Apr. 6, 2006 (Vol. 06, No. 8)

The Official
Newsletter
of the Oregon Section Association of Engineering Geologists

Serving Professionals in Engineering, Environmental, and Groundwater Geology

APRIL 2006 SECTION MEETINGS

STUDENT POSTER NIGHT - TUESDAY APRIL 18

POSTERS FEATURING GEOSCIENCE GRADUATE AND UNDERGRADUATE RESEARCH

(continued on page 3)

PSU Smith Memorial Union,
Room 327, 1800 SW Broadway
Portland, OR

6:00 pm Poster Session & Social
7:30 pm Dinner
8:30 pm Presentation

Cheesy Baked Manicotti, sautéed zucchini, green salad and tiramisu.

Assorted beverages, free beer
$15.00 dinner ($7.50 students).

E-mail <glenda.christman@amec.com> with "AEG Reservations" in the subject line, or call 503-639-3400, by 4 pm Thurs. Apr. 13. There is a $2.00 surcharge for those who do not reserve by the deadline.

Door Prize: one signed copy of Dr. Derek Cornforth's book titled *Landslides in Practice - Investigation, Analysis, and Remedial/Preventative Options in Soils*

Parking: Parking permits will be provided for those that make reservations (see above) at Structure #1 on 6th Ave between Hall and Harrison. Tell the attendant your name and that you are with the PSU AEG. For a map of the PSU campus, Smith Center and Parking Structure see:
<http://www.pdx.edu/media/c/a/campusmap_bw.pdf>
Parking in the garage and on the street is free after 7:00 pm.

SPECIAL MEETING: JAHNS LECTURER - WEDNESDAY APRIL 19

DR. JERRY HIGGINS, PH.D., P.G., ROCK-FALL ANAYLISIS AND MITIGATION

(*continued on page 3)*

Old Market Pub
6959 SW Multnomah Blvd
Portland (Garden Home), OR

6:00 pm Social
7:00 pm Presentation

No Meal (no charge)

Beverages hosted by
Geo-Tech Explorations, a Division of Boart Longyear

E-mail <glenda.christman@amec.com> with "AEG Reservations" in the subject line, or call 503-639-3400, by 4 pm Thurs. Apr. 13.

MESSAGE FROM THE CHAIR

Well, if you did not attend last month's section meeting you missed a great presentation. I would like to thank Steve Mumma from Geo-Brugg North America for his presentation on Flexible Debris Flow Barrier Development and Testing. I have worked on a number of projects with Steve and I appreciate his knowledge of his products and the fact that his company goes to such lengths to test their systems.

I hope everyone has been enjoying the NCAA basketball tournament (and I hope you did better in your office pool than I did). It is hard to compete with the excitement of March Madness; however, I think our section is going to come pretty close with our April lineup. I gave you a little tease in my last message from the chair about the two great events we have scheduled this month.

The first event is the traditional student night, where students from our local universities present posters and compete for scholarship funds provided by our section. A Student Scholarship Fund with a $300 and $200 grant will be awarded to the first and second place finishers of the poster presentation competition. Portland State University's AEG Student Chapter will also be giving away awards for other poster categories.

I've always enjoyed this event and I feel that it is an excellent forum for students and our members to see the latest research topics and network with other professionals in our field. I also feel that by coming and supporting this event it is great way to give something back to our universities that in a large way are responsible for the professions that we have today. Fortunately, when I was in graduate school, I had a great champion of AEG just like Scott Burns who encouraged his students to become active in our organization. In addition, we will be giving away a copy of Dr. Derek Cornforth's new book titled *Landslides in Practice - Investigation, Analysis, and Remedial/Preventative Options in Soils* as a door prize to one lucky person. I know that I am probably biased, but it is a great book and free is a very good price.

Lastly, Jerry Higgins from the Colorado School of Mines is AEG's Jahns Lecturer this year and is giving a presentation on Wednesday, April 19. There will be no dinner served at this event (no cost) and all sorts of refreshments will be provided, compliments of a Geo-Tech Explorations.

So there you have it, what more could you ask for? A field trip you say. Well not this month, but stay tuned for more details about an upcoming trip to the Columbia River Jetties. I hope to see you all at both events.

Brent Black
AEG Oregon Section Chair

THANKS FOR SUPPORTING OREGON AEG!

AMEC
Columbia Geotechnical, Inc.
Cornforth Consultants, Inc.
DOGAMI
Geo-Tech Explorations, Inc.
GRI, Inc.
Kuper Consulting
Northwest Geophysical Assoc, Inc.
Oregon Department of Forestry
PBS Engineering and Environmental
PSI, Inc.
Portland State University
Portland District COE

AEG OREGON CALENDAR

May 16: Dr. Darrel Schmitz, AEG President, topic to be announced

OREGON SECTION AEG NEWSLETTER is published monthly from September through May. Subscriptions are for members of AEG affiliated with the Oregon Section or other Sections, and other interested people who have requested and paid a local subscription fee of $10.00. E-mail subscriptions are free.

News items are invited and should be sent to: Charlie Hammond, OR Section AEG Newsletter Editor, Cornforth Consultants, 10250 SW Greenburg Road, Portland, OR 97223, e-mail: <or.aeg.news@cornforthconsultants.com>, phone (503) 452-1100. Electronic media is preferred. Deadline for submittal is Friday three weeks before each meeting.

Advertising: business card $10/mo, $100/yr; ¼ page $30/mo, $200/yr; ½ page $35/mo, $350/yr.

Please notify Charlie if you have a change to your email or mailing address.

STUDENT POSTER NIGHT

POSTERS FEATURING GEOSCIENCE GRADUATE AND UNDERGRADUATE RESEARCH

The 5th annual Student Poster Night will be hosted by the PSU Student Chapter of AEG on April 18, 2005. A poster session will highlight the academic activities and research of both graduate and undergraduate students from Oregon universities. A panel of university, private and agency professionals will review posters and grant awards to outstanding posters. Dinner will follow the poster session along with presentation of student awards.

In past years this has been a gregarious and social evening, encouraging interaction between professionals and students. The range of poster topics has historically been large, including groundwater remediation, landslide mapping, slope stability, debris flows, stratigraphy, glacial hydrology, paleoclimatology, crustal deformation, hydrogeochemistry and volcanology.

Anticipated posters include:

- Influences of Temperature Observed in the North Fork John Day River, Central Oregon - *Christopher J. Sheridan*
- Presence of Diatoms in Geothermal Springs, Mickey Hot Springs, Southeastern Oregon: Implications for Paleoenvironmental Reconstruction" - *Mary Dietrich*
- "Sensitivity of Williamson River Basin Groundwater Flow to Climate Perturbations" - *Scott Braunsten*
- Landslide Activity in the West Hills of Portland, Oregon compared to rainfall and soil Moisture Data - *Joshua Theule*
- Glacier Behavior After Ice Shelf Collapse in Crane Glacier, Antarctic Peninsula - *Amie Lamb*
- New Evidence of Paleotsunami Runup in the Central Cascadia Margin - *Adam Campbell*
- Numerical Model Calculating Melt-water Production on Canada Glacier, Taylor Valley, Antarctica: Implications for Ecosystem Stability - *Jonathan Ebnet*
- Finite Strain of the Pacific Northwest, USA, and Southeast Asia - *Nathan W. Smith*
- Using West Hills Portland to Characterize Thresholds for LIDAR Mapping - *authors, Marina C Drazba and Audra R Inglish*

SPECIAL MEETING: JAHNS LECTURER

DR. JERRY HIGGINS, PH.D., P.G., ROCK-FALL ANAYLISIS AND MITIGATION

Jerry D. Higgins, Ph.D., P.G. has been named the 2006 Jahns Distinguished Lecturer. The Association of Engineering Geologists and the Engineering Geology Division of the Geological Society of America (GSA) jointly established the Richard H. Jahns Distinguished Lectureship in 1988 to commemorate Jahns and to promote student awareness of engineering geology through a series of lectures offered at various locations around the country throughout the year. Richard H. Jahns (1915-1983) was an engineering geologist who had a diverse and distinguished career in academia, consulting, and government.

Dr. Higgins has served on the Geology and Geological Engineering faculty at the Colorado School of Mines since 1986. He received a B.S. Geology degree from Missouri State University (1969) and M.S. Geology and Ph.D. Geological Engineering degrees (1975 and 1980) from the University of Missouri-Rolla. Prior to coming to CSM, Dr. Higgins served on the civil engineering faculty at Washington State University and as a geological engineer with a consulting engineering firm and with the City of Springfield, Missouri.

Dr. Higgins has taught many engineering geology courses and short courses. His major areas of research are slope stability, rockfall analysis and mitigation, debris flow mechanics, seismic hazard assessment, geotechnical design in loess, characterization of expansive bedrock, construction materials characterization, and engineering geologic mapping. He has completed over $1.4 million in funded research from government and private industry. He was a contributing author to the Transportation Research Board.

The abstract for Dr. Higgins' April 19, 2006 presentation to the Oregon Section of AEG is:

Rock fall refers to the detachment of rock from a steep slope along a surface on which little or no shear displacement occurs. The material rapidly descends a slope by falling, bouncing, or rolling. Except when the displaced rock has been undercut, falling will be preceded by small sliding or toppling movements that separate the displacing material from the undisturbed mass. Rock fall may involve more than one rock, but does not include large volumes such as rock slides.

The traffic on highways crossing steep topography has steadily

(Continued on page 4)

(Continued from page 3)

increased resulting in an increase in the number of rock-fall related accidents and deaths. In the past 20 years or so, transportation departments have become increasingly concerned with identifying rock-fall hazard and attempting to reduce the risk of accidents along heavily traveled routes. The resulting research has led to the development of new management, analyses and mitigation techniques that make it possible to stabilize or control many of the smaller, but high risk, potential rock falls. Today, these developments are commonly applied throughout civil, environmental, and mining practice.

Engineering geologists have had the tools for many years to recognize structural or environmental conditions that may increase the potential for rock-fall events. Research in the early 1960s developed an empirical method to design effective rock-fall catchment ditches along roadways. Beginning in the 1980s several computer programs were written and tested that were effective in helping engineering geologists predict how rocks behave as they bounce down slopes, which aided in catchment ditch design or the placement and design of rock-fall barriers on the slope. Several versions of rock-fall inventory systems were developed to aid engineering geologists in selecting priorities for remediation. Many full-scale rock-rolling experiments have been conducted for calibration of computer programs or as a basis for design of barrier or ditch systems. Various types of rock-fall barriers were designed and underwent full-scale testing. Today rock-fall analysis and mitigation has become relatively sophisticated and geologists and engineers have the tools to analyze slopes for rock-fall hazard and to construct rather sophisticated stabilization or catchment systems.

This presentation will review the development of important rock fall assessment and analysis tools, the various mitigation techniques, and full-scale-testing of rock-fall barriers.

AEG 2006 Annual Meeting: Call for Abstracts

May 1 is fast approaching! This is the deadline date to submit your abstract for the AEG-2006 Annual Meeting to be held in Boston, Massachusetts at the Boston Park Plaza Hotel, October 30 through November 4. The theme of the annual meeting is "Northeast Engineering Geology: From Till to Fill."

Technical Session topics include:

- Marine Geology
- Tunnels and Underground Construction
- Coastal Processes / Sea Level
- Applied Geophysics
- Landslides / Rockfalls
- Environmental Geology
- Alternate Energy Sources
- Engineering Materials
- Water Supply
- Glacial Geology
- "Till and Fill" throughout the Boston History

You may submit your abstract directly to Julie Keaton (aegjuliek@aol.com) as an attachment or pasted directly into your e-mail.

STUDENT POSTER ABSTRACTS

Influences of Temperature Observed in the North Fork John Day River, Central Oregon

Christopher J. Sheridan

The John Day River is situated in Central Oregon and is recognized as one of the few remaining free flowing fluvial systems in the Pacific Northwest. The North and Middle Forks combine to produce approximately 73-82% of the fish population within the John Day system, which is recognized as containing the largest spawning population for wild spring Chinook salmon and summer steelhead remaining in the Colombia River system (USFW 2002). High temperatures have a negative impact on this important habitat and have been observed within the North Fork during summer months using forward looking infrared (FLIR) imaging. This project attempts to gain insight regarding the sources of temperature input to the system and relative significance of each source. The analysis uses a multi-disciplinary approach, constraining the water-budget of the system during a time interval of approximately 7 days during summer base flow. Data from concurrent temperature logging will be compared with the water-budget model to make inferences as to the sources of observed temperature.

Presence of Diatoms in Geothermal Springs, Mickey Hot Springs, Southeastern Oregon: Implications for Paleoenvironmental Reconstruction"

Mary Dietrich

Diatoms are photosynthesizing algae with a siliceous skeleton and are found in almost every aquatic environment. They are found in environments with extreme temperatures, ranging from ice cores to geothermal springs. Various bacteria, such as *Chloroflexus,* and *Synechococcus* have been extensively studied in geothermal settings, but few studies have focused on the presence of diatoms along geothermal gradients and their incorporation into sinter deposits along the borders of many springs. The bacterial community of Mickey Hot Springs, a geothermal springs in southeastern Oregon, has been previously investigated, but diatoms have not been included in these studies. Samples from bacterial mats of 8 sites in Mickey Hot Springs were collected, prepared, and examined by SEM techniques. Temperature range of the collection sites was 40^{o} – 79^{o}C; pH 7.32 – 9.0. Four genera with seven species of diatoms were identified and measured. Genera included *Criticula, Nitzschia, Rhopalodia and Gomphonema. Criticula* and *Nitzschia* were the most prevalent. Sites with higher relative diatom abundance had temperatures of 41^{o} and 46^{o}C, and alkaline pH. No diatoms were identified at the two sites with temperatures >75^{o}C, the upper limit of temperature tolerance for photosynthesizing organisms. Numerous examples of the encrustation of diatoms with bacterial filaments and silica deposits were noted. Diatoms are easily incorporated into sinter fabric and may remain whole because of the great compressional strength of the diatom frustule structure. Because living diatom species have specific salinity, temperature and geochemical tolerances, it may be possible to use transfer functions to produce accurate paleoenvironmental reconstructions.

"Sensitivity of Williamson River Basin Groundwater Flow to Climate Perturbations"

Scott Braunsten

The Williamson River basin, the northernmost catchment in the Upper Klamath Basin, has a groundwater system that is of interest for its connections to local ecosystem and agricultural water requirements. The primary aquifer unit is a pyroclastic fall deposit from the 6850 year ago Mt. Mazama eruption, overlain by low-permeability pyroclastic flow units and underlain by older basin-fill sediments. The source of water for the aquifer is rain and snowfall on the eastern front of the Cascades and smaller nearby hills. Here, a numerical model of water flow through the ash fall layer is developed in order to study the effect of changing climate on groundwater resources in the Williamson River Basin. In particular, I am interested in the effect of changes in the timing of seasonal precipitation patterns on the delivery of water to the Klamath Marsh. This will be investigated by perturbing the modern precipitation pattern, which is a boundary condition for the groundwater model.

Slope Stability Concerns at the Parkin Quarry, Washington County, Oregon

Joshua Theule, Margaret Russell

An earthflow occurred during heavy rains at the Parkin Quarry. The earthflow event initiated an engineering geologic evaluation of the failure and the existing quarry area. Preliminary earthflow mitigation measures and slope stability concerns encountered in the quarry were evaluated. The basis for the geologic mapping was an aerial photo and new topography prepared at 2 foot contours.

The Parkin Quarry is located on the eastern flank of a northwesterly plunging anticline. The quarry extracts diabase sill within shales associated in the Eocene. The sill and shale dip out of slope 45 to 55

(Continued on page 6)

(Continued from page 5)

degrees.

Placement of the fills were in a small drainage above the quarry highwall. Heavy rains in December 2005 triggered the failure of the fills, the earthflow flowed down the canyon and onto an adjoining neighbor's property. A preliminary evaluation indicated that the existing fills and earthflow materials will need to be stabilized. By extracting the diabase sill in the quarry, portions of the shale have been destabilized located behind the sill. The stability of the shale and diabase vary due to the variations of weathering, dip slope of the shale, and the steep cut into the slope.

Preliminary stability analysis was performed on the shale. To stabilize the existing highwall will either entail, flattening of the highwall slopes or placement of fills in the quarry to buttress the existing highwall slope. Additional engineering geology and geotechnical evaluation may be needed depending on the final configuration of the quarry desired by the owner.

Glacier Behavior After Ice Shelf Collapse in Crane Glacier, Antarctic Peninsula

Amie Lamb

The Antarctic Peninsula is the fastest-warming region on Earth, about 2.5 C over the last 60 years. Since the early 1990's, many changes have been observed in the Peninsula's glacier systems, presumably in response to that warming. One such change, speed-up of Crane Glacier, is of interest here. Crane is a large glacier on the eastern side of the Peninsula that began to speed up in 2002, after the disintegration of the Larsen B ice shelf into which it had flowed. We use a combination of satellite remote sensing data sets to study this change. Glacier velocity is measured using standard image-correlation techniques and Landsat 7 and ASTER images. Speeds in the downstream trunk of the glacier were significantly slower between 18 December 2002 and 20 February 2003 (summer) than speeds computed over the entire 327-day period between 18 December 2002 and 13 January 2004. No significant differences were observed in the upstream region of the glacier. Calculated speeds due to internal deformation of the ice are significantly smaller than the observed speeds. Together, these lines of evidence suggest that the glacier is sliding over its bed during at least part of the year. The relatively slow summertime speeds (compared to the annual speed) may indicate that by this time in the melt season, the basal water system has become efficient, and basal water pressures a lower than at other times of the year. If this interpretation is correct, it suggests that in the absence of the Larsen B, Crane Glacier is behaving as a tidewater glacier, similar to large coastal outlet glaciers in Alaska and Greenland.

New evidence of paleotsunami runup in the Central Cascadia Margin

Adam Campbell

The Cascadia subduction zone is capable of generating earthquakes that can produce catastrophic tsunamis. Computer simulations of possible, tsunami excitation scenarios yield runup heights ranging from 5 to 30 m in height. Other approaches are needed to estimate likely tsunami runup in the Cascadia margin for purposes of evacuation planning. Our study focuses on finding evidence for paleotsunami runup elevations in the Central Cascadia Margin, specifically at upland sites 5 to 13 m elevation MSL, located south of the city of Newport, Oregon. Cores samples were collected in reducing marsh type environments where Holocene silt and mud deposits have accumulated. Samples taken at 20 to 100 cm subsurface depth show several sand deposits (0.5 to 5 cm in thickness), with sharp bottom contacts that grade upward to silt and mud layers. The core site elevations (NAD88) were surveyed by EDM total station (+/- 1 cm) and tied into either published benchmarks or GPS stations. It is possible that these anomalous sand layers have been deposited by tsunamis that reached the measured elevation of the investigation sites. Further investigation of the deposits and others in the Central Cascadia Margin, including radiocarbon age dating and marine diatom testing are required to confirm that the anomalous sand layers were deposited from nearfield tsunami runup.

Numerical Model Calculating Melt-water Production on Canada Glacier, Taylor Valley, Antarctica: Implications for Ecosystem Stability

Jonathan Ebnet

A numerical model has been developed to calculate the volume of melt-water from glaciers in Taylor Valley, one of the McMurdo Dry Valleys, Antarctica (77˚00'S 162˚52'E). The dry valleys are the largest relatively ice-free region in Antarctica and remain ice-free because the Trans-Antarctic Mountains block the flow of ice from the polar plateau. Glacial melt-water is important in Taylor Valley since the ephemeral, melt-water streams that flow from the termini of these glaciers are the main source of water and nutrients for perennially, ice-covered lakes that occupy the valley bottom. Small changes in melt-water production can have significant effects on life in this desert ecosystem. This model uses measured meteorological variables obtained from stations located on several glaciers. The model calculates surface and subsurface ice temperatures, total surface mass loss, and melt-water. Subsurface

(Continued on page 7)

(Continued from page 6)

melt-water is important because austral summer air temperatures rarely exceed 0˚C, suggesting that melt-water production has significant contributions from below the ice surface.

Preliminary results show that the numerical model predicts ice temperatures and total surface mass loss (sublimation/melt-water) well. Results show that from 1998 through 2005, the model predicts total surface mass loss with a 12% error. From 2002 through 2005, the model predicts subsurface ice temperatures at 50cm and 100cm depths with 4% and 5% errors respectively while from 2004 through 2005, the model predicts subsurface ice temperatures at depth in 25cm increments with errors ranging from 6% to 7%. This model will be applied over the melting area of a glacier in an attempt to reproduce the stream flow measured at the base of the glacier.

Finite Strain of the Pacific Northwest, USA, and Southeast Asia

Nathan W. Smith

What is the strain landward of the Pacific Northwest and Indonesian subduction zones determined from global positioning station (GPS) displacements? Strain in a region can be determined using the changes in distance between global position stations. Average strain over the area of a triangle is obtained by analyzing the displacements of three stations which form a triangle. We characterize strain in the Pacific Northwest and Southeast Asia by analyzing the average strain over the areas of the relatively large triangles and relatively small triangles. We characterize strain more specifically by analyzing patterns of one-dimensional strain along select transects. We suspect the observed deformations in both areas are mainly due to the strain that has accumulated in the continental crust landward of the subduction zones trenches in both regions. Our calculations indicate the magnitudes of strain in both regions are of similar order. We compare our observed patterns of strain with the expected/ predicted patterns of strain of a dislocation model.

Using West Hills, Portland to Characterize Thresholds for Lidar Mapping

Marina C Drazba, Audra R Inglish

Mapping landslides in western Oregon is problematic due to the heavy vegetation. The West Hills of Portland, Oregon are prone to landslides as there is loess (ML soils) overlying basalt on steep slopes. The geology coupled with high levels of precipitation during the winter and parts of spring lead to high numbers of slope failures. Landslide indicators are hard to distinguish, on traditional aerial photographs or satellite imagery which would be used for inventory maps in areas that aren't populated. LIDAR (light detection and ranging) penetrates the vegetation for a view of the ground surface. The LIDAR data were acquired by Portland State University from the Puget Sound LIDAR Consortium (PSLC) which flew the West Hills area in winter of 2004. In this project we attempted to define large-medium-small landslides in the West Hills, Portland using LIDAR. We created contour lines with different intervals (5, 15, 50 feet) and compared the number of landslides identified in each. Within the different contour intervals we also measured the area of landslide that we were able to delineate. The intervals set at 5 and 15 feet allowed us to see "small" landslides of ~5,000 sq ft, as well as the large ones. The 50 foot interval depicted smaller landslides with an area of 20,000 sq ft. While the 5 and 15 feet contour lines were the best, they also took 5- 10 seconds to load every time we panned the screen. We found hill shading wasn't as accurate as contour lines, and it sometimes presented a false image of the area. To maximize the image, we draped contour lines over the hill shade, which seemed to give a better view of what the ground morphology was really like. The 5 foot contour was the best, but the longest to load. We could see some of the same landslides in the 15 foot contour, especially with the hill shade image below. We recommend using the 50 foot contour when locating larger slides in areas that are heavily populated it was difficult to discern the housing complexes with disturbed slopes.

OREGON SECTION OFFICERS & COMMITTEE CHAIRS

Chair: Brent Black, Cornforth Consultants, Inc., (503)452-1100, bblack@cornforthconsultants.com

Chair-Elect: Michael Zimmerman, GRI, Inc., (503)641-3478, mzimmerman@gri.com

Secretary: Matt Brunengo, (503)534-0414, mbrunengo@aol.com

Treasurer: Jason Hinkle, (503)945-7406, jhinkle@odf.state.or.us

Past-Chair: Rowland French, Northwest Geophysical Associates, Inc., (541)757-7231, rowland@nga.com

Program Co-Chair: Lisa Glonek, AMEC, lisa.glonek@amec.com

Program Co-Chair: Bill Burns, DOGAMI bburns@dogami.state.or.us

PSU Student Chapter President: **Marina Drazba** mcdrazba@pdx.edu

Membership Chair: **Ruth Wilmoth**, Columbia Geotechnical, Inc., (360)513-2692, ruthwilmoth@comcast.net

Field Trip Chair: **Dave Scofield**, Portland District COE, (503) 808-4867, scofield@onemain.com

History Chair: vacant

Newsletter Editor: Charlie Hammond, Cornforth Consultants, Inc., (503) 452-1100, or.aeg.news@cornforthconsultants.com

Assistant Newsletter Editor: **Darren Beckstrand**, Cornforth Consultants, Inc., (503) 452-1100, dbeckstrand@cornforthconsultants.com

Legislature Chair: **Dorian Kuper**, Kuper Consulting, Inc., (503)638-9722, dkuper@cybcon.com

Continuing Ed. Liaison: **Andrew Harvey**, PBS Engineering and Environmental, andrew_harvey@pbsenv.com