



PGS Newsletter

<http://www.pittsburghgeologicalsociety.org/>

Vol. LXI, No. 6

Robert Burger, Editor

February, 2009

Wednesday, February 18, 2009
The Pittsburgh Geological Society presents

Three Geophysical Methods for Detecting Subsurface Anomalies

by Peter J. Hutchinson, PhD., PG
The Hutchinson Group, Ltd., Murrysville, PA

Deep-mine voids are an insidious subsurface mining hazard and identification is imperative to minimizing subsidence to roads, bridges, buildings and other infrastructures. Three common geophysical methods exist for detecting subsurface voids; electrical imaging in the form of continuous vertical electrical sounding (CVES); mapping using microgravity measurements; and seismic imaging. All three have limitations resulting from cultural noise, surface mining, and anomalous lithology.

CVES is the most common method of imaging subsurface voids and is effective at predicting voids to at least 100 feet below grade. The electrical resistivity of a geologic unit is measured in Ohm-meters and is a function of the porosity, permeability, water saturation and the concentration of dissolved solids in pore fluids. Electrical imaging (EI) methods measure the bulk resistivity of the subsurface by injecting current into the ground through surface electrodes. EI methods, in a continuous vertical electric sounding mode, can provide accurate estimates of depths, thickness and electrical resistivity of subsurface layers. The disadvantage to resistivity methods is that the survey must be conducted far away from grounded structures, so the survey cannot be collected near metal fences, pipelines, and railroad tracks. The EI method is also one of the more labor-intensive geophysical methods for data collection. Four examples of CVES imaging: State College, Pennsylvania; Sweetwater, Texas; St. Marys, Pennsylvania, and Akron, Ohio, show the efficacy of this tool for predicting subsurface anomalies.

A microgravimeter measures the acceleration due to the earth's gravitational field and is a slow, sounding-type tool. Microgravity measurements require an accurate vertical and horizontal position for each location and a detailed survey must be conducted. Microgravity measurements are not readily impacted by cultural noise and can be used in urban settings including buildings. Microgravity measurements in a high school in State College, Pennsylvania indicated the presence of voids that may adversely impact a proposed vertical expansion of the building. Microgravity mapping of a warehouse near Oklahoma City, Oklahoma detected the dissolution of gypsum that was used as fill.

(Continued on next page.)

Social hour - 6:00 p.m.

Dinner - 7:00 p.m.

Program - 8:00 p.m.

Dinner will cost **\$25.00/person, students \$5.00**; checks preferred. **Reservations should be emailed to Steve McGuire at smcguire@chesterengineers.com** – please title as "PGS Dinner Reservation." If you are unable to use email, call (412) 809-6723 and leave your name and number of reservations needed by **noon, Monday, February 16.**

Meeting will be held at Foster's Restaurant, Foster Plaza Bldg 10, Green Tree.

Seismic methods involve bouncing elastic waves (i.e., acoustic) off of subsurface density contrasts. Reflection seismic techniques record the 2-way travel time of a wave front from the source to receiver. Refraction seismic methods exploit Snell's Law, which states that the refraction of a wave front is caused by the change in density experienced by a wave when it changes medium. Either of these two methods, when deployed conventionally, requires that data collection occur in a straight line with significant coverage on either side of the target. Seismic methods are interpretive and processing of the profiles requires extensive knowledge of the processing techniques, the rock/soil layers, and velocity of the materials. Three seismic methods are commonly used by The Hutchinson Group: a proprietary "single-fold" refraction method; multichannel analysis of surface waves (MASW), a reflection method; and tomography, a refraction method. Single-fold seismic reflection methods were instrumental in mapping shallow mine workings in Penn Hills, Pennsylvania and fault plane imaging in Austin, Texas. The MASW method is an up-and-coming seismic reflection method based upon the velocity of surface waves. Tomographic refraction mapping in Bellefonte, Pennsylvania imaged subsurface highwalls and auger mining.

Pittsburgh Geological Society

PGS STUDENT FIELD WORKSHOP

The Pittsburgh Geological Society once again invites students of geology & engineering geology to attend the 7th installment of the "Student Field Workshop." At this workshop, you will have the opportunity to work along side an experienced drilling contractor and learn from field-wise geological professionals. It will be an excellent learning opportunity and your chance to ask all those questions regarding life after college. During the event, you will be introduced to sampling techniques, soil and rock descriptions, well installation, monitoring equipment, and designing a drilling program.

The course will be held **Saturday March 28, 2009**, at Slippery Rock University, Slippery Rock, PA, in the Swope Music Hall/Aebersold Rec Center parking lot. Cost to attend is \$15.00 for PGS student members and \$20.00 for student non-members. Pizza and soft drinks will be provided for lunch and are included in the fee. **Register ASAP as space is limited.** Please note that payment is not required at the time of registration and may be made at the February or March PGS meeting, or the day of the workshop.

The drilling process is often dusty, wet, and muddy. In addition, this workshop will be held outdoors, rain or shine, so watch the weather forecast and dress accordingly.

This course is limited to active students and recent graduates, so please, no corporate trainees. To sign up, contact: Frank Benacquista, PG at rollerbit@comcast.net or 412-469-9331.

PGS SPRING FIELD TRIP

PGS is running a one-day field trip to explore the geology and history along the Montour Trail. The trip, which will be led by Albert Kollar, is being offered on Saturday, May 9, 2009.

The Montour Trail is a 46-mile multi-use, non-motorized, recreational rail-trail that extends 10 miles west and 15 miles south of Pittsburgh running from Coraopolis to Clairton, Allegheny County, Pennsylvania. The Montour Railroad (1877 – 1984) owned and operated the line through the mid-1970s for the sole purpose of coal transportation.

The PGS field trip will cover a 30-mile section from Moon Township, near Coraopolis, to the Greer Tunnel, near Hendersonville, Washington County. Participants will travel by vans and visit ten stops to examine rocks deposited during the Earth's greatest Phanerozoic ice ages in the late Carboniferous (Pennsylvanian-age Conemaugh and Monongahela Groups) through early Permian (Dunkard Group), and Pleistocene where the Carmichaels Formation forms stream terraces. Along the trail we will visit the Enlow, National, and Greer Tunnels, visit the location where a former Pitt geology student discovered a now-famous Pennsylvanian amphibian skull, see evidence of the great McDonald oil field, and see reclaimed strip mines in the Pittsburgh Coal and brownfield sites.

Details regarding registration, fees, and meeting location have yet to be arranged. This is sure to be a fascinating trip, so stay tuned for updates in future emails and newsletters.

CALL FOR NOMINEES

PGS is calling on the membership for interested candidates for next year's officer and director-at-large positions.

There are three director-at-large positions that need to be filled. These positions are for a term of two years and require regular attendance at the board meetings held one hour prior to the social hour of each monthly society meeting. The position requires that you become involved at some level in the monthly operations of the society by aiding the officers and committees in various ongoing projects.

If you are an active member of the society and have an interest in being a candidate, or know of a member that you think would be a good candidate, please inform **Ray Follador**, Nominations and Elections Committee Chair, ASAP at geodawg@comcast.net or (724) 744-0399. A list of all candidates will be announced at the April meeting with the election to be held at the May meeting.

ORIGINS OF WESTERN PA PLACE NAMES

Bakerstown, a small community in northern Allegheny County, is named for Thomas Baker from Nova Scotia. Baker bought two lots of Depreciation Lands (land given to Revolutionary War Veterans in payment for their services) at the crossroads of the Packsaddle Trail (now Bakerstown Road) and the Venango Trail (now PA Route 8) around 1810. One of the early buildings in Bakerstown, the Hull House, was a "station" on the "Underground Railroad." Bakerstown gave its name to the Upper and Lower Bakerstown coal seams near the top of the Glenshaw Formation of the Conemaugh Group. In certain localities around western Pennsylvania these seams are considered economically mineable.

7th ANNUAL STUDENT NIGHT CALL FOR ABSTRACTS!

Students are invited to submit abstracts of a Senior Research Project, Senior Design Project, Master's or PhD Thesis for presentation at the Seventh Annual Student Night joint meeting of the Association of Engineering Geologists, the Pittsburgh Geological Society, and the Geotechnical Group of the Pittsburgh Section of

the American Society of Civil Engineers. Abstracts relating to subjects such as geology, engineering geology, geotechnical or environmental engineering, hydrology, and hydrogeology are welcome.

Three students will be selected to give 15 minute oral presentations and receive \$100 awards. The remainder of students will be invited to present posters summarizing their research work. The top three selected students presenting posters will each receive \$50 awards. All students who present their research, either verbally or orally, will receive a one year membership into PGS, a special award certification, and dinner that evening.

Abstracts submitted must be 350 words or less. Due date for submittal is Friday, March 6, 2009. Notification will be given to the selected speakers by March 13, 2009. Submit abstracts via email to barnerwl@cdm.com and cc: magrosspgs@verizon.net. If you have any questions or wish to submit your abstract by mail please call Wendell Barner at 412-208-2409.

The meeting will be held at 6:00 p.m., Wednesday, April 15, 2009 at Foster's Restaurant, Foster Plaza Bldg. 10, Green Tree, PA

DID YOU KNOW . . . ?

- A team of researchers from Kingston University in London has found high levels of metals, such as lead, chromium, and manganese, in wine from France, Germany, and Spain.
- In areas of gently dipping rocks, such as in western PA, surface features such as joints can often be correlated with preferred hydraulic fracturing directions in shallow wells.
- More than 95 percent of Earth's freshwater occurs in subterranean aquifers.
- If you're worried about global warming, stop eating mushrooms! Researchers say that mushrooms growing in northern hemisphere forests are helping to slow climate change.

PGS Website of the Month

For the skeptics among us:
<http://www.paulmacrae.com/?p=62>

PGS Board-of Directors

President:	Mike Forth	Director-at Large:	Bob Fedinetz	Director-at Large:	Richard Ruffolo
Vice President:	Mary Ann Gross	Director-at Large:	Ray Follador	Counselor:	John Harper
Treasurer:	Steve McGuire	Director-at Large:	Bill Gould	Counselor:	Mary Robison
Secretary:	Erica Love	Director-at Large:	Barbara Hamel	Counselor:	Charles Shultz
Past President:	Patrick Burkhart	Director-at Large:	Mary McGuire		

Other PGS Positions

AAPG Delegate:	Dan Billman	Webmaster:	Mary McGuire	Historian:	Judy Neelan
Newsletter Editor:	Robert Burger				

Memberships: For information about memberships, please write PGS Membership Chair, PO Box 58172, Pittsburgh PA 15209, call John Harper at (412) 442-4230, or e-mail jharper@state.pa.us. Membership information may also be found at our website: www.pittsburghgeologicalsociety.org.

Programs: If you would like to make a presentation at a PGS meeting, please contact Mary Ann Gross, Program Chairman at (412) 721-3499 or email at magrosspgs1@verizon.net.

News items: To submit a news item in the PGS Newsletter, please contact Robert Burger at (724) 818-5659, mail at 1885 Redcoach Road, Allison Park, PA 15101, or email at r.burger@verizon.net. Be sure to also send an email address and phone number where you may be contacted.

PGS CORPORATE SPONSORS

ABARTA Oil & Gas Co., Inc.

ACA Engineering, Inc.

The Baron Group, Inc.

Billman Geologic Consultants, Inc.

Civil & Environmental Consultants, Inc.

DC Energy Consultants

Dorso, LP

East Resources, Inc.

Gannett Fleming, Inc.

Hotwell Services, Inc.

Howard Concrete Pumping Company, Inc.

Pennsylvania Drilling Co.

Pennsylvania Soil and Rock, Inc.

Shaw Environmental & Infrastructure, Inc.

URS Corporation

PITTSBURGH GEOLOGICAL SOCIETY
PO Box 58172
Pittsburgh PA 15209