formed by the explosive eruption of cinders that form around a vent.
A small conical-shaped volcano formed by the accumulation of ejected cinders and other volcanic debris that falls back to Earth close to the vent area. (Gardner, et.al., 1995)

Composite volcano:
A steep-sided volcano built by lava flows and tephra deposits.
A steep-sided volcano composed of many layers of volcanic rocks, usually of high-viscosity lava and fragmented debris such as lahar and pyroclastic deposits. (Brantley, 1994)
Composite volcanoes erupt episodically over tens to hundreds of thousand of years and can display a wide range of eruption styles. See also Monogenetic volcanoes. (Walder, et.al., 1999)
Also called: Stratovolcano

Conduit (volcanic):
A subterranean passage through which magma reaches the surface during volcanic activity.

"Continental" Volcanoes:
In the typical "continental" environment, volcanoes are located in unstable, mountainous belts that have thick roots of granite or granitelike rock. Magmas, generated near the base of the mountain root, rise slowly or intermittently along fractures in the crust. During passage through the granite layer, magmas are commonly modified or changed in composition and erupt on the surface to form volcanoes constructed of nonbasaltic rocks. (Tilling, 1985)

Crater:
The circular depression containing a volcanic vent.
A steep-sided, usually circular depression formed by either explosion or collapse at a volcanic vent.

Crust:
The Earth's outermost layer.

Dacite:
Typically light-colored, fairly silica-rich (63 to 68 percent SiO2) volcanic rock with a high viscosity when in a molten state; eruptions are commonly explosive (e.g., Mount St. Helens' eruption of May 18, 1980) and may produce voluminous tephra, pyroclastic flows, and lava domes.

Debris flow:
A flowing mixture of water and rock debris, sometimes referred to as a lahar (originating at a volcano) or
mudflow. (Gardner, et.al., 1995)
See also: Lahar.

Deposit:
Earth material that has accumulated by some natural process. For example, a flowing mixture of water and rock debris is called a debris flow, but when the flow ceases to move, a layer of fine and coarse rock is left which is called a debris-flow deposit. (Gardner, et.al., 1995)

Diatreme:
A general term for a volcanic vent or pipe drilled through enclosing rocks (usually flat-lying sedimentary rocks) by the explosive energy of gas-charged magmas. The diamond-bearing kimberlite pipes of South Africa are diatremes. (Dict.Geological Terms, 1962)

Dike:
A tabular igneous body that cuts across the planar structures of the surrounding rocks.

Directed blast:
A hot, low-density mixture of rock debris, ash, and gases that moves at high speed along the ground surface. Directed blasts are generated by explosions. (Miller, 1989)

Dome:
A steep-sided mount that forms when very viscous lava is extruded from a volcanic vent.
A steep-sided mound that forms when viscous lava piles up near a volcanic vent. Domes are formed by andesite, dacite, and rhyolite lavas. (Brantley, 1994)
A steep-sided mass of viscous (doughy) lava extruded from a volcanic vent, often circular in plan view and spiny, rounded, or flat on top. Its surface is often rough and blocky as a result of fragmentation of the cooler, outer crust during growth of the dome. (Foxworthy and Hill, 1982)
Also called: Lava dome.

Dormant volcano:
An active volcano that is in repose (quiescence) but is expected to erupt in the future.
A volcano that is not presently erupting but that is considered likely to erupt in the future. (Foxworthy and Hill)

Earthquake:
The abrupt shaking of the ground caused by an abrupt shift of rock along a fracture in the Earth.

Ejecta:
Material that is thrown out by a volcano, including pyroclastic material (tephra) and, from some volcanoes, lava bombs. (Foxworthy and Hill, 1982)

Extinct volcano:
A volcano that is not expected to erupt again.
A volcano that is not presently erupting and is not likely to do so for a very long time in the future. (Foxworthy and Hill, 1982)

Fumarole:
A vent that releases volcanic gases, including water vapor (steam). (Gardner, et.al., 1995)
An opening at the Earth's surface from which water vapor and other gases are emitted, often at high temperature. (Foxworthy and Hill, 1982)
An vent or opening in the ground from which hot water vapor (steam) and (or) volcanic gases are emitted.

Fumarolic activity
Volcanic gas emissions, that may be accompanied by a change in the temperature of the gases or fluids emitted. (Gardner, et.al., 1995)

Glacier outburst flood:

A sudden release of melt water from a glacier or glacier-dammed lake sometimes resulting in a catastrophic flood, formed by melting of a channel or by subglacial volcanic activity. (Gardner, et.al., 1995)

Graben:
An elongate crustal block that is relatively depressed (downdropped) between two fault systems. (Foxworthy and Hill, 1982)

Granite:
Igneous rocks are formed from melted rock that has cooled and solidified. When rocks are buried deep within the Earth, they melt because of the high pressure and temperature; the molten rock (called magma) can then flow upward or even be erupted from a volcano onto the Earth's surface. When magma cools slowly, usually at depths of thousands of feet, crystals grow from the molten liquid, and a coarse-grained rock forms. When magma cools rapidly, usually at or near the Earth's surface, the crystals are extremely small, and a fine-grained rock results. A wide variety of rocks are formed by different cooling rates and different chemical compositions of the original magma. Obsidian (volcanic glass), granite, basalt, and andesite porphyry are four of the many types of igneous rock. (Barker, 1997)

Harmonic Tremor:
Continuous rhythmic earthquakes in the Earth's upper lithosphere that can be detected by seismographs. Harmonic tremors often precede or accompany volcanic eruptions.
A continuous release of seismic energy typically associated with the underground movement of magma. It contrasts distinctly with the sudden release and rapid decrease of seismic energy associated with the more common type of earthquake caused by slippage along a fault. (Foxworthy and Hill, 1982)

Hawaiian eruption:
"Hawaiian" eruptions may occur along fissures or fractures that serve as linear vents, such as during the eruption of Mauna Loa Volcano in Hawaii in 1950, or they may occur at a central vent such as during the 1959 eruption in Kilauea Iki Crater of Kilauea Volcano, Hawaii. In fissure-type eruptions, molten, incandescent lava spurts from a fissure on the volcano's rift zone and feeds lava streams that flow downslope. In central-vent eruptions, a fountain of fiery lava spurts to a height of several hundred feet or more. Such lava may collect in old pit craters to form lava lakes, or form cones, or feed radiating flows. (Tilling, 1985)

Hot Spot:
An area in the middle of a lithospheric plate where magma rises from the mantle and erupts at the Earth's surface. Volcanoes sometimes occur above a hot spot.

Hydrothermal:
Pertains to hot water or the action of heated water, often considered heated by magma or in association with magma. (Gardner, et.al., 1995)

Members of this year's Nominating Committee were selected at the September 15, 2001, GSOC Board Meeting. They are Beverly Vogt, Chairman, Richard Bartels, and Cecelia Crater. Our thanks to members of the Nominating Committee!

WEB TEASERS

These web teasers will get you ready for this month's noon meeting:

Information on Pacific Northwest earthquake activity and hazards from the Pacific Northwest Seismograph Network (PNSN):
http://www.geophys.washington.edu/SEIS/PNSN/

The Nisqually Earthquake Information Clearinghouse:
http://maximus.ce.washington.edu/~nisqually/

And for our Friday night meeting, from the CVO website:
The South Sister ground uplift:
http://vulcan.wr.usgs.gov/Volcanoes/Sisters/WestUplift/ground_uplift_may2001.html or also
http://vulcan.wr.usgs.gov/Volcanoes/Sisters/WestUplift/framework.html
The Mount Ranier lahars:
http://vulcan.wr.usgs.gov/Volcanoes/Rainier/Lahars/framework.html

COMPLETELY FRACTURED GEOLOGY

Correct definitions for COMPLETELY FRACTURED GEOLOGY, mostly adapted from AGI Dictionary of Geological Terms, 3rd Ed., Bates & Jackson, by E. Pratt.

1. **Washover**: small deltas produced by storm waves and built up on the landward side of a sandbar.
2. **Teilzone**: a term denoting how long a certain species of organism lived in a particular location.
3. **Lysocline**: in the ocean, the depth at which calcium carbonate going into solution barely exceeds the rate at which it is precipitated and deposited.
4. **Pinacoid**: an open crystal form consisting of two parallel. faces.
5. **Underhand stoping**: the working of a block of ore from an upper to a lower level
6. **Acoustic log**: well log that shows how long it took sound waves to travel through soil and rock in a borehole.
7. **Serpentine**: a group of common green to black rock-forming minerals with a soapy feel, found in igneous and metamorphic rocks.
8. **Labile**: describes rocks, minerals,plant or animal materials which are easily decomposed.
9. **Truncation**: the cutting-off or removal of part of a geologic structure, as by erosion.
10. **Anhydrite**: a form of calcium sulfate which easily alters to gypsum; found in deserts where water has evaporated and left minerals behind.

THE GEOLOGICAL NEWSLETTER

GSOC

SEPTEMBER 2001

GEOLOGICAL SOCIETY
OF THE OREGON
COUNTRY
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PORTLAND, OR 97207

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

2001-2002 ADMINISTRATION
BOARD OF DIRECTORS

THE GEOLOGICAL NEWSLETTER

ACTIVITIES:

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

FIELD TRIPS: Usually one per month. Fees: Members, $1.00, Non-members, $3.00. See calendar next page.

GEOLOGY SEMINAR: Third Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.

GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.

PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Consult current calendar (next page) or verified by phone: 503/235-5158 or 503/892-6514.

MEMBERSHIP: Per year from January 1: Individual--$20.00, Family--$30.00, Junior (under 18)/Student--$10.00.

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

WEBSITE: www.gsoc.org. Email address: gsoc@spiritone.com.

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Children under age 18_____

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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 9
SEPTEMBER 2001

SEPTEMBER ACTIVITIES

PRESIDENT'S FIELD TRIP:

GEOLOGICAL TOUR of the OREGON WINE COUNTRY:

An examination of the soils that help create Oregon's fine wines. Sept. 4-8, Tue.-Sat. Bus trip will include lectures by Dr. Scott Burns, PSU geologist; Greg Jones, SOU geographer & climatologist; Taylor Hunt; David Buchanan, retired biologist/4th generation winemaker; and other experts in 13 wineries from the Willamette Valley to the Rogue River. Also, we might see a Shakespearean play in Ashland. To sign up, call Sandra Adamson at 503-667-6287, or e-mail her at SLA757927@aol.com.

Fri. Sept. 14, 8:00 PM: The Environmental Observation System with Application to the Columbia River Estuary. Dr. Arun Chawla, Center for Coastal & Land-Margin Research & specialist in wave action at entrances to river inlets. Rm. 371 Cramer Hall, PSU.

Seminar Wed. Sept. 19, 8:00 PM: Richard Bartels will discuss the Columbia River Basalts. Rm. S-17 Cramer Hall, PSU.

Preview of coming attractions:

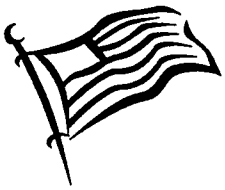
Fri. noon, Oct. 12(?): Building Damage & Soil Failure in the Nisqually Earthquake. Carol Hasenberg, structural engineer & past president of GSOC. Central Library, 801 SW 10th.

Fri. evening, Oct. 12: TBA.

Field Trip: Call Taylor Hunt, 503-662-4790, or Evelyn Pratt, 503-223-2601.
Oct. 27, Saturday. Geology of Longview-Kelso basin area

Bob Strebin & Tim Tolle now chair noon meetings.

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.



UPDATE ON THE 2001 GSOC PRESIDENT'S FIELD TRIP

"A Geological Tour of Oregon's Wine Country"

September 4 through September 8 (five days/four nights)

Tour Highlights include:

- **Guest speakers** who are local authorities on wine-growing soils and viticulture:
  - Dr. Scott Burns, Portland State University, geologist and expert in soils of viticulture.
  - Dr. Gregory Jones, Southern Oregon University, geographer/climatologist and second generation winemaker. (http://www.sou.edu/Geography/JONES/jones.htm).
  - Mr. David Buchannon, biologist from Oregon Department of Fisheries and Wildlife (retired) and winemaker, specializes in nutrient delivery in soil.
  - Tentative plans for Gerard Koschal, Oregon geologist.
  - Dr. Earl Jones, Abacela Vineyard and Winery, to discuss the fault which bisects his vineyard.
  - other viticulture experts
- **Winery tours** in the Willamette Valley, Umpqua, Rogue and the Applegate Valley appellations, each a distinct and different wine growing region. The winery list includes:
  - Kramer Vineyards
  - Erath Vineyards
  - Airlie Winery
  - Benton-Lane Winery
  - Tyee Wine Cellars
  - Abacela Vineyard and Winery
  - Valley View Winery
  - Foris Vineyards
  - Marquam Hill Vineyards
  - Champoeg Wine Cellars
  - wineries/vinevards in the Eola Hills area
- **Shakespearean play** in Ashland.

There are still a few spots available on the bus. Estimated cost of trip is between $600 and $700. Costs will cover transportation, lodging, breakfast and lunch, and winery admission fees.

This trip is intended for GSOC members. If you're not currently a member and wish to go on the trip, join GSOC now! **Membership form** is on the title page of this newsletter.

Please contact Sandy Adamson for details:

- phone: (503)667-6287
- email: sla757927@aol.com

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

John Farwell

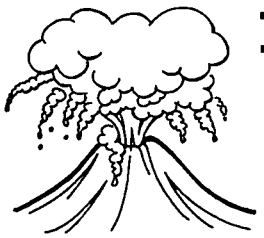
Robert Todd

COMPLETELY FRACTURED GEOLOGY

Answers on page 45.

1. **Orogeny**: refers to those little things on a chromosome which are responsible for making people produce Oreo cookies.
2. **Zeolite**: a low-calorie religious radical
3. **Overthrust**: (1) teeth before braces (2) in baseball, a fast ball thrown out at the strike zone (3) what a very buxom rock star has a lot of.
4. **Accrete**: native of a large Mediterranean island.
5. **Inundate**: (1) rendezvous at the local drive-in burger restaurant (2) a quiet night at home with one's sweetie.
6. **Micaceous**: as in, "Micaceous, you look lovely today!"

7. **Unconformity**: (1) refusal to wear the school uniform (2) what all those people who voted for Ralph Nader are guilty of.
8. **Dike**: (1) what the little Dutch boy put his finger in (2) (ask Taylor!).
9. **Diabase sill**: what you do when you want to tryout a new color at the bottom of your windows.
10. **Arkosic**: how Noah felt after 40 days.



MARY'S PEAK FIELD TRIP RECAP

SATURDAY, JUNE 23, 2001

Taylor Hunt, Trip Leader and Field Trip Director

22 people met at Portland State University for a day of geo-speak and field trip back in time to the Eocene Period.

Mary's Peak (4097 ft) is topped by an erosion-resistant sill which intrudes bedded sandstones of the middle Eocene Flournoy Formation which in turn overlie the early Eocene Siletz River Volcanics. The Corvallis fault at the base of the peak and the Kings Valley fault are crossed several times. The bulk of the peak is composed of Siletz River Volcanics. This trip traverses the structural grain of the area.

The rock units are of the Eocene and younger intrusions which make up the bulk of the exposed coast range. The oldest exposed unit, Siletz River Volcanics, is submarine pillow and massive basalt flows, basalt breccias and tuffs, and associated thin basaltic-sedimentary rocks. The unexposed base, by geophysical data, suggest sediments beneath it. The lower part is thought to be oceanic crust which accreted to the continental margin. Rocks of more varied composition in the upper part are seamounts. The unit is estimated at over 10,000 feet.

The upper part, the Kings Valley Siltstone Member, is 500 ft thick on Mary's Peak. It is mainly tuffaceous siltstones and minor tuffaceous sandstones of basaltic derivation. Locally white ash beds are present, some with fossils.

The Flournoy overlies the Kings Valley with no unconformity. It is a thick sequence of rhythmically bedded marine sandstones and siltstones of middle Eocene derived from the Klamath Mountains. The sandstone is arkosic and micaceous. Sedimentary structures indicative of turbidite deposition are common. The unit is 6000 feet thick west of Mary's Peak and thins rapidly to the east. The Flournoy is overlain unconformably by the late Eocene Spencer Formation, a series of thick-bedded basaltic, arkosic, and micaceous marine sandstones, deposited off the block west of the Corvallis fault during and after the early motion on the fault.

The Mary's Peak sill intruded between beds of the Flournoy Formation. It formed from a basaltic magma and developed a typical basalt differentiation sequence. The entire sill is about 1000 feet thick. It has chilled margins. A radiometric date of 29.9 m.y. gives an Oligocene age for the sill.

Before our 1st Mt. Stop we paused for coffee on the Corvallis Fault in the parking lot of Hoover Elementary.

Drive west from Philomath, following Hwy 34 to the Mary's Peak Park.

As we turned right on Mary's Peak Road, altered Siletz River volcanics in this area show ghostly outline of pillows in red soil.

Our first stop showed a relatively fresh outcrop of Siletz River Volcanics showing the contact between pyroclastics on the east and a columnar jointed flow on the west. Relatively steep northwest dip. A small low angle fault cuts the outcrop. Zeolite and calcite secondary mineralization are filling spaces in the rock.

At stop two, weather permitted at this overlook to view southwest along the Corvallis fault and east across the Willamette Valley. Southeast across the Corvallis fault Flat Mountain and Green Peak are supported by sill similar to that on Mary's Peak. Massive, jointed flows of Siletz River basalt in outcrop across road.

At stop three, a road cut, had excellent outcrop of Siletz River pillow basalts passing upward into massive basalt. This is topped by a thin bed of basaltic glass tuff over which there is another pillow basalt unit. Several small faults are present. The pillows are well preserved. Most are surrounded by a glassy rind and show a well-developed radial joint. Calcite and zeolites occur between pillows. The basalt is composed of labradorite, augite, titaniferous magnetite, and glass is commonly intensely layered.

Stop four, after turning left onto Harlan Road, going a short distance to Parker Creek. Outcrop of Flournoy sandstone about 150 feet below the base of the Mary's Peak sill. Here we were west of the Kings Valley fault in the down dropped block. We ate lunch by this beautiful tumbling creek and collected naturolite sprays in vugs. We returned to Mary's Peak Road, crossing Kings Valley fault again.

Stop five, after turning left to continue on Mary's Peak Road, to Parker Creek Waterfall, a roadside stop. The middle of Mary's Peak sill is seen here. It is a dark gray ultramafic rock.

Stop six, end of the road, and overlook to the west across the Coast Range. The parking lot and the walk up from the saddle to the top was fogged in, but on a clear day the bridge across the Yaquina estuary can be seen, even from the parking lot. Many of the huge rocks lining the parking lot are highly altered by zeolites. (Trip from park entrance to top is 9 ½ miles.) The group disbanded here for the return home.

TWO NOTEWORTHY GSOC MEMBERS DECEASED

Mrs. Mildred T. Phillips

We regret to say that we have lost our last GSOC charter member Mildred Phillips. Her daughter-in-law Jeannie Phillips graciously sent us this story of Mildred's life:

Thank you for asking about our Darling Mid! She was born in a snow storm near Marshaltown, Iowa on Feb. 11, 1905. She came West to attend Willamette University in 1923, where she became May Queen the year she graduated. She taught high school in Woodburn, Oregon.

Mildred Isadore Tomlinson married Clarence D. Phillips at the home of her Grandparents New Year's Eve, 1928. They had 2 children, Shirley and Jim. She always reminded everyone, Jim was born the year GSOC was chartered in 1935. Mildred's husband, Clarence was the GSOC President in 1936.

Mildred climbed Mt. Hood when she was 50 years old and was always active in many organizations. She enjoyed traveling with Clarence and in 1957, one of the highlights of her life was being introduced to the Queen of England at Buckingham Palace. She kept active and in her later years took classes in China painting and Calligraphy. She also taught several Vietnamese people English as a volunteer.

Mildred drove her own car until she was ninety. For her 95th Birthday we took her to Hawaii where she had a wonderful time touring around Oahu. She attended the 100th banquet of Sons and Daughters of Oregon Pioneers on her 96th Birthday where she was also the oldest guest. She was proud to be the last living Charter Member of the Geological Society of the Oregon Country and looked forward to the Banquet and getting "her rose". Mildred died July 30, 2001.

Dr. Donald Botteron

A memorial service was held for Dr. Donald Botteron Tuesday July 31, at Capitol Hill United Methodist Church. He died July 24, 2001 at the age of 84. Dr. Botteron was born July 29, 1916, in Columbus, Ohio. He was raised in Wood River Illinois, and graduated from the University of Illinois. He earned a doctorate in chemistry from Northwestern University. He was a professor of organic chemistry at Syracuse University, from 1943 until retiring in 1981, when he moved to Portland.

He was president of GSOC and Portland Astronomers (now Rose City Astronomers). He led GSOC on a trip with Ellen Morris Bishop to the Wallowa Mountains for the 1994 President's Campout. In 1941 he married Elizabeth Louise Lamb. Remembrances can be sent to the Oregon chapter of the Nature Conservancy.

Glossary of Volcano and Related Terminology

From the USGS Cascades Volcano Observatory website:
http://vulcan.wr.usgs.gov

Aa:
Aa (pronounced "ah-ah" - a Hawaiian term), is lava that has a rough, jagged, spiny, and generally clinkery surface. In thick aa flows, the rubbly surface of loose clinkers and blocks hides a massive, relatively dense interior. (Tilling, Heliker, and Wright, 1987)

Active volcano:
A volcano that is currently erupting, or has erupted during recorded history.
A volcano that is erupting. Also, a volcano that is not presently erupting but that has erupted within historical time and is considered likely to do so in the future (there is no distinction between "active" and "dormant" in this sense). (Foxworthy and Hill, 1982)

Aerosol: Fine liquid or solid particles suspended in the atmosphere. Aerosols resulting from volcanic eruptions are tiny droplets of sulfuric acid -- sulfur dioxide that has picked up oxygen and water.

Airfall:
Ash falling from an eruption column or ashcloud. (Miller, 1989)
Volcanic ash that has fallen through the air from an eruption cloud. A deposit so formed is usually well sorted and layered. (Foxworthy and Hill, 1982)
Also called: ashfall.

Andesite:
A medium-colored dark gray volcanic rock containing 53-63 percent silica with a moderate viscosity when in a molten state. Intermediate in color, composition, and eruptive character between basalt and dacite.

Ash (volcanic):
Fragments less than 2 millimeters (about 1/8 inch) in diameter of lava or rock blasted into the air by volcanic explosions.
Fragments of lava or rock smaller than 2 millimeters in size that are blasted into the air by volcanic explosions. (Miller, 1989)
Fine pyroclastic material in fragments less than 4.0 millimeters in diameter. "Ash" in this sense is quite distinct from the ash produced by common combustion because the rocks do not catch fire and burn during a volcanic event. (Foxworthy and Hill, 1982)

Ash cloud:
The fine material that is generated by a pyroclastic flow and rises above it. (Gardner, et.al., 1995)
Cloud of ash formed by volcanic explosions or derived from a pyroclastic flow. (Miller, 1989).

Ashfall:
See: Airfall.

Ash flow:
A pyroclastic flow consisting predominantly of ash-sized (less than 4 millimeters in diameter) particles. Also called a glowing avalanche if it is of very high temperature. (Foxworthy and Hill, 1982)

Atmospheric shock wave:
Strong compressive atmospheric wave driven by volcanic ejecta.

Avalanche:
A large mass of material or mixtures of material falling or sliding rapidly under the force of gravity. Avalanches often are classified by their content, such as snow, ice, soil, or rock avalanches. A mixture of these materials is a debris avalanche. (Foxworthy and Hill, 1982)
See also: Debris avalanche

Ballistic fragment:
An explosively ejected rock fragment that follows a ballistic trajectory.

Basalt:
Dark-colored, low-silica (less than 53 percent SiO2), low viscosity volcanic rock that is relatively fluid when molten; eruptions of basalt are generally nonexplosive and tend to produce relatively long thin lava flows like those common in Hawaii.

Base surge:
Turbulent, low-density cloud of rock debris and water and (or) steam that moves over the ground surface at high speed. Base surges are generated by explosions. (Miller, 1989)

Blocks:
Tephra is the general term now used by volcanologists for airborne volcanic ejecta of any size. Historically, however, various terms have been used to describe ejecta of different sizes. ... Fragments larger than about 2.5 inches are called blocks if they were ejected in a solid state and volcanic bombs if ejected in semi-solid, or plastic, condition. (Tilling, Heliker, and Wright, 1987)
Fragments of lava or rock larger than 64 millimeters in size that are blasted into the air by volcanic explosions. (Miller, 1989)
See: Tephra.

Blowdown: Trees felled by a volcanic blast.

COMPLETELY FRACTURED GEOLOGY

Correct definitions for COMPLETELY FRACTUREDGEOLOGY, mostly adapted from AGI
Dictionary of Geological Terms, 3rd Ed., Bates & Jackson, by E. Pratt.

1. **Orogeny**: the process of forming mountains.
2. **Zeolite**: a large group of aluminum silicates similarto feldspar, found as crystals in holes in basalt and in beds of tuff. Zeolites lose or gain water molecules easily, swell when heated, and are used to soften water, to absorb gases, and as drying agents.
3. **Overthrust**: a large, low-angle thrust fault.
4. **Accrete**: in plate tectonics, refers to the way new land is shoved onto a continent and adheres to it (EP)
5. **Inundate**: (Amer. Heritage Dictionary) to cover or to overwhelm with a flood.
6. **Micaceous**: consisting of, containing, pertaining to, or resembling mica, that group of thin easily-split minerals used in electric insulators, paint, and sparkling sidewalks.
7. **Unconformity**: a break or gap in the geologic record, shown by a rock sequence that has been interrupted. Usually the rock surface below the break was eroded, then new sediments or igneous rocks were put in place on top of the old surface.
8. **Dike**: a tabular-shaped body of igneous rock that cuts across the structure of the surrounding rocks.
9. **Diabase sill**: an intrusion made of cooled magma high in the minerals labradorite and pyroxene, with lath-shaped plagioclase crystals included in augite crystals.
10. **Arkosic**: a term pertaining to coarse-grained, feldspar-rich, typically pink or red sandstone.

THE GEOLOGICAL NEWSLETTER

GSOC

NOVEMBER 2001

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OF THE OREGON
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ACTIVITIES:

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

FIELD TRIPS: Usually one per month. Fees: Members, $1.00, Non-members, $3.00. See calendar next page.

GEOLOGY SEMINAR: Third Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.

GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.

PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Consult current calendar (next page) or verified by phone: 503/235-5158 or 503/892-6514.

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VISITORS WELCOME AT ALL MEETINGS — VOL. 67, No. 11
INFORMATION: www.gsoc.org *or* e-mail: gsoc@spiritone.com — NOVEMBER 2001
Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

NOVEMBER ACTIVITIES

Note changes in times and dates!

Fri. *2-3:30 PM* ***(Note time change.)*** Nov. 2: Geology and Wildflowers of the Mojave Desert. Don Barr, past president of GSOC. Central Library, 801 SW 10th.

Fri. 8 PM Nov. 9: Outburst Floods from a Glacier-dammed Lake in Alaska. Michelle Cunico, PSU. ***Rm. 171*** Cramer Hall, PSU. ***(Note room change.)***

Field Trip Sat. Nov. *10 (Note change of date)*: Geology of Oregon City Area. Best views require walking on forest trail. See 30'-tall Boring lava columns; walk on landslides and on top of a volcano-in-disguise; measure Willamette Falls erosion. Meet 9AM at Oregon City's cliffside elevators. Taylor Hunt, 503-662-4790. Fee schedule – members $1, non-members $3.

No seminar due to the holidays

****

Preview of coming attractions:

Fri. Dec. 7, 8:00 PM: Airborne Volcanic Gas Monitoring, Ken McGee, USGS, Cascades Volcano Observatory.

Field trip Sat. Dec. 8: Downtown Portland. How to identify a rock – migmatite, granite, travertine/limestone - by touching a building. See the start of a "skid road" and how pioneers used an erratic rock. Taylor Hunt, 503-662-4790. Fee schedule – members $1, non-members $3.

The **next seminar** will be in January, when Taylor Hunt will talk about what those Ice-Age Floods did to areas around Portland and the Northwest.

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Joan Rainey

Kenneth Bergman

ARE YOU A ROCKHOUND OR JUST A MINERAL COLLECTOR?

A **rockhound** is someone who shows extreme levels of interest in rocks and collecting. A **mineral collector** is someone who just likes minerals and rocks. If you are uncertain as to which you are, here are some surefire signs that you have exceeded "casual" or "rockpup"levels and have graduated to fullblown "rockhound.".

You are a rockhound if:

The sign on the side of the highway says "Falling Rock." You pull over and wait.

The severe sunburn from your vacation is a one-inch wide strip of skin at the gap between the tail of your shirt and the top of your pants (also known as "plumbers' sunburn.")

Your friend shows you a "pretty stone" he/she has found, and you work hard to talk him/her out of it.

You care more about what happened to the diamond in the film "Titanic" than about the people.

You hit your hand with your rock hammer. Your spouse screams that it's broken, and you reply that it is a fracture and it has good cleavage.

Your fellow diner asks how the soup is and you reply, "Variable color, greasy surface, low specific gravity, texture smooth with bits of ductile material."

You lick rocks to show off the colors.

Your family puts your birthday candles on a slab of amethyst instead of cake.

A truck throws a rock into the windshield of your car and you examine the rock first.

You can pronounce "molybdenite" quickly and correctly on the first try.

You believe that the primary function of road cuts is for easy mineral collecting.

You own more pieces of quartz than of underwear.

You associate the word "hard" with a value on the Mohs scale, rather than with "work."

Your spouse has to ask you to move flats of rocks out of the tub so the family can take baths.

Attending the Tucson Gem and Mineral Show is at the top of your Christmas list.

You examine individual rocks in driveway gravel.

You know the location of every rock shop within a 100-mile radius of your home.
When they haven't seen you for a week, the shop owners send you get-well cards.

You always take a pick, shovel, mallet, hand lens, and acid bottle on your vacation.

You associate the word "saw" with diamonds instead of with wood.

You receive a letter from the county informing you that a landfill permit is required if you want to put any more rocks in your backyard.

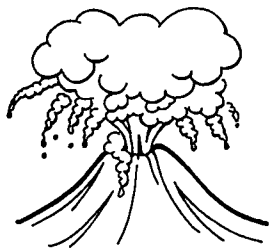
Your Internet homepage has pictures of your favorite rocks.

ARCHIE STRONG DECEASED

His name was Archie Kelly Strong. Born February 20, 1910, in Marcola, Oregon, he died Sept 24, 2001 in West Columbia, South Carolina, having lived most of his life in Oregon. He graduated from Glendale High School, earned a BS from Linfield College, and MS from Oregon State University. He was a biology instructor and coach in Oregon high schools, and also worked for the forest service before retiring in 1975.

Archie pursued many interests. He had a long standing interest in the community garden at Fulton Park. He received many awards for his produce, and in 1999 received best of show for a single gladiolus blossom at the FP annual garden show. He was also very interested in 4H and always attended their shows at the Oregon State Fair. He was a volunteer for many years at the Nature of the NW info center. He was an active member of GSOC, serving as president in 1971. Archie also served GSOC in the last few years as an after-meeting host.

At age 91 Archie was still living alone and maintaining his own house and garden. He survived two marriages; his first wife Marian who died in the 1960's, and his second wife Laura. Survivors include stepdaughter Athena Vaughn, nephews Rock Roop and Kurt Rolfes and niece Ellen Mooshier. Remembrances can be sent to your favorite charity, 4H clubs of Oregon, or GSOC.



Glossary of Volcano and Related Terminology

From the USGS Cascades Volcano Observatory website:
http://vulcan.wr.usgs.gov

Hydrothermal alteration:
Alteration of rocks or minerals by the reaction of hot water (and other fluids) with pre-existing rocks. The hot water is generally heated groundwater and dissolved minerals. (Gardner, et.al., 1995)

Igneous:
Solidified from a magma; also applied to processes related to the formation of igneous rocks.

Igneous rocks:
Igneous rocks are formed from melted rock that has cooled and solidified. When rocks are buried deep within the Earth, they melt because of the high pressure and temperature; the molten rock (called magma) can then flow upward or even be erupted from a volcano onto the Earth's surface. When magma cools slowly, usually at depths of thousands of feet, crystals grow from the molten liquid, and a coarse-grained rock forms. When magma cools rapidly, usually at or near the Earth's surface, the crystals are extremely small, and a fine-grained rock results. A wide variety of rocks are formed by different cooling rates and different chemical compositions of the original magma. Obsidian (volcanic glass), granite, basalt, and andesite porphyry are four of the many types of igneous rock. (Barker, 1997)

"Island Arc" Volcanoes:
In a typical "island-arc" environment, volcanoes lie along the crest of an arcuate, crustal ridge bounded on its convex side by a deep oceanic trench. The granite or granite-like layer of the continental crust extends beneath the ridge to the vicinity of the trench. Basaltic magmas, generated in the mantle beneath the ridge, rise along fractures through the granitic layer. These magmas commonly will be modified or changed in composition during passage through the granitic layer and erupt on the surface to form volcanoes built largely of non-basaltic rocks. (Tilling, 1985)

Jökulhlaup:
Icelandic term for Glacial outburst floods

K-Ar dating:
Determination of ;the age of a mineral or rock in years based on the known radioactive decay rate of potassium-40 to argon-40.

Lahar:

A flowing mixture of water-saturated rock debris that forms on the slopes of a volcano, and moves downslope under the force of gravity, sometimes referred to as debris flow or mudflow. The term comes from Indonesia.

Lahar-runout flow:
Hyper-concentrated streamflow transitional in sediment concentration between a lahar and normal streamflow.

Lapilli:
Fragments of lava or rock between 2 and 64 millimeters in size that are blasted into the air by volcanic explosions. (Miller, 1989)

WEB TEASERS

This web teaser will get you ready for this month's Friday night meeting:

Information on Outbursts from a Glacier-Dammed Lake from the Portland State University website: http://www.geol.pdx.edu/Glaciers/kennicott/default.html

WHAT'S COOKING IN THE CASCADES ?

A synopsis of the Friday, October 12, GSOC meeting with speaker Ed Klimasauskas, USGS

by Carol Hasenberg

GSOC was visited by Cascade Volcano Observatory specialist Ed Klimasauskas last month for an update on the recent events in the Cascade Mountains in Oregon and Washington. His talk was about 3 different subjects:

- monitoring at Mt. St. Helens, the most frequent erupter in the Cascades
- INSAR satellite radar images which detected a bulge in an area just west of the South Sister volcano
- recent debris flows at Mt. Rainier

New monitoring devices at Mt. St. Helens include
- 3 GPS receivers
- lahar monitoring

The GPS receivers can replace the older range finding method of detecting ground movement in portions of the mountain. Lahar monitoring is done with devices which are similar to seismographs used for detecting earthquakes but are tuned to a higher frequency and longer signal time. The lahar monitors can be viewed on the CVO website in "real time". Go to the CVO website (see below), Menus of Interest, "Real Time" Monitoring, Mt. St. Helens, mudflows.

Topic two, the bulge near South Sister, has gotten recent press. The bulge is a 4-inch maximum inflation of the ground surface in an area about 10 miles in diameter on the west side of the South Sister volcano. The detection technique uses satellite radar images taken at 35-day intervals during the summer when the snow has melted in this part of the country. An image is compared with previous images to determine if any changes have occurred on the ground surface. This technique is accurate to a range of 1-2 cm.

The presence of magma at a depth of about 4 miles is presumed to be the cause of the bulge, and no danger of imminent eruptions is indicated. The presence of the magma is additionally supported by high concentrations of chloride gases from Separation Creek which were first noted in 1990.

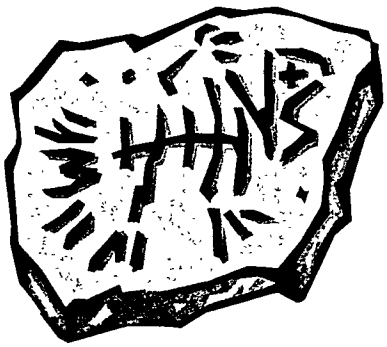
The highlight of the talk came near the end when Ed presented a video which was taken from a helicopter flying above debris flows occurring in Van Trump Creek in the Nisqually River drainage on Mt. Rainier on August 14 and 15, 2001. The debris flows were caused by glacial melt water soaking into a field of loose glacial till flanking on the side of the mountain. The melting and subsequent runoff were especially heavy during this unusually dry year due to the absence of loose snow

that normally caps the glacier, slowing melting and absorbing melt water like a sponge, thereby slowing its release into the drainage below. The debris flows brought the level of the Nisqually River up about a foot on the night of August 14, causing a bit of excitement for the emergency personnel in the area.

As a final note, Ed mentioned that the CVO headquarters is moving to the Columbia Tech Center in Cascade Park on the east side of Vancouver, WA.

You can find out more about this and other Cascade Volcano topics by checking out the CVO website: http://vulcan.wr.usgs.gov/

Another thing you can do on the CVO website in "Real Time" Monitoring is look at Volcano cams from around the world. Way cool!



F.O.P. FIELD TRIP REPORT

September 28-30, 2001
by Evelyn Pratt

This year the Friends of the Pleistocene, Pacific NW Cell, investigated the sagebrush flats once covered by Pluvial Lake Chewaukan. The V-shaped area about 1½ hours southeast of Bend and LaPine includes Summer Lake, Upper and Lower Chewaukan marshes, and Lake Abert. Both 4100-4200-foot-elevation lakes are bounded by spectacular 7000-foot scarps – Winter Rim on the west and Abert Rim on the east.

At this time of year the lake is a longish pond at the north end of a huge dry alkali flat. The Oregon Fish and Wildlife office where we met in the mornings is on the now-dry lakeshore at the foot of Winter Rim. Local population is small, based pretty much in the wee settlement of Summer Lake, a couple of lodges, a campground by a hot springs, and Paisley, strung out along the highway at the south end of the lakebed.

Our group swelled that number by 150 or so, which may seem like a lot in this rather remote area, but wildlife director Marty St. Louis expected 1100 licensed hunters to descend on Summer Lake the following week. My daughter, along with 2000 participants of Cycle Oregon, had camped by Paisley just two weeks before. All these folks missed Paisley's earlier annual Mosquito Festival, whose motto "Don't bring any– we have plenty to spare" – wouldn't seem very conducive to large-scale outsider participation. But obviously this area does get company.

From 30 to 50 vehicles lined up at the wildlife station each frosty morning. Leader Rob Negrini encouraged people to carpool, and after a few adventures on dusty much-rutted back roads, many did so. The first day we were introduced to high and low stands of Lake Chewaucan and its remnants, to land movements in this area, and to reasons why it could be "a 'Rosetta Stone' in which volcanic events, paleomagnetic stratigraphy, and paleoecology can be precisely related for much of the last 335,000 years." (Jonathan Davis, 1985)

One of the first geologists to study southern Oregon and Summer Lake was I. C. Russell in 1884. Next Ira Allison of OSU and another noted geologist, Ernst Antevs, were asked to help in a study done by archeologist Luther Cressman, volcanologist Howel Williams of UC Berkeley, and vertebrate paleontologist John Merriam of Carnegie Institution. Allison later published "Geology of Pluvial Lake Chewaucan" and told the history of early to middle 20th century research in the area. Antevs developed a "migrating jet stream" theory that drew on his and other field observations to come up with a model of global climate change. The popular though not universally accepted theory says that movement of the jet stream north or south influences melting on the Greenland ice cap, which changes currents by either dumping or withholding masses of fresh water into the North Atlantic, which

during the past has produced climatic changes all across the U. S.

In May 1980 Jonathan Davis of USGS was driving north past Summer Lake on his way to study newly-erupted Mt. St. Helens. He looked, and was hooked by, the more than 50 layers of exposed volcanic ash along the Ana River that Allison had worked on. Such tephra is great for age-dating; here was a calendar of events ready to be worked out. On Day 1 we saw this and other sections along the Ana River Fault.

A general background of the area may be helpful. Much of it seems to be underlain by early Oligocene rocks covered in some places by a formation with John-Day-like fossils in it. Some 16 million years ago and later, Steens-Mountain-type basalts flooded over these. Next, the pulling apart of Basin and Range made uptilted fault-block mountains and downdropped valleys or grabens. Most Basin and Range fault blocks such as Abert Rim tilt gently eastward, with steep cliffs on the west. A few such as Steens Mountain and Winter Rim have long westward slopes and more-or-less vertical scarps on their east sides.

The center of deposition of Lake Chewaucan sediments is at the foot of Winter Rim next to the west side of the basin, in today's Summer Lake. Sediments here are up to 1½ kilometers deep. Whenever Lake Chewaucan dried into playas and smaller lakes, winds from the southwest swept off enough sediment to make sand dunes on the eastern and northern ends of the basin. The dunes indicate that sediment deposits right after the lake dried were probably considerably deeper than they are now.

What methods are used to find the ages of these deposits? The vertical soil exposures we saw were banded with many layers of white tephra. These ashes give some fairly reliable methods of dating – the unique chemistry of each layer, the displacement of the tephra by faults and subsequent deposits of silt and newer tephra, and records of magnetic reversals, among others - for the top 100,000 years of sediment.

Below that lies a large unconformity where between 20,000 and 60,000 years of sediments have eroded away. Some older tephras beneath the unconformity can be correlated with other ash layers in various parts of the West to 225,000 years ago, but the record is not as clear. Altogether, up to half of the tephra layers come from Newberry Volcano eruptions. I didn't realize that this mountain less than 60 miles north was so lively!

Carbon 14 dating is often used on organic material less than 40,000 years old, including that from human occupation. Many layers between tephra bands are full of ostracods. These sesame-seed-and-smaller crustaceans mutated rapidly, so their shells are good indicators of age. Characteristics of age-dated fossil fishes in Pluvial Lakes Idaho and Lahontan can be compared with those of fishes still living in Pyramid Lake, NV, and California's Central Valley lakes, and estimates made of the amount of time that has elapsed since the lakes which the fossils once inhabited dried up.

Regional fault structures show a broad range in strike, length, displacement, and connectedness. N-NW striking faults are generally shorter, have less throw, and are more numerous than N-NE striking faults. By studying such faults - when and where and how much and across what they cut – stratigraphers can tell a lot about relative ages of lakebed sediments.

Ancient Lake Chewaucan was about 100 meters (300+ feet) deep near the fault escarpments. It occupied fault-bound basins developed within a graben or half-graben bounded by horst blocks. Summer Lake is in the largest and deepest graben. During high stands (levels) of Lake Chewaucan, water in Summer Lake basin was at least 400 feet deep.

(to be continued)

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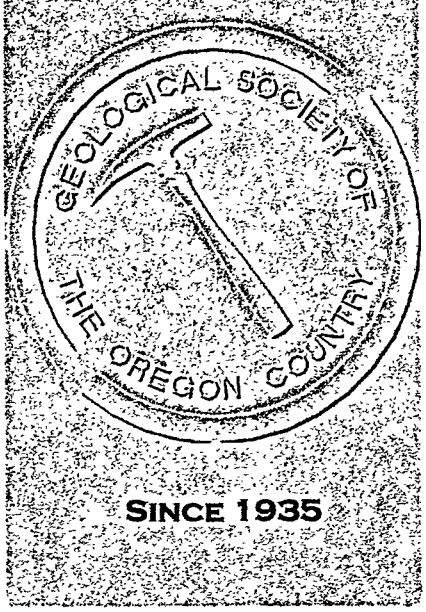

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Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 10
OCTOBER 2001

OCTOBER ACTIVITIES

Fri. noon Oct. 12: Building Damage & Soil Failure in the Nisqually Earthquake. Carol Hasenberg, structural engineer & past president of GSOC. Central Library, 801 SW 10th.

Fri. 8 PM Oct. 12: What's Cooking in the Cascades These Days: Ground Deformation of South Sister and Lahar on Mt. Rainier. Ed Klimasauskas, USGS, Cascades Volcano Observatory. Rm. 371 Cramer Hall, PSU.

Seminar Wed. Oct. 17, 8:00 PM: Richard Bartels, "Geology of Portland: From the Columbia River Basalt Group up to the Ice Age Floods". Rm. S-17 Cramer Hall, PSU.

Field Trip Sat. Oct. 27: Geology of Kelso, Longview, & Lower Columbia Basin. See basalt flows from early Eocene to CRB; walk on top of CRB columns; check reverse topography of Columbia River; find amygdules, fossilized Eocene tree roots. Meet 9am at Sylvan Exit 26, parking lot by Standard gas station. Taylor Hunt, 503-662-4790. Fee schedule – members $1.00, non-members $3.00.

Preview of coming attractions:

Fri. Nov. 2, 2-3:30 PM: Mojave Desert Geology and Wildflowers. Don Barr, GSOC past president. Central Library, 801 SW 10th.

Fri. Nov. 9, 8:00 PM: TBA. Rm. 371 Cramer Hall, PSU.

No seminars in Nov. or Dec. due to holidays.

Field Trip Sat. Nov. 17: Geology of Oregon City Area. Best views require walking on forest trail. See 30'-tall Boring lava columns; CRB, Troutdale Fms.; 1 vent or 2? Meet 9am at Oregon City's cliffside elevators. Taylor Hunt, 503-662-4790. Fee schedule – members $1.00, non-members $3.00.

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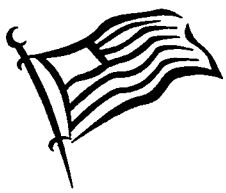
Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.



UPDATE ON THE 2001 `FIELD TRIP

"A Geological Tour of Oregon's Wine Country"

We are sorry to report that the trip was cancelled. However, some GSOC members did make it down to Abacela Winery near Roseburg in the Umpqua Valley. A fault runs through the vineyard and soil samples were taken. The soil south of the fault is 225 million year old Klamath mountain bed rock from the Jurassic period, characterized by shallow rocky clay-loam containing serpentine, quartz, jasper, blueshist, sandstone, and conglomerate. North of the fault lies younger soil which is about 25 millian years old and originated in the Miocene. It was formed from sea floor volcanics and is characterized as highly porous sandy loam, laced with round stones, smooth, "tumbled" stones. The first wines produced from grapes grown north of the vault may be available for tasting some time next Spring. Hopefully, we will be able to report on the difference in the wine grown on either side of the fault.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Charles Carter
Loren Jolley
Hal Hewett

BOARD MEETING NOTES

Summary of September 15 Board Meeting

The GSOC Board met September 15 at the home of Rosemary Kenney. Minutes of the previous meeting were approved. The treasurer reported that the Society has a balance of $4,619.27 in the checking account.

Major topics of discussion included the following:

· Two **President's Field Trips** have been cancelled in recent years because not enough people signed up to cover the cost of the trip. Several board members will do research on reasons why this has happened, and next meeting will include a discussion of reasons for lower attendance and possible alternatives for the traditional trip.

· Taylor Hunt has discovered that running **monthly field trips** takes more time than he has. He needs an assistant to help him do research, scout, prepare materials, and help run his field trips. Anyone interested in helping him should contact Taylor at 503-662-4790 or by email at hunt6422@msn.com.

· The new **Nominating Committee** consists of Bev Vogt as chair, along with Cecelia Crater and Richard Bartels. Anyone who is interested in serving as a new Vice President or Board Member should contact Bev at 503-292-6939 or by email at bevfrob@teleport.com.

The next board meeting will be 10:00, Saturday November 3, at Rosemary Kenney's house.

COMPLETELY FRACTURED GEOLOGY

We owe last month's COMPLETELY FRACTURED GEOLOGY to Taylor & Jean Hunt, Merry MacKinnon, Marlene Adams, Linda Wilson, Fran Pearson, Duane Diller, and others on the Mary's Peak Field Trip – thanks! EP

Answers on page 50.

1. **Washover**: what you take your Toyota to the carwash for.
2. **Teilzone**: part of an animal such as a sheep that goes over the fence last.

3. **Lysocline**: a line showing how far up the lye soaked.
4. **Pinacoid**: what the Brooklyn wrestler threatened to do before he got into the ring with a wrestler from Kurdistan: "I'm gonna pinacoid to da mat!"
5. **Underhandstoping**: sneaky way of causing the cessation of an action.
6. **Acousticlog**: the best kind of wood with which to make a drum.
7. **Serpentine**: paint thinner made of ground-up snakeskins.
8. **Labile**: a small piece of paper or cloth attached to something, describing what it is or who owns it.
9. **Truncation**: taking a pleasure trip with really heavy luggage.
10. **Anhydrite**: as in, "Ann, hide right here behind the sofa!"

Glossary of Volcano and Related Terminology

From the USGS Cascades Volcano Observatory website:
http://vulcan.wr.usgs.gov

Bombs:
Tephra is the general term now used by volcanologists for airborne volcanic ejecta of any size. Historically, however, various terms have been used to describe ejecta of different sizes.

- Fragments larger than about 2.5 inches are called blocks if they were ejected in a solid state and volcanic bombs if ejected in semi-solid, or plastic, condition.
- Volcanic bombs undergo widely varying degrees of aerodynamic shaping, depending on their fluidity, during the flight through the atmosphere. Based on their shapes after they hit the ground, bombs are variously described, in graphic terms, as "spindle or fusiform,", "ribbon", "bread-crust", or "cow-dung". (Tilling, Heliker, and Wright, 1987)

See: Tephra.

Caldera:
A large volcanic collapse depression, commonly circular or elliptical when seen from above.

Cinders:
Cinders are lava fragments about 1 centimeter (about 1/2 inch) in diameter.

Cinder cone:
A steep-sided volcano formed by the explosive eruption of cinders that form around a vent.
A small conical-shaped volcano formed by the accumulation of ejected cinders and other volcanic debris that falls back to Earth close to the vent area. (Gardner, et.al., 1995)

Composite volcano:
A steep-sided volcano built by lava flows and tephra deposits.
A steep-sided volcano composed of many layers of volcanic rocks, usually of high-viscosity lava and fragmented debris such as lahar and pyroclastic deposits. (Brantley, 1994)
Composite volcanoes erupt episodically over tens to hundreds of thousand of years and can display a wide range of eruption styles. See also Monogenetic volcanoes. (Walder, et.al., 1999)
Also called: Stratovolcano

Conduit (volcanic):
A subterranean passage through which magma reaches the surface during volcanic activity.

"Continental" Volcanoes:
In the typical "continental" environment, volcanoes are located in unstable, mountainous belts that have thick roots of granite or granitelike rock. Magmas, generated near the base of the mountain root, rise slowly or intermittently along fractures in the crust. During passage through the granite layer, magmas are commonly modified or changed in composition and erupt on the surface to form volcanoes constructed of nonbasaltic rocks. (Tilling, 1985)

Crater:
The circular depression containing a volcanic vent.
A steep-sided, usually circular depression formed by either explosion or collapse at a volcanic vent.

Crust:
The Earth's outermost layer.

Dacite:
Typically light-colored, fairly silica-rich (63 to 68 percent SiO2) volcanic rock with a high viscosity when in a molten state; eruptions are commonly explosive (e.g., Mount St. Helens' eruption of May 18, 1980) and may produce voluminous tephra, pyroclastic flows, and lava domes.

Debris flow:
A flowing mixture of water and rock debris, sometimes referred to as a lahar (originating at a volcano) or
mudflow. (Gardner, et.al., 1995)
See also: Lahar.

Deposit:
Earth material that has accumulated by some natural process. For example, a flowing mixture of water and rock debris is called a debris flow, but when the flow ceases to move, a layer of fine and coarse rock is left which is called a debris-flow deposit. (Gardner, et.al., 1995)

Diatreme:
A general term for a volcanic vent or pipe drilled through enclosing rocks (usually flat-lying sedimentary rocks) by the explosive energy of gas-charged magmas. The diamond-bearing kimberlite pipes of South Africa are diatremes. (Dict.Geological Terms, 1962)

Dike:
A tabular igneous body that cuts across the planar structures of the surrounding rocks.

Directed blast:
A hot, low-density mixture of rock debris, ash, and gases that moves at high speed along the ground surface. Directed blasts are generated by explosions. (Miller, 1989)

Dome:
A steep-sided mount that forms when very viscous lava is extruded from a volcanic vent.
A steep-sided mound that forms when viscous lava piles up near a volcanic vent. Domes are formed by andesite, dacite, and rhyolite lavas. (Brantley, 1994)
A steep-sided mass of viscous (doughy) lava extruded from a volcanic vent, often circular in plan view and spiny, rounded, or flat on top. Its surface is often rough and blocky as a result of fragmentation of the cooler, outer crust during growth of the dome. (Foxworthy and Hill, 1982)
Also called: Lava dome.

Dormant volcano:
An active volcano that is in repose (quiescence) but is expected to erupt in the future.
A volcano that is not presently erupting but that is considered likely to erupt in the future. (Foxworthy and Hill)

Earthquake:
The abrupt shaking of the ground caused by an abrupt shift of rock along a fracture in the Earth.

Ejecta:
Material that is thrown out by a volcano, including pyroclastic material (tephra) and, from some volcanoes, lava bombs. (Foxworthy and Hill, 1982)

Extinct volcano:
A volcano that is not expected to erupt again.
A volcano that is not presently erupting and is not likely to do so for a very long time in the future. (Foxworthy and Hill, 1982)

Fumarole:
A vent that releases volcanic gases, including water vapor (steam). (Gardner, et.al., 1995)
An opening at the Earth's surface from which water vapor and other gases are emitted, often at high temperature. (Foxworthy and Hill, 1982)
An vent or opening in the ground from which hot water vapor (steam) and (or) volcanic gases are emitted.

Fumarolic activity
Volcanic gas emissions, that may be accompanied by a change in the temperature of the gases or fluids emitted. (Gardner, et.al., 1995)

Glacier outburst flood:

A sudden release of melt water from a glacier or glacier-dammed lake sometimes resulting in a catastrophic flood, formed by melting of a channel or by subglacial volcanic activity. (Gardner, et.al., 1995)

Graben:
An elongate crustal block that is relatively depressed (downdropped) between two fault systems. (Foxworthy and Hill, 1982)

Granite:
Igneous rocks are formed from melted rock that has cooled and solidified. When rocks are buried deep within the Earth, they melt because of the high pressure and temperature; the molten rock (called magma) can then flow upward or even be erupted from a volcano onto the Earth's surface. When magma cools slowly, usually at depths of thousands of feet, crystals grow from the molten liquid, and a coarse-grained rock forms. When magma cools rapidly, usually at or near the Earth's surface, the crystals are extremely small, and a fine-grained rock results. A wide variety of rocks are formed by different cooling rates and different chemical compositions of the original magma. Obsidian (volcanic glass), granite, basalt, and andesite porphyry are four of the many types of igneous rock. (Barker, 1997)

Harmonic Tremor:
Continuous rhythmic earthquakes in the Earth's upper lithosphere that can be detected by seismographs. Harmonic tremors often precede or accompany volcanic eruptions.
A continuous release of seismic energy typically associated with the underground movement of magma. It contrasts distinctly with the sudden release and rapid decrease of seismic energy associated with the more common type of earthquake caused by slippage along a fault. (Foxworthy and Hill, 1982)

Hawaiian eruption:
"Hawaiian" eruptions may occur along fissures or fractures that serve as linear vents, such as during the eruption of Mauna Loa Volcano in Hawaii in 1950, or they may occur at a central vent such as during the 1959 eruption in Kilauea Iki Crater of Kilauea Volcano, Hawaii. In fissure-type eruptions, molten, incandescent lava spurts from a fissure on the volcano's rift zone and feeds lava streams that flow downslope. In central-vent eruptions, a fountain of fiery lava spurts to a height of several hundred feet or more. Such lava may collect in old pit craters to form lava lakes, or form cones, or feed radiating flows. (Tilling, 1985)

Hot Spot:
An area in the middle of a lithospheric plate where magma rises from the mantle and erupts at the Earth's surface. Volcanoes sometimes occur above a hot spot.

Hydrothermal:
Pertains to hot water or the action of heated water, often considered heated by magma or in association with magma. (Gardner, et.al., 1995)

Members of this year's Nominating Committee were selected at the September 15, 2001, GSOC Board Meeting. They are Beverly Vogt, Chairman, Richard Bartels, and Cecelia Crater. Our thanks to members of the Nominating Committee!

WEB TEASERS

These web teasers will get you ready for this month's noon meeting:

Information on Pacific Northwest earthquake activity and hazards from the Pacific Northwest Seismograph Network (PNSN):
http://www.geophys.washington.edu/SEIS/PNSN/

The Nisqually Earthquake Information Clearinghouse:
http://maximus.ce.washington.edu/~nisqually/

And for our Friday night meeting, from the CVO website:
The South Sister ground uplift:
http://vulcan.wr.usgs.gov/Volcanoes/Sisters/WestUplift/ground_uplift_may2001.html or also
http://vulcan.wr.usgs.gov/Volcanoes/Sisters/WestUplift/framework.html
The Mount Ranier lahars:
http://vulcan.wr.usgs.gov/Volcanoes/Rainier/Lahars/framework.html

COMPLETELY FRACTURED GEOLOGY

Correct definitions for COMPLETELY FRACTURED GEOLOGY, mostly adapted from AGI Dictionary of Geological Terms, 3rd Ed., Bates & Jackson, by E. Pratt.

1. **Washover**: small deltas produced by storm waves and built up on the landward side of a sandbar.
2. **Teilzone**: a term denoting how long a certain species of organism lived in a particular location.
3. **Lysocline**: in the ocean, the depth at which calcium carbonate going into solution barely exceeds the rate at which it is precipitated and deposited.
4. **Pinacoid**: an open crystal form consisting of two parallel. faces.
5. **Underhand stoping**: the working of a block of ore from an upper to a lower level
6. **Acoustic log**: well log that shows how long it took sound waves to travel through soil and rock in a borehole.
7. **Serpentine**: a group of common green to black rock-forming minerals with a soapy feel, found in igneous and metamorphic rocks.
8. **Labile**: describes rocks, minerals,plant or animal materials which are easily decomposed.
9. **Truncation**: the cutting-off or removal of part of a geologic structure, as by erosion.
10. **Anhydrite**: a form of calcium sulfate which easily alters to gypsum; found in deserts where water has evaporated and left minerals behind.

THE GEOLOGICAL NEWSLETTER

GSOC

DECEMBER 2001

GEOLOGICAL SOCIETY
OF THE OREGON
COUNTRY
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PORTLAND, OR 97207

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Calendar:
Evelyn Pratt – 503/223-2601

Business Manager:
Rosemary Kenney – 503/892-6514
Assistant Business Manager:
Cecelia Crater – 503/235-5158

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.
FIELD TRIPS: Usually one per month. Fees: Members, $1.00, Non-members, $3.00. See calendar next page.
GEOLOGY SEMINAR: Third Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.
GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Consult current calendar (next page) or verified by phone: 503/235-5158 or 503/892-6514.
MEMBERSHIP: Per year from January 1: Individual--$20.00, Family--$30.00, Junior (under 18)/Student--$10.00.
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Please indicate Membership type and include check for appropriate amount:
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GEOLOGICAL NEWSLETTER

THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@spiritone.com
Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 12
DECEMBER 2001

DECEMBER ACTIVITIES

No December noon program.

Fri. Dec. 14, 8pm: Geohazards and Geopolitics: Seattle's Ash Wednesday Quake and Science Policy on Capitol Hill. Yumei Wang, DOGAMI. Rm. 371 Cramer Hall, PSU.

Field trip Sat. Dec. 8: Downtown Portland. How to identify a rock – migmatite, granite, travertine/limestone - by touching a building. See the start of a "skid road" and how pioneers used an erratic rock. Taylor Hunt, 503-662-4790. Fee schedule – members $1, non-members $3.

No seminar due to the holidays.

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Preview of coming attractions:

Fri. Jan 4, 12 noon: Utah's Geology – The Lost Continent. Taylor Hunt, GSOC Field Trip Director. Central Library, 801 SW 10th.

Fri. Jan. 11, 8:00 PM: Airborne Volcanic Gas Monitoring. Ken McGee, USGS, Cascade Volcano Observatory. Rm. 371 Cramer Hall, PSU.

Seminar Wed. Jan. 16, 8:00 PM: Ice Age Floods and What They Did in Portland and the Pacific Northwest. Taylor Hunt. Rm. S-17 Cramer Hall, PSU.

Field trip Sat. Jan. 26 (weather permitting). Landslides and Faults Around Bald Peak and the Chehalem Mts. Walk on faults and landslides, learn how to recognize and identify them and learn why the mountains are there. Taylor Hunt, 503-662-4790. Fee schedule – members $1, non-members $3.

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Chris Hedeen
Edward Kazzimir
Janet Kaye
Cindy Muller

BOARD MEETING NOTES

Summary of November 3, 2001 GSOC Board Meeting:

The GSOC Board met Saturday morning, Nov. 3, at the home of Rosemary Kenney. Following is a summary of main actions taken, decisions made, and topics discussed:

The checking account balance on hand is $4,511.27, with an additional CD balance on hand of $6,808.04.

The **Nominating Committee reported** that Evelyn Pratt has agreed to be nominee for Vice President and Sue Ikeda nominee for new Board member. Additional nominations may be taken from the floor at the December 14 meeting. After that, nominations are closed, and the election is held at the February annual meeting.

To help members get acquainted, the Board has decided to use **disposable name tags** at events. This way, people can get to know each other by name.

The library has quite a few outdated books. A **short-term library committee** has been formed to remove the outdated material from the library. The committee, consisting of Beverly Vogt, Richard Bartels, Tom and Diana Gordon, and Taylor Hunt will work over the next few months to decide which books to keep, to recycle, to sell at the banquet, or give away to members at meetings.

Next year's **President Tom Gordon** is hard at work on plans for his field trip next summer or early fall. Tentative plans are to go to Mt. Lassen, Mammoth Lake, and Mono Lake. Watch for more details.

Discussion continues on how to make the President's annual trip more fully meet the needs and desires of the members. GSOC members with suggestions on what they would like to do on such trips and when and how such trips should take place are urged to make their feelings known to any of the board members. The name of the annual President's trip will eventually be changed to the **Annual GSOC Field Trip**, and an Annual Field Trip Committee consisting of the President, Vice President, Cecelia Crater, Phyllis Thorne, and an additional member is being formed. The Board is also reviewing other GSOC activities to make sure they fit the members' interests and needs.

Taylor Hunt, who runs the **popular monthly field trips**, discussed his activities with the Board. **Taylor needs help**, both (1) with short-term activities such as signing waivers, collecting money, writing up the trip for the newsletter, and driving the vehicle that brings up the rear at each trip—and (2) with long-term activities such as researching and planning new trips, handling the many phone calls each trip requires, preparing handouts, and finding local experts with knowledge of new areas. GSOC members who attend the trips are urged to **volunteer to help** during the trips, and GSOC members with geologic knowledge or time to help with the phoning are urgently asked to help Taylor out. People love field trips, and running these trips each month takes a lot of time. This is a chance to repay the organization for the pleasure you get from its activities. Please contact Taylor (phone 503.662.4790 or email hunt6422@msn.com) with your offers of at least a little of your time and/or expertise.

Rosemary Kenney announced that the Children's Museum is eager to get **donations of fossils**, minerals, and rocks to give away to children. This is

a real opportunity to recycle those materials that you had fun collecting and put them in the hands of children who dearly love beautiful fossils, rocks, and minerals. Contact Rosemary (phone 503.892.6514) or the Children's Museum for more information.

The Board wishes to acknowledge Betty Botteron's gift of Don's **geology books** to the GSOC library. They will be put to good use in the library.

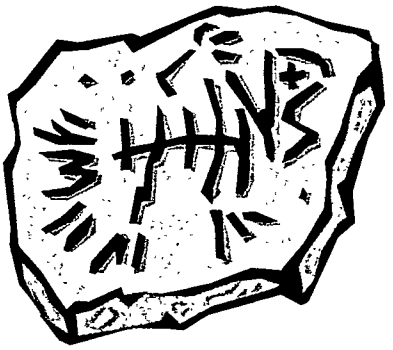
The Board also **remembers** with great fondness one of its members, **Archie Strong**, who died in September, and thanks Don Barr, who has graciously agreed to fill in for the remainder of Archie's term of office.

COMPLETELY FRACTURED GEOLOGY

This month's li'l gems are completely from the fertile imagination of our intrepid Evelyn Pratt.

Answers on page 60.

1. **Sienna:** as in, "Where are the cookies? I don't sienna."
2. **Well log:** a healthy piece of lumber
3. **Sonde:** combined with music, denotes what the hills are alive with
4. **Taconite:** an evening when Mexican food is served
5. **Perlite:** (1) refers to good manners (2) a lamp that,when turned on, creates a happy cat
6. **Morganite:** a 17th century pirate's attack after dark
7. **Batholith:** a process used in Ireland to keep rocks clean
8. **Flocculation:** what a sheep dog is good at
9. **Eurypterid:** what the psychologist accused a depressed girl's boyfriend of doing
10. **Trona:** as in, "He got arrested for trona rotten tomato at the speaker."



F.O.P. FIELD TRIP REPORT

September 28-30, 2001
by Evelyn Pratt

Continued from last month's newsletter...

This year the Friends of the Pleistocene, Pacific NW Cell, investigated the sagebrush flats once covered by Pluvial Lake Chewaukan. The V-shaped area about 1½ hours southeast of Bend and LaPine includes Summer Lake, Upper and Lower Chewaukan marshes, and Lake Abert. Both 4100-4200-foot-elevation lakes are bounded by spectacular 7000-foot scarps – Winter Rim on the west and Abert Rim on the east.

Our first stop this morning was at a small ridge on the south side of Summer Lake Inn, near the site of a core taken "offshore" (now alkali flat). The core showed several thousand years of northern hemisphere climate changes. It indicated to Sam Zic and others that Great Basin lake levels rose during warm times between glaciations. More warming in the north Atlantic was correlated with more precipitation in the Summer Lake region. This particular core was matched with records of isotopes in a Greenland ice core. Both indicate that roughly 24,000, 30,000,and 40,000 years ago global climate was quite cool, and that 29,000, 39,000,and 45,000 years ago it was relatively warm.

Next we drove 20 miles south along hummocky landslide slumps between Summer Lake's dry bed and the base of Winter Rim. Each major slide exceeds several square miles in area. Much of the rim is scalloped by broad, cirque-like bowls – head scarps of the slides. Above the town of Summer Lake and just under Winter Rim's basalt rimrock are white cliffs made of weak layers of tuff, breccia,

and tuffy sedimentary rock. These form outcrops south to the largest landslide at the base of Slide Mountain, and are the probable cause of the Winter Rim landslides.

On the way we passed Summer Lake Hot Springs next to the lake. Here water rises some 4500' along a fault to the surface and emerges at more than 120oF. (That evening some FOPpers enjoyed a swim in the warm pool.)

Landslides get progressively older from north to south. The Slide Mountain event at the southwest end of the lake is the oldest. It was a single landslide that covered parts of several ancient shorelines, particularly the 15,000 to 20,000 year-ago high stand shoreline at 4520 feet. Near the top of Slide Mountain is an impressive ~1300' steep-walled escarpment from which it came. A small landslide fan from Kelly Creek to the west buries part of the 9-km.-long Slide Mountain fault scarp, and is in turn cut by a slightly younger shoreline. Silvio Pezzopane age-dated charcoal in the fan at a little over 2000 years – probably close to the age of the Slide Mountain landslide.

To determine when various Winter Rim landslides gave way and why they did so, work is in progress that includes studies of faults and earthquakes associated with them. Most landslide surfaces have junipers growing on them, so age-dating cores from old trees would indicate the latest time that slide movements could have taken place.

A broad ~4400' sill divides Summer Lake from the rest of what was once Lake Chewaucan. When water was below this sill there would be two Chewaucan lakes, the second composed of the Chewaucan marshes and Abert Lake. Paisley's new airport is built on a flat platform of the sill's edge.

Many of the original homesteads in and around Paisley are called "Century Ranches" because they've been in the same family for at least 100 years. One of the oldest and largest, the ZX Ranch, was bought recently by "Mr. Spud," aka J. R. Simplot. He's been quoted as saying about his new 1.3 million acre acquisition, "It's not just a ranch, it's an empire!"

South of Paisley, Upper and Lower Chewaucan marshes are partly separated from each other by Tucker Hill rhyolite dome. It's easy to see several shorelines along this ridge and along Coglan Buttes to the east. Those on the east side are several meters higher than those on the west, possibly due to tectonic deformation. Other methods of deducing ancient lake levels include examining sediment, taking pollen counts, and studying geochemical data. Rob Negrini also found that recent high/low concentrations of magnetite in Summer Lake sediments correlate with high/low lake levels.

At Valley Falls Junction we turned west along well-named Willow Creek. The bluffs along the creek show cross-lamination, gradations from silt to sand to gravel, and gently inclined bedding planes under a fan surface. Evidently about 12,000 years ago a delta built up at around 4300' where Willow Creek ran into Lake Chewaucan. At that time Summer Lake was separate. Then the water rose to more than 4500 feet, and all the lakes coalesced. We saw evidence of other high-water stands at a 30 to 45-foot-high fill terrace farther up the creek. Good exposures of Mazama ash and charcoal layers helped date various deposits, which ranged from about 3300 years ago near the top of the bluff to about 6000 years ago near the base.

From here we headed toward Lake Abert. The lake is in a basin that is a mirror image of Summer Lake basin, with spectacular Abert Rim rising up on its east side similar to Winter Rim west of Summer Lake. We parked on a narrow flat overlooking the highway and the lake on one side, with the rim looming above us on the other. Light green lichen coats cliffs all along the Abert Rim. We were told that at sunset the lichen glows an almost fluorescent lime-green.

Mel Aikens, archaeologist from U.of O, told us that during the last few years evidence has been discovered that people lived in this area as long as 6000 years before present. Between 3500 and 500 years ago the area was fairly well populated. Varying altitudes a short distance apart meant that more foods were available, such as biscuitroot

higher up and brine shrimp and alkali flies in and by the lake. We could see the latter coating the shoreline by the millions. Some kind soul passed around a large plastic bag full of dried alkali flies for us to nibble on. One response: "I might try 'em tonight after I've drunk a LOT of beer!"

Blair Jones told us how the geochemistry of Lake Abert affects sediments. There is a lot of salt on the lake floor, but it consistently decreases with depth. At times Lake Abert's salinity has been close to that of seawater. Since brine shrimp and alkali flies thrive in salty water with high pH (alkalinity) while fairy shrimp need a lower pH, all are good chemical indicators.

Wave-formed terraces and ostraacod/gastropod-bearing shore deposits on the outer edges of the terraces provided evidence for various changes in level of pluvial Lake Chewaucan. Together with sand, pebble, and gravel layers, five distinct stratigraphic units appear. One is age-dated at around 11,600 years ago, and a couple of others nearby are just slightly older. At that time, with the beach at 4300 feet, Lake Abert and Lower Chewaucan Marsh would have been one lake.

Our last stop was by a 100-foot-wide overflow channel cut through the sill that from time to time separated Summer Lake from the rest of Lake Chewaucan. Here a probable sequence of Lake Chewaucan events was summarized. The Chewaucan River fed Summer Lake basin during most of the Pleistocene. This hypothesis is supported by (1) Summer Lake basin is the lowest of all the basins, (2) it's full of lake sediments,and (3) Chewaucan Marshes are not. About 14-15,000 years ago Lake Chewaucan began to recede. A fan/delta complex diverted water away from Summer Lake basin into the lake formed by Lake Abert and the Chewaucan Marshes. Around 12,000 years ago this abbreviated Lake Chewaucan rose back up to the level of the sill and spilled over into Summer Lake. Sediments in the Willow Creek fan delta are this age, as are nearshore lake sediments and tufa throughout the Chewaucan basin. The delta and channel are not very large, so the final all-inclusive Lake Chewaucan couldn't have lasted long. Since then, progressively drier conditions have reduced 480-square-mile Pluvial Lake Chewaucan to Lake Abert, the Chewaucan Marshes, and the alkali flats of Summer Lake.

Correct definitions for COMPLETELY FRACTURED GEOLOGY, adapted from AGI Dictionary of Geological Terms, 3rd Ed., Bates & Jackson; et al, by E. Pratt

Come to think of it, a couple of the correct definitions came out of Rand McNally...

1. **Sienna:** brownish-yellow limonite pigments used for oil stains and paints
2. **Well log:** a record of the measured physical characteristics of a rock section in a borehole
3. **Sonde:** along tool assembly lowered into a borehole in order to get a well log
4. **Taconite:** low-grade iron ore
5. **Perlite:** (1) rhyolitic volcanic glass found in small pearl-like spheres (2) volcanic glass that will "pop" when heated to form lightweight aggregate
6. **Morganite:** rose-colored beryl
7. **Batholith:** an igneous mass (often granitic) more than 40 square miles on the surface, with no known floor
8. **Flocculation:** the process by which minute suspended particles such as clay are held together in clots or lumps
9. **Eurypterid:** one of a group of large Paleozoic underwater arthropods
10. **Trona:** a whitish mineral found in salty residues – a major source of sodium compounds

Nominating Committee Results

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

President ..... Tom Gordon
Vice President ..... Evelyn Pratt
Secretary ..... Beverly Vogt
Treasurer ..... Phyllis Thorne
Director, 3 years ..... Sue Ikeda
Director, 2 years ..... John Newhouse
Director, 1 year ..... Taylor Hunt

Nominations will also be open at the December club meeting on Friday, December 14, 2001. Consent of the nominees must be secured prior to their nomination. Nominations will be closed after the December meeting. Final nominations will be published in the January newsletter. The slate of officers will be voted on and approved at the February monthly meeting.

The Nominating Committee members are Beverly Vogt, Chairman, Richard Bartels, and Cecelia Crater. Our thanks to the selected members and members of the Nominating Committee!

Don't forget that annual **DUES PAYMENTS** are coming up! Think about all those great member benefits for a mere annual fee of $20 (individual)!!!

PS – If you joined GSOC in September or later, your 2002 dues are paid, good deal!!!

THE GEOLOGICAL NEWSLETTER

GSOC

NOVEMBER 2001

GEOLOGICAL SOCIETY
OF THE OREGON
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ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Business Meeting—February.
FIELD TRIPS: Usually one per month. Fees: Members, $1.00, Non-members, $3.00. See calendar next page.
GEOLOGY SEMINAR: Third Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU.
GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually first Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Consult current calendar (next page) or verified by phone: 503/235-5158 or 503/892-6514.
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Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 11
NOVEMBER 2001

NOVEMBER ACTIVITIES

Note changes in times and dates!

Fri. *2-3:30 PM* ***(Note time change.)*** Nov. 2: Geology and Wildflowers of the Mojave Desert. Don Barr, past president of GSOC. Central Library, 801 SW 10th.

Fri. 8 PM Nov. 9: Outburst Floods from a Glacier-dammed Lake in Alaska. Michelle Cunico, PSU. ***Rm. 171*** Cramer Hall, PSU. ***(Note room change.)***

Field Trip Sat. Nov. *10 (Note change of date)*: Geology of Oregon City Area. Best views require walking on forest trail. See 30'-tall Boring lava columns; walk on landslides and on top of a volcano-in-disguise; measure Willamette Falls erosion. Meet 9AM at Oregon City's cliffside elevators. Taylor Hunt, 503-662-4790. Fee schedule – members $1, non-members $3.

No seminar due to the holidays

****

Preview of coming attractions:

Fri. Dec. 7, 8:00 PM: Airborne Volcanic Gas Monitoring. Ken McGee, USGS, Cascades Volcano Observatory.

Field trip Sat. Dec. 8: Downtown Portland. How to identify a rock – migmatite, granite, travertine/limestone - by touching a building. See the start of a "skid road" and how pioneers used an erratic rock. Taylor Hunt, 503-662-4790. Fee schedule – members $1, non-members $3.

The **next seminar** will be in January, when Taylor Hunt will talk about what those Ice-Age Floods did to areas around Portland and the Northwest.

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Joan Rainey

Kenneth Bergman

ARE YOU A ROCKHOUND OR JUST A MINERAL COLLECTOR?

A **rockhound** is someone who shows extreme levels of interest in rocks and collecting. A **mineral collector** is someone who just likes minerals and rocks. If you are uncertain as to which you are, here are some surefire signs that you have exceeded "casual" or "rockpup"levels and have graduated to fullblown "rockhound.".

You are a rockhound if:

The sign on the side of the highway says "Falling Rock." You pull over and wait.

The severe sunburn from your vacation is a one-inch wide strip of skin at the gap between the tail of your shirt and the top of your pants (also known as "plumbers' sunburn.")

Your friend shows you a "pretty stone" he/she has found, and you work hard to talk him/her out of it.

You care more about what happened to the diamond in the film "Titanic" than about the people.

You hit your hand with your rock hammer. Your spouse screams that it's broken, and you reply that it is a fracture and it has good cleavage.

Your fellow diner asks how the soup is and you reply, "Variable color, greasy surface, low specific gravity, texture smooth with bits of ductile material."

You lick rocks to show off the colors.

Your family puts your birthday candles on a slab of amethyst instead of cake.

A truck throws a rock into the windshield of your car and you examine the rock first.

You can pronounce "molybdenite" quickly and correctly on the first try.

You believe that the primary function of road cuts is for easy mineral collecting.

You own more pieces of quartz than of underwear.

You associate the word "hard" with a value on the Mohs scale, rather than with "work."

Your spouse has to ask you to move flats of rocks out of the tub so the family can take baths.

Attending the Tucson Gem and Mineral Show is at the top of your Christmas list.

You examine individual rocks in driveway gravel.

You know the location of every rock shop within a 100-mile radius of your home.
When they haven't seen you for a week, the shop owners send you get-well cards.

You always take a pick, shovel, mallet, hand lens, and acid bottle on your vacation.

You associate the word "saw" with diamonds instead of with wood.

You receive a letter from the county informing you that a landfill permit is required if you want to put any more rocks in your backyard.

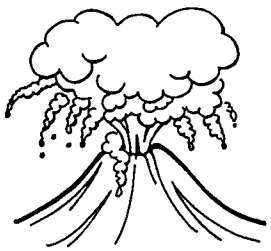
Your Internet homepage has pictures of your favorite rocks.

ARCHIE STRONG DECEASED

His name was Archie Kelly Strong. Born February 20, 1910, in Marcola, Oregon, he died Sept 24, 2001 in West Columbia, South Carolina, having lived most of his life in Oregon. He graduated from Glendale High School, earned a BS from Linfield College, and MS from Oregon State University. He was a biology instructor and coach in Oregon high schools, and also worked for the forest service before retiring in 1975.

Archie pursued many interests. He had a long standing interest in the community garden at Fulton Park. He received many awards for his produce, and in 1999 received best of show for a single gladiolus blossom at the FP annual garden show. He was also very interested in 4H and always attended their shows at the Oregon State Fair. He was a volunteer for many years at the Nature of the NW info center. He was an active member of GSOC, serving as president in 1971. Archie also served GSOC in the last few years as an after-meeting host.

At age 91 Archie was still living alone and maintaining his own house and garden. He survived two marriages; his first wife Marian who died in the 1960's, and his second wife Laura. Survivors include stepdaughter Athena Vaughn, nephews Rock Roop and Kurt Rolfes and niece Ellen Mooshier. Remembrances can be sent to your favorite charity, 4H clubs of Oregon, or GSOC.



Glossary of Volcano and Related Terminology

From the USGS Cascades Volcano Observatory website:
http://vulcan.wr.usgs.gov

Hydrothermal alteration:
Alteration of rocks or minerals by the reaction of hot water (and other fluids) with pre-existing rocks. The hot water is generally heated groundwater and dissolved minerals. (Gardner, et.al., 1995)

Igneous:
Solidified from a magma; also applied to processes related to the formation of igneous rocks.

Igneous rocks:
Igneous rocks are formed from melted rock that has cooled and solidified. When rocks are buried deep within the Earth, they melt because of the high pressure and temperature; the molten rock (called magma) can then flow upward or even be erupted from a volcano onto the Earth's surface. When magma cools slowly, usually at depths of thousands of feet, crystals grow from the molten liquid, and a coarse-grained rock forms. When magma cools rapidly, usually at or near the Earth's surface, the crystals are extremely small, and a fine-grained rock results. A wide variety of rocks are formed by different cooling rates and different chemical compositions of the original magma. Obsidian (volcanic glass), granite, basalt, and andesite porphyry are four of the many types of igneous rock. (Barker, 1997)

"Island Arc" Volcanoes:
In a typical "island-arc" environment, volcanoes lie along the crest of an arcuate, crustal ridge bounded on its convex side by a deep oceanic trench. The granite or granite-like layer of the continental crust extends beneath the ridge to the vicinity of the trench. Basaltic magmas, generated in the mantle beneath the ridge, rise along fractures through the granitic layer. These magmas commonly will be modified or changed in composition during passage through the granitic layer and erupt on the surface to form volcanoes built largely of non-basaltic rocks. (Tilling, 1985)

Jökulhlaup:
Icelandic term for Glacial outburst floods

K-Ar dating:
Determination of ;the age of a mineral or rock in years based on the known radioactive decay rate of potassium-40 to argon-40.

Lahar:

A flowing mixture of water-saturated rock debris that forms on the slopes of a volcano, and moves downslope under the force of gravity, sometimes referred to as debris flow or mudflow. The term comes from Indonesia.

Lahar-runout flow:
Hyper-concentrated streamflow transitional in sediment concentration between a lahar and normal streamflow.

Lapilli:
Fragments of lava or rock between 2 and 64 millimeters in size that are blasted into the air by volcanic explosions. (Miller, 1989)

WEB TEASERS

This web teaser will get you ready for this month's Friday night meeting:

Information on Outbursts from a Glacier-Dammed Lake from the Portland State University website: http://www.geol.pdx.edu/Glaciers/kennicott/default.html

WHAT'S COOKING IN THE CASCADES ?

A synopsis of the Friday, October 12, GSOC meeting with speaker Ed Klimasauskas, USGS

by Carol Hasenberg

GSOC was visited by Cascade Volcano Observatory specialist Ed Klimasauskas last month for an update on the recent events in the Cascade Mountains in Oregon and Washington. His talk was about 3 different subjects:

- monitoring at Mt. St. Helens, the most frequent erupter in the Cascades
- INSAR satellite radar images which detected a bulge in an area just west of the South Sister volcano
- recent debris flows at Mt. Rainier

New monitoring devices at Mt. St. Helens include
- 3 GPS receivers
- lahar monitoring

The GPS receivers can replace the older range finding method of detecting ground movement in portions of the mountain. Lahar monitoring is done with devices which are similar to seismographs used for detecting earthquakes but are tuned to a higher frequency and longer signal time. The lahar monitors can be viewed on the CVO website in "real time". Go to the CVO website (see below), Menus of Interest, "Real Time" Monitoring, Mt. St. Helens, mudflows.

Topic two, the bulge near South Sister, has gotten recent press. The bulge is a 4-inch maximum inflation of the ground surface in an area about 10 miles in diameter on the west side of the South Sister volcano. The detection technique uses satellite radar images taken at 35-day intervals during the summer when the snow has melted in this part of the country. An image is compared with previous images to determine if any changes have occurred on the ground surface. This technique is accurate to a range of 1-2 cm.

The presence of magma at a depth of about 4 miles is presumed to be the cause of the bulge, and no danger of imminent eruptions is indicated. The presence of the magma is additionally supported by high concentrations of chloride gases from Separation Creek which were first noted in 1990.

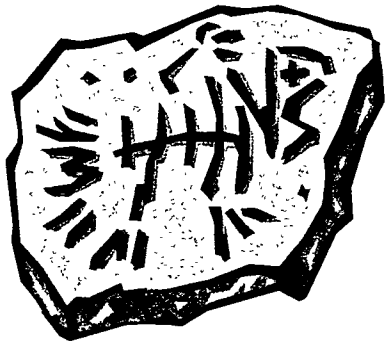
The highlight of the talk came near the end when Ed presented a video which was taken from a helicopter flying above debris flows occurring in Van Trump Creek in the Nisqually River drainage on Mt. Rainier on August 14 and 15, 2001. The debris flows were caused by glacial melt water soaking into a field of loose glacial till flanking on the side of the mountain. The melting and subsequent runoff were especially heavy during this unusually dry year due to the absence of loose snow

that normally caps the glacier, slowing melting and absorbing melt water like a sponge, thereby slowing its release into the drainage below. The debris flows brought the level of the Nisqually River up about a foot on the night of August 14, causing a bit of excitement for the emergency personnel in the area.

As a final note, Ed mentioned that the CVO headquarters is moving to the Columbia Tech Center in Cascade Park on the east side of Vancouver, WA.

You can find out more about this and other Cascade Volcano topics by checking out the CVO website: http://vulcan.wr.usgs.gov/

Another thing you can do on the CVO website in "Real Time" Monitoring is look at Volcano cams from around the world. Way cool!



F.O.P. FIELD TRIP REPORT

September 28-30, 2001
by Evelyn Pratt

This year the Friends of the Pleistocene, Pacific NW Cell, investigated the sagebrush flats once covered by Pluvial Lake Chewaukan. The V-shaped area about 1½ hours southeast of Bend and LaPine includes Summer Lake, Upper and Lower Chewaukan marshes, and Lake Abert. Both 4100-4200-foot-elevation lakes are bounded by spectacular 7000-foot scarps – Winter Rim on the west and Abert Rim on the east.

At this time of year the lake is a longish pond at the north end of a huge dry alkali flat. The Oregon Fish and Wildlife office where we met in the mornings is on the now-dry lakeshore at the foot of Winter Rim. Local population is small, based pretty much in the wee settlement of Summer Lake, a couple of lodges, a campground by a hot springs, and Paisley, strung out along the highway at the south end of the lakebed.

Our group swelled that number by 150 or so, which may seem like a lot in this rather remote area, but wildlife director Marty St. Louis expected 1100 licensed hunters to descend on Summer Lake the following week. My daughter, along with 2000 participants of Cycle Oregon, had camped by Paisley just two weeks before. All these folks missed Paisley's earlier annual Mosquito Festival, whose motto "Don't bring any– we have plenty to spare" – wouldn't seem very conducive to large-scale outsider participation. But obviously this area does get company.

From 30 to 50 vehicles lined up at the wildlife station each frosty morning. Leader Rob Negrini encouraged people to carpool, and after a few adventures on dusty much-rutted back roads, many did so. The first day we were introduced to high and low stands of Lake Chewaucan and its remnants, to land movements in this area, and to reasons why it could be "a 'Rosetta Stone' in which volcanic events, paleomagnetic stratigraphy, and paleoecology can be precisely related for much of the last 335,000 years." (Jonathan Davis, 1985)

One of the first geologists to study southern Oregon and Summer Lake was I. C. Russell in 1884. Next Ira Allison of OSU and another noted geologist, Ernst Antevs, were asked to help in a study done by archeologist Luther Cressman, volcanologist Howel Williams of UC Berkeley, and vertebrate paleontologist John Merriam of Carnegie Institution. Allison later published "Geology of Pluvial Lake Chewaucan" and told the history of early to middle 20th century research in the area. Antevs developed a "migrating jet stream" theory that drew on his and other field observations to come up with a model of global climate change. The popular though not universally accepted theory says that movement of the jet stream north or south influences melting on the Greenland ice cap, which changes currents by either dumping or withholding masses of fresh water into the North Atlantic, which

during the past has produced climatic changes all across the U. S.

In May 1980 Jonathan Davis of USGS was driving north past Summer Lake on his way to study newly-erupted Mt. St. Helens. He looked, and was hooked by, the more than 50 layers of exposed volcanic ash along the Ana River that Allison had worked on. Such tephra is great for age-dating; here was a calendar of events ready to be worked out. On Day 1 we saw this and other sections along the Ana River Fault.

A general background of the area may be helpful. Much of it seems to be underlain by early Oligocene rocks covered in some places by a formation with John-Day-like fossils in it. Some 16 million years ago and later, Steens-Mountain-type basalts flooded over these. Next, the pulling apart of Basin and Range made uptilted fault-block mountains and downdropped valleys or grabens. Most Basin and Range fault blocks such as Abert Rim tilt gently eastward, with steep cliffs on the west. A few such as Steens Mountain and Winter Rim have long westward slopes and more-or-less vertical scarps on their east sides.

The center of deposition of Lake Chewaucan sediments is at the foot of Winter Rim next to the west side of the basin, in today's Summer Lake. Sediments here are up to 1½ kilometers deep. Whenever Lake Chewaucan dried into playas and smaller lakes, winds from the southwest swept off enough sediment to make sand dunes on the eastern and northern ends of the basin. The dunes indicate that sediment deposits right after the lake dried were probably considerably deeper than they are now.

What methods are used to find the ages of these deposits? The vertical soil exposures we saw were banded with many layers of white tephra. These ashes give some fairly reliable methods of dating – the unique chemistry of each layer, the displacement of the tephra by faults and subsequent deposits of silt and newer tephra, and records of magnetic reversals, among others - for the top 100,000 years of sediment.

Below that lies a large unconformity where between 20,000 and 60,000 years of sediments have eroded away. Some older tephras beneath the unconformity can be correlated with other ash layers in various parts of the West to 225,000 years ago, but the record is not as clear. Altogether, up to half of the tephra layers come from Newberry Volcano eruptions. I didn't realize that this mountain less than 60 miles north was so lively!

Carbon 14 dating is often used on organic material less than 40,000 years old, including that from human occupation. Many layers between tephra bands are full of ostracods. These sesame-seed-and-smaller crustaceans mutated rapidly, so their shells are good indicators of age. Characteristics of age-dated fossil fishes in Pluvial Lakes Idaho and Lahontan can be compared with those of fishes still living in Pyramid Lake, NV, and California's Central Valley lakes, and estimates made of the amount of time that has elapsed since the lakes which the fossils once inhabited dried up.

Regional fault structures show a broad range in strike, length, displacement, and connectedness. N-NW striking faults are generally shorter, have less throw, and are more numerous than N-NE striking faults. By studying such faults - when and where and how much and across what they cut – stratigraphers can tell a lot about relative ages of lakebed sediments.

Ancient Lake Chewaucan was about 100 meters (300+ feet) deep near the fault escarpments. It occupied fault-bound basins developed within a graben or half-graben bounded by horst blocks. Summer Lake is in the largest and deepest graben. During high stands (levels) of Lake Chewaucan, water in Summer Lake basin was at least 400 feet deep.

(to be continued)

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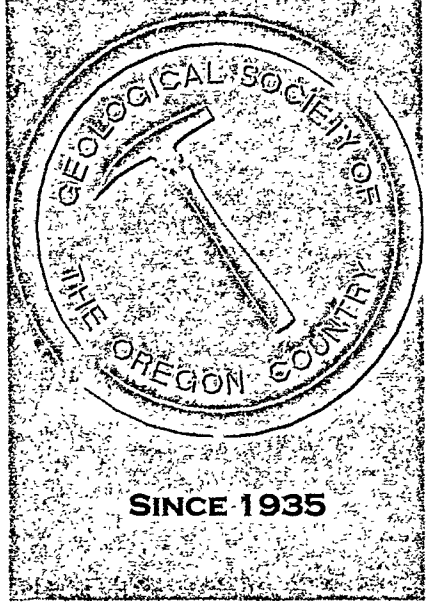

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GEOLOGICAL NEWSLETTER

THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
P.O. BOX 907, PORTLAND, OR 97207

VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@spiritone.com
Sandra Adamson, 503-667-6287 or
Evelyn Pratt, 503-223-2601

VOL. 67, No. 12
DECEMBER 2001

DECEMBER ACTIVITIES

No December noon program.

Fri. Dec. 14, 8pm: Geohazards and Geopolitics: Seattle's Ash Wednesday Quake and Science Policy on Capitol Hill. Yumei Wang, DOGAMI. Rm. 371 Cramer Hall, PSU.

Field trip Sat. Dec. 8: Downtown Portland. How to identify a rock – migmatite, granite, travertine/limestone - by touching a building. See the start of a "skid road" and how pioneers used an erratic rock. Taylor Hunt, 503-662-4790. Fee schedule – members $1, non-members $3.

No seminar due to the holidays.

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Preview of coming attractions:

Fri. Jan 4, 12 noon: Utah's Geology – The Lost Continent. Taylor Hunt, GSOC Field Trip Director. Central Library, 801 SW 10th.

Fri. Jan. 11, 8:00 PM: Airborne Volcanic Gas Monitoring. Ken McGee, USGS, Cascade Volcano Observatory. Rm. 371 Cramer Hall, PSU.

Seminar Wed. Jan. 16, 8:00 PM: Ice Age Floods and What They Did in Portland and the Pacific Northwest. Taylor Hunt. Rm. S-17 Cramer Hall, PSU.

Field trip Sat. Jan. 26 (weather permitting). Landslides and Faults Around Bald Peak and the Chehalem Mts. Walk on faults and landslides, learn how to recognize and identify them and learn why the mountains are there. Taylor Hunt, 503-662-4790. Fee schedule – members $1, non-members $3.

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Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Chris Hedeen
Edward Kazzimir
Janet Kaye
Cindy Muller

BOARD MEETING NOTES

Summary of November 3, 2001 GSOC Board Meeting:

The GSOC Board met Saturday morning, Nov. 3, at the home of Rosemary Kenney. Following is a summary of main actions taken, decisions made, and topics discussed:

The checking account balance on hand is $4,511.27, with an additional CD balance on hand of $6,808.04.

The **Nominating Committee reported** that Evelyn Pratt has agreed to be nominee for Vice President and Sue Ikeda nominee for new Board member. Additional nominations may be taken from the floor at the December 14 meeting. After that, nominations are closed, and the election is held at the February annual meeting.

To help members get acquainted, the Board has decided to use **disposable name tags** at events. This way, people can get to know each other by name.

The library has quite a few outdated books. A **short-term library committee** has been formed to remove the outdated material from the library. The committee, consisting of Beverly Vogt, Richard Bartels, Tom and Diana Gordon, and Taylor Hunt will work over the next few months to decide which books to keep, to recycle, to sell at the banquet, or give away to members at meetings.

Next year's **President Tom Gordon** is hard at work on plans for his field trip next summer or early fall. Tentative plans are to go to Mt. Lassen, Mammoth Lake, and Mono Lake. Watch for more details.

Discussion continues on how to make the President's annual trip more fully meet the needs and desires of the members. GSOC members with suggestions on what they would like to do on such trips and when and how such trips should take place are urged to make their feelings known to any of the board members. The name of the annual President's trip will eventually be changed to the **Annual GSOC Field Trip**, and an Annual Field Trip Committee consisting of the President, Vice President, Cecelia Crater, Phyllis Thorne, and an additional member is being formed. The Board is also reviewing other GSOC activities to make sure they fit the members' interests and needs.

Taylor Hunt, who runs the **popular monthly field trips**, discussed his activities with the Board. **Taylor needs help**, both (1) with short-term activities such as signing waivers, collecting money, writing up the trip for the newsletter, and driving the vehicle that brings up the rear at each trip—and (2) with long-term activities such as researching and planning new trips, handling the many phone calls each trip requires, preparing handouts, and finding local experts with knowledge of new areas. GSOC members who attend the trips are urged to **volunteer to help** during the trips, and GSOC members with geologic knowledge or time to help with the phoning are urgently asked to help Taylor out. People love field trips, and running these trips each month takes a lot of time. This is a chance to repay the organization for the pleasure you get from its activities. Please contact Taylor (phone 503.662.4790 or email hunt6422@msn.com) with your offers of at least a little of your time and/or expertise.

Rosemary Kenney announced that the Children's Museum is eager to get **donations of fossils**, minerals, and rocks to give away to children. This is

a real opportunity to recycle those materials that you had fun collecting and put them in the hands of children who dearly love beautiful fossils, rocks, and minerals. Contact Rosemary (phone 503.892.6514) or the Children's Museum for more information.

The Board wishes to acknowledge Betty Botteron's gift of Don's **geology books** to the GSOC library. They will be put to good use in the library.

The Board also **remembers** with great fondness one of its members, **Archie Strong**, who died in September, and thanks Don Barr, who has graciously agreed to fill in for the remainder of Archie's term of office.

COMPLETELY FRACTURED GEOLOGY

This month's li'l gems are completely from the fertile imagination of our intrepid Evelyn Pratt.

Answers on page 60.

1. **Sienna:** as in, "Where are the cookies? I don't sienna."
2. **Well log:** a healthy piece of lumber
3. **Sonde:** combined with music, denotes what the hills are alive with
4. **Taconite:** an evening when Mexican food is served
5. **Perlite:** (1) refers to good manners (2) a lamp that,when turned on, creates a happy cat
6. **Morganite:** a 17th century pirate's attack after dark
7. **Batholith:** a process used in Ireland to keep rocks clean
8. **Flocculation:** what a sheep dog is good at
9. **Eurypterid:** what the psychologist accused a depressed girl's boyfriend of doing
10. **Trona:** as in, "He got arrested for trona rotten tomato at the speaker."

F.O.P. FIELD TRIP REPORT

September 28-30, 2001
by Evelyn Pratt

Continued from last month's newsletter...

This year the Friends of the Pleistocene, Pacific NW Cell, investigated the sagebrush flats once covered by Pluvial Lake Chewaukan. The V-shaped area about 1½ hours southeast of Bend and LaPine includes Summer Lake, Upper and Lower Chewaukan marshes, and Lake Abert. Both 4100-4200-foot-elevation lakes are bounded by spectacular 7000-foot scarps – Winter Rim on the west and Abert Rim on the east.

Our first stop this morning was at a small ridge on the south side of Summer Lake Inn, near the site of a core taken "offshore" (now alkali flat). The core showed several thousand years of northern hemisphere climate changes. It indicated to Sam Zic and others that Great Basin lake levels rose during warm times between glaciations. More warming in the north Atlantic was correlated with more precipitation in the Summer Lake region. This particular core was matched with records of isotopes in a Greenland ice core. Both indicate that roughly 24,000, 30,000,and 40,000 years ago global climate was quite cool, and that 29,000, 39,000,and 45,000 years ago it was relatively warm.

Next we drove 20 miles south along hummocky landslide slumps between Summer Lake's dry bed and the base of Winter Rim. Each major slide exceeds several square miles in area. Much of the rim is scalloped by broad, cirque-like bowls – head scarps of the slides. Above the town of Summer Lake and just under Winter Rim's basalt rimrock are white cliffs made of weak layers of tuff, breccia,

and tuffy sedimentary rock. These form outcrops south to the largest landslide at the base of Slide Mountain, and are the probable cause of the Winter Rim landslides.

On the way we passed Summer Lake Hot Springs next to the lake. Here water rises some 4500' along a fault to the surface and emerges at more than 120oF. (That evening some FOPpers enjoyed a swim in the warm pool.)

Landslides get progressively older from north to south. The Slide Mountain event at the southwest end of the lake is the oldest. It was a single landslide that covered parts of several ancient shorelines, particularly the 15,000 to 20,000 year-ago high stand shoreline at 4520 feet. Near the top of Slide Mountain is an impressive ~1300' steep-walled escarpment from which it came. A small landslide fan from Kelly Creek to the west buries part of the 9-km.-long Slide Mountain fault scarp, and is in turn cut by a slightly younger shoreline. Silvio Pezzopane age-dated charcoal in the fan at a little over 2000 years – probably close to the age of the Slide Mountain landslide.

To determine when various Winter Rim landslides gave way and why they did so, work is in progress that includes studies of faults and earthquakes associated with them. Most landslide surfaces have junipers growing on them, so age-dating cores from old trees would indicate the latest time that slide movements could have taken place.

A broad ~4400' sill divides Summer Lake from the rest of what was once Lake Chewaucan. When water was below this sill there would be two Chewaucan lakes, the second composed of the Chewaucan marshes and Abert Lake. Paisley's new airport is built on a flat platform of the sill's edge.

Many of the original homesteads in and around Paisley are called "Century Ranches" because they've been in the same family for at least 100 years. One of the oldest and largest, the ZX Ranch, was bought recently by "Mr. Spud," aka J. R. Simplot. He's been quoted as saying about his new 1.3 million acre acquisition, "It's not just a ranch, it's an empire!"

South of Paisley, Upper and Lower Chewaucan marshes are partly separated from each other by Tucker Hill rhyolite dome. It's easy to see several shorelines along this ridge and along Coglan Buttes to the east. Those on the east side are several meters higher than those on the west, possibly due to tectonic deformation. Other methods of deducing ancient lake levels include examining sediment, taking pollen counts, and studying geochemical data. Rob Negrini also found that recent high/low concentrations of magnetite in Summer Lake sediments correlate with high/low lake levels.

At Valley Falls Junction we turned west along well-named Willow Creek. The bluffs along the creek show cross-lamination, gradations from silt to sand to gravel, and gently inclined bedding planes under a fan surface. Evidently about 12,000 years ago a delta built up at around 4300' where Willow Creek ran into Lake Chewaucan. At that time Summer Lake was separate. Then the water rose to more than 4500 feet, and all the lakes coalesced. We saw evidence of other high-water stands at a 30 to 45-foot-high fill terrace farther up the creek. Good exposures of Mazama ash and charcoal layers helped date various deposits, which ranged from about 3300 years ago near the top of the bluff to about 6000 years ago near the base.

From here we headed toward Lake Abert. The lake is in a basin that is a mirror image of Summer Lake basin, with spectacular Abert Rim rising up on its east side similar to Winter Rim west of Summer Lake. We parked on a narrow flat overlooking the highway and the lake on one side, with the rim looming above us on the other. Light green lichen coats cliffs all along the Abert Rim. We were told that at sunset the lichen glows an almost fluorescent lime-green.

Mel Aikens, archaeologist from U.of O, told us that during the last few years evidence has been discovered that people lived in this area as long as 6000 years before present. Between 3500 and 500 years ago the area was fairly well populated. Varying altitudes a short distance apart meant that more foods were available, such as biscuitroot

higher up and brine shrimp and alkali flies in and by the lake. We could see the latter coating the shoreline by the millions. Some kind soul passed around a large plastic bag full of dried alkali flies for us to nibble on. One response: "I might try 'em tonight after I've drunk a LOT of beer!"

Blair Jones told us how the geochemistry of Lake Abert affects sediments. There is a lot of salt on the lake floor, but it consistently decreases with depth. At times Lake Abert's salinity has been close to that of seawater. Since brine shrimp and alkali flies thrive in salty water with high pH (alkalinity) while fairy shrimp need a lower pH, all are good chemical indicators.

Wave-formed terraces and ostraacod/gastropod-bearing shore deposits on the outer edges of the terraces provided evidence for various changes in level of pluvial Lake Chewaucan. Together with sand, pebble, and gravel layers, five distinct stratigraphic units appear. One is age-dated at around 11,600 years ago, and a couple of others nearby are just slightly older. At that time, with the beach at 4300 feet, Lake Abert and Lower Chewaucan Marsh would have been one lake.

Our last stop was by a 100-foot-wide overflow channel cut through the sill that from time to time separated Summer Lake from the rest of Lake Chewaucan. Here a probable sequence of Lake Chewaucan events was summarized. The Chewaucan River fed Summer Lake basin during most of the Pleistocene. This hypothesis is supported by (1) Summer Lake basin is the lowest of all the basins, (2) it's full of lake sediments,and (3) Chewaucan Marshes are not. About 14-15,000 years ago Lake Chewaucan began to recede. A fan/delta complex diverted water away from Summer Lake basin into the lake formed by Lake Abert and the Chewaucan Marshes. Around 12,000 years ago this abbreviated Lake Chewaucan rose back up to the level of the sill and spilled over into Summer Lake. Sediments in the Willow Creek fan delta are this age, as are nearshore lake sediments and tufa throughout the Chewaucan basin. The delta and channel are not very large, so the final all-inclusive Lake Chewaucan couldn't have lasted long. Since then, progressively drier conditions have reduced 480-square-mile Pluvial Lake Chewaucan to Lake Abert, the Chewaucan Marshes, and the alkali flats of Summer Lake.

COMPLETELY FRACTURED GEOLOGY

Correct definitions for COMPLETELY FRACTURED GEOLOGY, adapted from AGI Dictionary of Geological Terms, 3rd Ed., Bates & Jackson; et al, by E. Pratt

Come to think of it, a couple of the correct definitions came out of Rand McNally...

1. **Sienna:** brownish-yellow limonite pigments used for oil stains and paints
2. **Well log:** a record of the measured physical characteristics of a rock section in a borehole
3. **Sonde:** along tool assembly lowered into a borehole in order to get a well log
4. **Taconite:** low-grade iron ore
5. **Perlite:** (1) rhyolitic volcanic glass found in small pearl-like spheres (2) volcanic glass that will "pop" when heated to form lightweight aggregate
6. **Morganite:** rose-colored beryl
7. **Batholith:** an igneous mass (often granitic) more than 40 square miles on the surface, with no known floor
8. **Flocculation:** the process by which minute suspended particles such as clay are held together in clots or lumps
9. **Eurypterid:** one of a group of large Paleozoic underwater arthropods
10. **Trona:** a whitish mineral found in salty residues – a major source of sodium compounds

Nominating Committee Results

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

President	Tom Gordon
Vice President	Evelyn Pratt
Secretary	Beverly Vogt
Treasurer	Phyllis Thorne
Director, 3 years	Sue Ikeda
Director, 2 years	John Newhouse
Director, 1 year	Taylor Hunt

Nominations will also be open at the December club meeting on Friday, December 14, 2001. Consent of the nominees must be secured prior to their nomination. Nominations will be closed after the December meeting. Final nominations will be published in the January newsletter. The slate of officers will be voted on and approved at the February monthly meeting.

The Nominating Committee members are Beverly Vogt, Chairman, Richard Bartels, and Cecelia Crater. Our thanks to the selected members and members of the Nominating Committee!

Don't forget that annual **DUES PAYMENTS** are coming up! Think about all those great member benefits for a mere annual fee of $20 (individual)!!!

PS – If you joined GSOC in September or later, your 2002 dues are paid, good deal!!!