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ON THE COVER - The Mosquito River area of the Pictured Rocks National Lakeshore is an outcrop of medium grained quartz sandstone comprising the Chapel Rock Member of the Late Cambrian Munising Formation. The sandstones that make up the outcrops at Pictured Rocks were formed during the Cambrian and early Ordovician periods as sediments were shed off a regional range of mountains and deposited in the shallow seas and near-shore deltas that covered what is now northern Michigan. These formations were exposed by Quaternary glaciation and shaped by erosion as Lake Superior elevation has fluctuated over the millenia. Minerals dissolved in groundwater seeping through the outcrops creates the colors observed throughout the lakeshore – red and orange are copper, green and blue are iron, black is manganese, and white is lime. Photo by Karen Wallis from Lake Superior.
Autumn — and the Conference Season Begins — Introduce yourself to me in Traverse City at the 2007 AIPG Annual Conference

Gail G. Gibson, CPG-09993, Florida Community College at Jacksonville
1154 Morgan Circle E.
Orange Park, FL 32073
ggibson@fccj.edu

It always seems that about the time school begins in the Fall, my e-mail inbox and my snail mail Dropbox begin burgeoning with reminders (and reminders of the reminders) of upcoming regional and annual conference schedules for the professional organizations of which I am a member, and from affiliated organizations, of which I am not a member. In thinking back over the years that I have been attending such conferences there have been many highlights, including; technical information from presentations, differing points of view from panel discussions, an illustration from a poster session, the joy of field excursions (a Colorado River Raft Trip), meeting and sharing information with folks with common interests (resulted in inclusion of Earth Science as a high school science requirement in North Carolina), making new friends and contacts, and realizing just how easy it is to allow myself to become physically and intellectually isolated from the rest of my profession.

For example, years ago I attended a conference, where Australian geologists displayed examples of Late Precambrian Ediacaran body fossils. The comments I heard from North American geologists viewing these specimens at that conference included such things as; ‘everybody knows that there are no body fossils in the Precambrian’ or ‘these things are not fossils’ or ‘these people have no idea where they are in the stratigraphic section.’ Being young, and of course knowing everything, I asked myself ‘why not body fossils in the Precambrian’ or ‘these things are not body fossils in the Precambrian?’ This question sprung from a comment Edmund M. Spieker, whose field experience included mapping the Mesozoic-Cenozoic sedimentary section in southern Utah in the 1920’s, made to a group of new graduate students -- “If you want to find an unconformity, think unconformity.” Many years later, a colleague and I published (Gibson and Teeter, 1984) an article on Ediacaran fossils collected from the Carolina Slate Belt in south-central North Carolina, a three thousand meter volcanosedimentary section that was generally thought to be devoid of fossils. After all, why not body fossils in the Precambrian?

A geologist I met in 1960 on a conference field trip has been a close friend since that time. Our career paths have crossed and re-crossed, displayed many similarities, and like many close friends we do not see each other but every three to four years. How, many friends do you have who you see only at professional meetings? However, we talk often about geological situations we are working on, about students we have both taught, and about articles, texts, etc. we have written or are working on. I talked with him about the idea I was working on for the Editor’s Corner, and his comment was, “Remember how often we were reminded to be active members of professional organizations, and how often someone would ask if we would be attending some conference.” “So remind your membership,” he said, “of the value of learning something new, listening to a different perspective on a subject, meeting folks with similar interests and concerns, making new friends, and interacting with others in the profession.”

That is really the purpose of these comments — to remind ourselves of the obvious and not so obvious rewards of being active members of professional organizations like AIPG, of setting aside the time to attend conferences like the 2007 AIPG Annual Conference, to be held in Traverse City, Michigan, the week of 8-10 October, 2007 with both pre- and post-conference field excursions, to learn something new, and of course to make new friendships and renew old acquaintances.

So, I look forward to seeing you in Traverse City, and to meeting you at the 2007 AIPG Conference.
On behalf of the Michigan Section of AIPG and the 2007 Annual Meeting Planning Committee, I invite you to join us at one of Michigan’s top travel destinations for this year’s Annual Meeting. Traverse City offers many opportunities for fun and relaxation in addition to business. The newly renovated Park Place Hotel in Traverse City will provide a venue for a meeting that we hope will be long remembered. The Park Place Hotel has free, high-speed wireless internet available.

Traverse City is Michigan’s cherry capital, and has something for everyone. The downtown area contains numerous specialty shops and restaurants within walking distance of the Park Place Hotel. The Dennos Museum, which will be the location of one of the evening events, houses one of the largest and most historically complete collections of Inuit art of the Canadian Arctic in the United States. Numerous casinos and wineries are within a short drive of Traverse City. Interlochen Center for the Arts and Sleeping Bear Dunes National Lakeshore are also nearby. Miles of hiking and biking trails and three trout streams are also in the area. Golf Digest rated Traverse City as #12 in its list of the world’s top 50 golf destinations!

The theme for this year’s meeting, Geology: The Foundation for the Environment and Resources, will underscore the role of geology in our everyday lives. The program includes field trips to Northern Michigan’s Marquette Iron District, Mackinac Island, Sleeping Bear Sand Dunes, and local quarries. Several short courses will be offered, including the Geology of Michigan, Low-Flow Groundwater Sampling Techniques, Mining Issues in Northern Michigan, and Ethics in Geology. Social events include trips to several wineries near Traverse City, an evening at the Dennos Museum, the awards reception, and a golf outing.

The meeting will be held during the peak of the fall color season in Traverse City, and the field trips and social events will provide plenty of opportunity to see the incredible color of northern Lower Michigan. I hope that you plan to join us in Traverse City in October for a great meeting.

Adam Heft, CPG-10265
Chair, AIPG 44th Annual Meeting
California Section

For the past seven years, the California Section of AIGP has judged the State Science Fair awards at California Science Center, which is located within Exposition Park adjacent to the University of Southern California campus in Los Angeles. The judging was held on May 22, 2007.

On behalf of the California Council of Geoscience Organizations (CCGO), AIGP California Section Vice President David Sadoff, CPG-09933, presented Tierney R. Burke, with the CCGO/AIGP Senior Division award. The title of her presentation was Shear Wave Velocity Determined by Refraction Microtremor Surveys in the Oxnard Plain to Assess Earthquake Risk. Ms. Burke evaluated the variation of geologic materials near the Earth’s surface and determined that these materials can have a significant effect on ground motions from earthquakes. Shear-wave velocity (Vs) was evaluated as an appropriate measure of rock or soil conditions for ground motion calculations because it directly affects ground motion amplification. The refraction microtremor (ReMi) method was used in this study to determine shearwave velocity to evaluate ground motion hazard in the Oxnard Plain.

Refraction microtremor (ReMi) ambient noise recordings made on 140-m-long lines of standard refraction equipment were used to determine 30 meter (100 ft) average shear wave velocities and one-dimensional shear wave profiles down to depths of 100 meters. SeisOptReMi software allowed wavefield transformation data processing. ReMi processing involved: 1) velocity spectral analysis, 2) Rayleigh phase-velocity dispersion picking, 3) shearwave velocity modeling. Measurements were compared with UBC/IBC site classifications and downhole measurements by USGS. A shear wave velocity contour map of the site area was prepared to analyze area variation.

Fifty three field test measurements in this study produced shear-wave velocities between 180 and 360 m/sec which classified in the Uniform Building Code (UBC/IBC) class D group. Refraction microtremor method surveys throughout the Oxnard Plain showed shear velocity decrease as one moves in a southwestward direction away from the mountains. A higher velocity zone was identified along the course of the Santa Clara River, and a lower velocity zone along the slow-moving Calleaguas Creek on the eastern side of Camarillo.

According to Ms. Burke, the dense population and active tectonics of southern California necessitate extensive seismic hazard evaluations that include precise earthquake location determinations, path, and site effect studies. Seismic refraction method is well suited for general site investigations for soil dynamics and earthquake engineering purposes. ReMi surveys performed in this study provided a more extensive assessment of shear-wave velocities in the Oxnard Plain than previously reported. Noninvasive refraction microtremor surveys of shear-wave velocities in the Oxnard Plain compared with downhole velocity measurements, and surface map predictions of ground motion hazard.

Ms. Burke will be attending the University of California at Davis this fall.

For the Junior Division award at the California State Science Fair, Ms. Aradhana Sinha evaluated the absorption of pollutants in different soil types. She was awarded the CCGO/AIGP Junior Division Award. The purpose of this experiment was to determine which type of soil was the most absorbant of which kind of pollutants. The information gained from this experiment might be of interest to farmers, gardeners and botanists who deal with soil pollution problems, to better understand the effects of absorbanicy with different porosities of soil and with different viscosities of pollutants. In her experiment, she placed 200g of each type of soil and 100ml of each type of pollutant in separate cups. She waited until the soil was completely saturated and then she put the saturated soil on a filter for 15 minutes. She measured the residual pollutant by measuring the amount that was not absorbed. What Ms. Sinha discovered was that sand, the most porous soil, had absorbed the greatest amount of pollutants. Clay loam, the second most porous soil, had absorbed the second greatest amount of pollutants. Clay, the least porous soil, had absorbed the least amount of pollutant. Sand absorbed gasoline (the least viscous pollutant in the experiment) the most. It absorbed olive oil (the second least viscous pollutant in the experiment) the second most. Clay absorbed oil soap (the most viscous pollutant in the experiment) the least. Silt clay loam and clay absorbed oil soap the most, followed by olive oil and gasoline. Ms. Sinha’s conclusion was that the most porous soil absorbs the greatest amount of pollutants. In addition, she determined that the more viscous pollutants get absorbed more than less viscous pollutants. Clay absorbed oil soap the most, followed by olive oil and gasoline. She noted that using volatile fluids like gasoline evaporates and hence may create erroneous results. She also noted that an increase in the absorption time could have improved results.

The California Section of AIGP supports these awards, which consist of $250 for each winner. Both Dave Sadoff,
and Paul Enriquez are geologists who work at AIG Consultants and they donated their day to judge the Science Fair exhibits. Encouraging the youngest generation in earth science has been an important goal of this awards program.

James A. Jacobs, CPG-07760

Dear David Sadoff,

I am honored that the American Institute of Professional Geologists selected my project to receive an award at the 2007 California State Science Fair. I enjoyed the opportunity to meet with professional scientists.

Thank you for the monetary award and recognition. It will be helpful as I further my education at UC Davis. Please extend my thanks to the entire organization.

Sincerely,
Tierney Burke

Colorado Section

The following two pictures are a 15-second time-exposure of fluorescent minerals illuminated by an ultraviolet (“black”) light. Taken during the 2006 Forum on the Geology of Industrial Minerals field trip to the Spruce Pine Mining District, sponsored by the North Carolina Geological Survey. Photographs by Jim Reed.

On July 21, 2007, fifteen members and guests of the Colorado Section of the AIPG met in Central City, Colorado for a field trip visiting two historic gold mines in the Colorado Front Range. Access and an insightful tour of the “Glory Hole” were provided by Mr. Wallie Robinson, proprietor of the Grubstaker’s Colorado Gold Rush Store in Central City who represents several of the mine owners. Wallie provided a colorful history of the claims in and around Central City. The “Glory Hole”, was originally known as “The Patch”, based on 18 mining claims purchased by a dentist, William M. Muchow seeking gold for use in his dental practice. It was later referred to as the “Glory Hole” because of the mining technique of blasting the surface and wall rock allowing the ore to fall down to underlying tunnels where it was hauled to mills. During production the Glory Hole was about a 1,000 feet long, several hundred feet wide and 840 feet deep. Ore was blasted and dropped to the LaCrosse Tunnel at the 300 ft level; the Quartz Hill Tunnel at the 1,000 ft level; and to the Argo Tunnel at the 1,600 ft level which led to the Argo Mill in Idaho Springs four miles away.

Granite gneiss is the primary wall rock at the Glory Hole. The granite was intruded by a bostonite porphyry which created a fault block controlled breccia which was subsequently mineralized with disseminated sulfides resulting in a galena-sphalerite ore type. Lots of ore samples and crystals were gathered by field trip participants.

After lunch the field trip traveled through Black Hawk and north on the Peak-to-Peak highway to Nederland and on towards Caribou, stopping at Calais Resources Cross Mine. Here geologist-prospector-entrepreneur-extraordinaire, Tom Hendricks gave us a wonderful description of the history and mineralization of the Caribou Consolidated District and an underground tour of portions of the Cross Mine. Tom Hendricks is the epitome of perseverance and over the last 37 years he has worked, bought, sold, and ultimately consolidated the 3.5 square miles of precious metals gold and silver claims in the historic Caribou District. This area is the northeast extension of the Colorado Mineral Belt and consists of Precambrian metamorphics intruded by several phases of Tertiary monzonitic rocks. Northeast striking veins which parallel the mineral belt cut east-west veins. These vein systems are hypothesized to be the conduits for mesothermal silver, lead, zinc, and copper mineralization which later underwent a gold phase mineralization.

The underground tour was a bit wet, but enjoyed by all. Tom Hendricks was a wonderful host and guide and inspiring to all. This day long driving trip was
full of wonderful Rocky Mountain views and diverse weather from rain and hail to baking sunshine. A few of us chose to debrief in a colorful Nederland establishment and all enjoyed and will long remember this field trip.

**Tom Cavanaugh, CPG-10493**

**Kentucky Section**

The 2007 KY-AIPG Spring Field Trip and Awards Banquet was held in May. The field trip went the lower paleozoic stratigraphy of the Maysville area with a tour of the Carmeuse Maysville Limestone Mine.

On the morning of May 12, participants at the 2007 KY-AIPG spring field trip gathered at the Blue Licks Battlefield State Resort Park. From there we proceeded to our first stop, a tour of the underground limestone mining operation at Carmeuse Lime in Maysville, Kentucky. After a brief introduction and safety class, we went down 900 feet to the mine operating level. No pictures were allowed to be taken in the mine. Once we came back to the surface, we toured the kilns that calcinate the limestone to lime. No pictures were allowed to be taken down in the mine.

The Carmeuse Maysville Operation mines a certain interface of the Upper Ordovician Camp Nelson Limestone just above the first white marker bed and below the contact with the Oregon Formation. This limestone meets their chemical requirements of calcium and magnesium ratio for calcining limestone to lime for various needs.

We examined large exposures of the upper half of the Kope Formation, the overlying Fairview, and much of the Grant Lake Formation. We were shown the depositional features and fossil assemblages associated with each.

Next we traveled to a location where the upper Kope Formation is exposed. Here the roadcut showed the preservation of synsedimentary deformation, which has been interpreted as seismites. The extremely deformed layers consist of plastically deformed ball-and-pillow blocks of laminated silt and fine calcarenite. In between these blocks were squeezed diapirs of clay called flame structures. Another interesting feature found on the deformed siltstones were deformed sole features and distorted burrow molds. It was suggested that the sea floor was firm enough to preserve these features, but the floor could behave plastically during deformation events.

The lime is then shipped up and down the Ohio River to a number of power plants that utilize sulfur-containing fossil fuels. The lime is used extensively in the flue-gas desulfurization process for control of sulfur dioxide emissions. The lime can efficiently remove 99 percent of the SO$_2$ while scrubbing flue gas from the high-sulfur fuel; it also produces gypsum of 99 percent purity, which is shipped off to wallboard processing plants. Unfortunately, we were not allowed to take pictures in the mine or of the calcining operation.

After the mine tour, we drove to Maysville for lunch by the Ohio River at Caproni’s, located on Rosemary Clooney Street. Maysville got its start in 1773 and was originally known as Limestone because of the name of the creek that ran by it. Maysville was an important port, exporting bourbon and tobacco for the whole region; it was also used for ferrying people up and down the Ohio River.

After lunch we met with Dr. Carlton Brett and his graduate students from the University of Cincinnati for some lower Paleozoic stratigraphy of the Maysville area.

That ended the day, and we returned to the Blue Licks Battlefield State Resort Park to get ready for the banquet and award presentations.

After we had eaten, Dan Phelps, MEM-0236, the Kentucky Section President, announced that Ken Fishel, CPG-04976, recipient of the Lifetime Achievement Award could not stay for the banquet, so his plaque had been presented to him in the parking lot.

The Geologist of the Year Award went to Daniel Carey for his work in creating county land-use maps addressing vari-
ous geological parameters and hazards for county planning commissions as well as for laypersons.

The first student award was presented to Wesley Smith, who attended Morehead State University. Wesley had worked with Professor Charles Mason, CPG-07465, on the Haughton-Mars Project in the Arctic. Wesley will be applying to graduate schools, where he plans to pursue a master’s degree in the oil and gas field.

Our speaker for the evening was Paul Tierney, Parks Program Service Supervisor. His presentation was on the history of the Blue Licks area. Throughout history, the salt springs (which no longer flow) have attracted prehistoric and contemporary animals, Indians, and pioneers. In the 19th century it was a resort for people seeking rejuvenation in the therapeutic waters. The spot where the resort sits is more widely known as the site of the last Revolutionary War battle in Kentucky, even though the Revolutionary War had ended ten months earlier. In 1782, British soldiers, Tories, and 300 Indians continued to wreak havoc on various outposts in the west. The dedicated enemy continued their assaults on in the east. One such occurrence was at Bryan’s Station. The Kentucky pioneers, already weakened in numbers because of sending recruits to help out in the east, decided to fight it out rather than surrender when they spotted the enemy. The enemy asked them to surrender, and when that was rebuffed, they made a couple of unsuccessful attacks. Since the enemy saw that scouts made it out successfully to get recruits, they changed their strategy. The enemy slowly retreated toward the northeast to the Licking River, to the Blue Licks Spring, following the buffalo trace and making their retreat traceable. Here is where geology played an unfortunate role for the pioneers. On the other side of the Licking River the land rose 100 feet above the river and made for a good post for the enemy to watch for the pioneers. The Licking River on either side of the buffalo trace cut steep banks, so the only crossable part of the river was the trace. Some of the leaders of the reinforcement pioneers mentioned that it seemed like a trap. They were called out for their lack of bravery and soon changed their minds to lead in the attack. Unfortunately, the Kentuckians were in fact led into a trap, and out-numbered, they suffered great losses, including Israel, one of Daniel Boone’s sons.

The Kentucky Section of the American Institute of Professional Geologists would like to thank the sponsors of this field trip and awards banquet for their generous contributions. The guidebook, “Lower Paleozoic Stratigraphy of the Maysville Area and a Limestone Mine Tour of the Carmeuse Operation in Maysville,” can be found on our Web site: www.professionalgeologist.org, then click on guidebooks.

The second student award went to Brian Thomas Scott, who attended the University of Kentucky. Brian has remained in the top of his class academically during his tenure at the University of Kentucky. In addition to being an outstanding student, Brian was a non-scholarship walk-on place kicker for the University of Kentucky Wildcat football team, which won the 2006 Music City Bowl. In the future, the University of Kentucky football recruiter will have to concentrate his recruitment efforts on geologists.

Tim Crumbie, CPG-10433, KY Section Past President, was presented with a plaque. His tireless dedication for the section was very much appreciated.

The Illinois/Indiana section Annual Meeting will be held on October 24, 2007 from 5:30 - 9:30 pm at The Morton Arboretum, 4100 Il. Rt. 53, Lisle, Illinois. There will be a guest speaker and this will be a great vendor and technology networking evening. Meeting contact David G. Pyles, CPG-07364, DavidP@KPRGInc.com.
MEMBERS IN THE NEWS

Bennett L. Bearden  
Selected as 2007 Outstanding Professor of the Year

AIPG member Bennett L. Bearden, CPG-07700, has been selected as an Outstanding Professor of the Year by the Birmingham School of Law graduating class of 2007.

Bearden is Director of the Petroleum Technology Transfer Council Eastern Gulf Region at the University of Alabama. He received the award at the school’s 92nd annual banquet held in Birmingham.

Bearden has served as an adjunct professor at the Birmingham School of Law since 1994 where he teaches water law, environmental law, trial advocacy, and equity. This is his sixth faculty honor and fifth consecutive teaching award. He received similar awards as one of the outstanding professors of the year in 1997, 2003, 2004, 2005, and 2006.

He is a member of the Alabama State Bar, Washington, D.C. Bar, and has been admitted to the Roll of Solicitors of the Supreme Court of England and Wales. He is a Licensed Professional Geologist in Alabama (No. 246). Bearden received his bachelor’s degree in geography (1980), bachelor’s degree in geology (1981) and master’s in geology (1984) from the University of Alabama. He is a 1992 graduate of the Birmingham School of Law, where he received his Juris Doctor (J.D.) degree ranked number one academically in his class. In 2006, he received his Master of Laws (LL. M.) degree (with honors) in commercial and corporate law from the University of London.

Dear Fellow Members,

Thank you all for your words of encouragement and a Special Thank You for the financial support that many of you provided and continue to provide! A quick update on my status. I am home, full time, now with full time (yes, that’s nights, too) help during the week and generally make it to the office at least part of two days a week. I am presently relearning the computer programs I was using and slowly remembering how to find oil and gas. Two of my major projects are just beginning to be drilled even though I sold them before my brain injury so I may yet be wealthy. But, probably not!

Susan M. Landon, CPG-04591

Stephen A. Sonnenberg, CPG-06201, has been named professor and Charles Boettcher Distinguished Chair in Petroleum Geology and Geological Engineering at the Colorado School of Mines, Golden, Colorado. Sonnenberg, a past AAPG president and previously a Denver independent.

The Association of American State Geologists (AASG) elected officers for the year 2007-2008 at their annual meeting held from June 9-13 in Key Largo, Florida. They are as follows:

- President: Chacko J. John, CPG-10044 (Louisiana)
- Past-President: Scott W. Tinker, CPG-10564 (Texas)
- President-Elect: Berry H. (Nick) Tew (Alabama)
- Vice-President: David R. Wunsch, MEM-0147 (New Hampshire)
- Secretary: Vicki S. McConnell, MEM-0649 (Oregon)
- Treasurer: Vince Matthews, MEM-0173 (Colorado)
- Editor: Karl W. Muessig, MEM-0264 (New Jersey)
- Historian: James C. Cobb, MEM-0141 (Kentucky)
- Statistician: Harvey Thorleifson, MEM-0854 (Minnesota)

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Dear Mr. McHome:

I grew up with the latest TPG. I happen to agree with and soot coming from China. plants, there will still be a lot of carbon emission controls on all of the power twentieth century. Even if they put strict nineteenth century and for most of the much as the United States did in the late 1970’s, at least. They would separate the asbestos with a blower system, so at times I went over there it looked like snow falling. They were interested mainly in the short fibers, so they would let me go into the mine and collect samples of the long fibers.

My uncle Earl Quinn had the job of stuffing asbestos into ships when he worked down at Todd Ship Yard in San Pedro during W.W.II. He used to tell how the asbestos came in burlap bags and how they scooped it out of the bags by hand and stuffed it into the areas of the ship that the military required its use. Since they were down inside the ship, they often used the full bags as a place to sit while they ate their lunch, rather than going top side. He also lived into his 90’s.

We used to put asbestos board behind our wood stoves and wall heaters. We just cut it to fit with a hand saw and had to drill it to nail it up, as drilling kept the board from cracking when it was nailed up. My grandfather was a plumber and used an asbestos wrap to put around the cast iron pipe to pour the lead caulking along horizontal pipelines. He kept a couple of these in his plumbing supplies, and I would play with them.

Dear Editor,

I fully support President Buchanan’s message regarding global warming.

What Andrew Koenigsberg, CPG-07973, failed to state is that the cause of the great die-off at the boundary of the Permian-Triassic periods has never been truly established. Some studies attribute this mass extinction to a mega impact similar to the one that caused the extinction of the dinosaurs. Other studies have shown that small extinctions were already taking place several million years before the boundary. Still other studies have suggested that the loss of viable oceanic habitat was the cause. Additionally, the Paleocene-Eocene warm period, which peaked at 55 million years ago and lasted until about 44 million years ago, occurred to a large extent as a result of better global ocean circulation which carried warm ocean currents to the Arctic.

Also, it seems that everyone on both sides of the global warming debate is forgetting about one important thing. Not all of the greenhouse gases are man made. Water vapor is very important in retaining heat globally. As the oceans warm and absorb energy, they give off more and more water vapor. Carbon dioxide may have served as the “match” that lit the global warming fire, but the evaporation of water vapor to the atmosphere is what is feeding the continuing warming, and will do so for the foreseeable future.

Another issue is the industrial growth of countries such as China. China’s economy must grow in order to remain stable - and eventually become a democracy. Except for local impacts, it almost doesn’t matter that one buys a hybrid car, changes all of their lights to fluorescent bulbs, and upgrades the energy efficiency of their homes. China must build many more power plants as fast and as cheaply as possible in order to provide power for its burgeoning cities, much as the United States did in the late nineteenth century and for most of the twentieth century. Even if they put strict emission controls on all of the power plants, there will still be a lot of carbon dioxide, nitrogen oxides, sulfur dioxide, and soot coming from China.

Raphael Ketani, CPG-09003 rvketani@gw.dec.state.ny.us

Dear Mr. McHome:

I enjoyed your article on asbestos in the latest TPG. I happen to agree with most of what you said. I grew up with my family around asbestos. One of my neighbors, Mr. Elmer E. Dunn, up here at Pinyon who prospected for asbestos and actually had a producing asbestos mine for a while. He lived to near 90. We used to go out with him and I had a nice collection of asbestos samples in my rock collection. I would get samples of long fiber asbestos from another mine near to his to sell to collectors and used the money to buy text books. The two brothers who ran that mine lived into their 80’s. They would separate the asbestos with a blower system, so at times I went over there it looked like snow falling. They were interested mainly in the short fibers, so they would let me go into the mine and collect samples of the long fibers.

My uncle Earl Quinn had the job of stuffing asbestos into ships when he worked down at Todd Ship Yard in San Pedro during W.W.II. He used to tell how the asbestos came in burlap bags and how they scooped it out of the bags by hand and stuffed it into the areas of the ship that the military required its use. Since they were down inside the ship, they often used the full bags as a place to sit while they ate their lunch, rather than going top side. He also lived into his 90’s.

We used to put asbestos board behind our wood stoves and wall heaters. We just cut it to fit with a hand saw and had to drill it to nail it up, as drilling kept the board from cracking when it was nailed up. My grandfather was a plumber and used an asbestos wrap to put around the cast iron pipe to pour the lead caulking along horizontal pipelines. He kept a couple of these in his plumbing supplies, and I would play with them.

I did petro’s for aggregate companies here in Southern California and some of the quarries along the base of the San Gabriel Mountains had Actinolite in their aggregate. This material was called a type of asbestos for a while, but was finally lifted off the ban list for asbestos. I have recently heard that it is to be, or has been, placed back on the list. We sent some samples out for fiber counts and some of them came back very high. The counts did not fit with the lithologic descriptions, so this high count was a problem. Additional analysis found that the lab used a binocular microscope and not a polarizing microscope and what they had counted were the cotton fibers from the sample bags. It is harder to get a poor test result removed than to get it verified, even when you can show it is an error.

I am not sure that this is what you were looking for, but I agree with you that asbestos has been given a bum wrap, even around New York City’s steam lines.

Respectfully submitted,
Harry M. Quinn MEM-0490 Geologist, Archaeologist, Paleontologist

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**Saturday, October 6, 2007**
- 7:00 am - 6:00 pm  Registration Booth Open
- 7:30 am - 5:30 pm  Mackinac Island Field Trip
- 3:00 pm - 6:00 pm  Hospitality Suite Open

**Sunday, October 7, 2007**
- 7:00 am - 6:00 pm  Registration Booth Open
- 7:00 am - 6:00 pm  Hospitality Suite Open
- 9:00 am - 4:00 pm  AIPG Executive Committee Meeting
- 12:30 pm - 4:30 pm  GTR Spa Package
- 5:00 pm - 9:00 pm  Icebreaker - Exhibit Area Open

**Monday, October 8, 2007**
- 7:00 am - 6:00 pm  Registration Booth Open
- 7:00 am - 6:00 pm  Hospitality Suite Open
- 7:00 am - 8:00 am  Speakers Breakfast
- 7:00 am - 8:00 am  Women in AIPG Breakfast
- 8:00 am - 9:30 am  Past Presidents Breakfast
- 8:00 am - 12:00 pm  Advisory Board Meeting
- 8:00 am - 5:00 pm  Exhibits Open
- 9:00 am - 12:00 pm  Technical Session I - Hydrogeology/Groundwater
- 9:00 am - 12:00 pm  Technical Session II - Oil & Gas
- 10:00 am - 4:30 pm  Old Mission Lighthouse and Winery Tour
- 12:00 pm - 1:30 pm  Foundation Lunch
- 1:00 pm - 4:00 pm  Technical Session III - Mining
- 1:00 pm - 4:00 pm  Joint Executive Committee Meeting
- 1:00 pm - 4:00 pm  Monitoring Groundwater Quality Using Low-Flow Sampling Techniques Short Course
- 1:00 pm - 5:00 pm  Student Interviews
- 6:00 pm - 9:00 pm  Evening at the Dennos Museum and the Keynote Address

**Tuesday, October 9, 2007**
- 7:00 am - 6:00 pm  Registration Booth Open
- 7:00 am - 6:00 pm  Hospitality Suite Open
- 7:00 am - 8:00 am  Speakers Breakfast
- 7:00 am - 8:30 am  Business Breakfast
- 7:30 am - 5:30 pm  Limestone Quarries and Fossil Collecting Field Trip
- 8:00 am - 12:00 pm  Exhibits Open
- 9:00 am - 12:00 pm  Technical Session IV - Ethics
- 9:00 am - 12:00 pm  Technical Session V - Legal/Conflict Management
- 9:00 am - 4:00 pm  Glacial Geology of Michigan Short Course
- 9:00 am - 4:00 pm  Leelanau Club Golf Scramble
- 10:00 am - 4:00 pm  Grass River Natural Area Tour
- 1:00 pm - 4:00 pm  Technical Session VI - Resource Exploration
- 1:00 pm - 5:00 pm  Student Interviews
- 6:00 pm - 9:00 pm  Awards Reception and Banquet

**Wednesday, October 10, 2007**
- 7:00 am - 6:00 pm  Registration Booth Open
- 7:00 am - 6:00 pm  Hospitality Suite Open
- 7:00 am - 8:00 am  Speakers Breakfast
- 7:30 am - 5:30 pm  Glacial Geology/Sleeping Bear Sand Dunes Field Trip
- 8:00 am - 5:00 pm  Practical Professional Ethics Short Course
- 8:00 am - 5:00 pm  Exploration for and Mining of Metals with Emphasis on Michigan’s Upper Peninsula Short Course
- 9:00 am - 12:00 pm  Technical Session VII - Geology: The Profession
- 9:00 am - 12:00 pm  Technical Session VIII - Contamination/Geochemistry
- 10:00 am - 5:30 pm  Leelanau Peninsula Winery Tour

**Thursday, October 11, 2007**
- 7:00 am - 6:00 pm  Hospitality Suite Open
- 7:00 am - Thursday - 5:30 pm Friday  Tilden/Empire Mine Two Day Field Trip
# 2007 NATIONAL AIPG MEETING REGISTRATION FORM

<table>
<thead>
<tr>
<th>NAME (Last)</th>
<th>(First)</th>
<th>(Middle Initial)</th>
<th>NAME FOR BADGE</th>
<th>Meeting Status</th>
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<tbody>
<tr>
<td></td>
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<td>Speaker</td>
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<td>Exhibitor</td>
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<td>Exec. Comm.</td>
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<td>COMPANY/INSTITUTION</td>
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<td>CPG or MEMBERSHIP NO.</td>
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<td>ADDRESS</td>
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<td></td>
<td>Membership</td>
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<td>CPG</td>
</tr>
<tr>
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<td>COUNTRY</td>
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<td>PHONE</td>
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<td>E-MAIL ADDRESS</td>
<td>Student</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td>Past President</td>
</tr>
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### **SPOUSE/GUEST NAME**

NAME FOR BADGE

*Spouse/Guest Registration includes admission to Icebreaker and Exhibits*

## FEES AND PAYMENT INFORMATION

<table>
<thead>
<tr>
<th>ANNUAL MEETING REGISTRATION</th>
<th>On or Before - 08/01/07</th>
<th>After 08/01/07</th>
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<td>Daily Registration (Member*)</td>
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<tr>
<td>Student** (Full Registration)</td>
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<tr>
<td>Daily Student Registration** Spec. Day(s)</td>
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<td>$20.00</td>
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*AIPG Members Only  **Student Confirmation Required  ***Registration Required

### FIELD TRIPS

<table>
<thead>
<tr>
<th>Field Trip Description</th>
<th>Before 8-1/After</th>
<th>No. Attending</th>
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<tr>
<td>Mackinac Island</td>
<td>$100.00/$110.00</td>
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<td>Limestone/Fossil Quarries, Charlevoix</td>
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<tr>
<td>Sleeping Bear Dunes</td>
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<td>Tilden/Empire Mine, Palmer</td>
<td>$200.00/$225.00</td>
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### SHORT COURSES

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<tr>
<td>Geology and Natural Resources in MI Basin</td>
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<tr>
<td>Low-Flow Purging and Sampling</td>
<td>$70.00/$85.00</td>
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<tr>
<td>Glacial Geology Michigan: New Insights and Interpretations</td>
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<td>Practical Professional Ethics</td>
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<tr>
<td>Exploring/mining metals in MI Upper Peninsula</td>
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### SOCIAL EVENTS

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<th>Unit Cost</th>
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<tr>
<td>Spa Package at Grand Traverse</td>
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<tr>
<td>Women in AIPG Breakfast</td>
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<tr>
<td>Old Mission Lighthouse and Winery Tour</td>
<td>$50.00/$60.00</td>
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<tr>
<td>Social Banquet at Dennos Museum</td>
<td>$65.00/$75.00</td>
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</table>
### Leelanau Golf Scramble (Tuesday, October 9)
$45.00/$55.00

### Grass River Natural Area and Fall Color Viewing (Tuesday, October 9)
$25.00/$35.00

### Awards Reception and Banquet (Tuesday, October 9)
$80.00/$70.00

### Leelanau Peninsula Winery Tour (Wednesday, October 10)
$50.00/$60.00

### Take a Student to Dinner
$80.00/$60.00

### Ice Breaker (Sunday, October 7) (Must Show Badge)
Complimentary

### Speakers/Moderators Breakfast (Monday, Tuesday, or Wednesday, please specify)
Complimentary

### Business Breakfast (Tuesday, October 9)
Complimentary

### Foundation Trustees Lunch (Monday, October 8)
Invitation Only

### Past-Presidents Breakfast (Monday, October 8)
Invitation Only

### TOTAL AMOUNT DUE

<table>
<thead>
<tr>
<th>National and Sectional Meetings</th>
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<tr>
<td>National Executive Committee Meeting (Sunday, Oct. 7)</td>
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<tr>
<td>2007 Advisory Board Meeting (Monday, Oct. 8)</td>
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<tr>
<td>2007/2008 Advisory Board Meeting (Monday, Oct. 8)</td>
<td>yes / no</td>
</tr>
<tr>
<td>2007-2008 Joint Executive Committee Meeting (Monday, Oct. 8)</td>
<td>yes / no</td>
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</table>

**Notes**
- The Field Trips and Short Courses are subject to cancellation due to lack of participation. Minimum numbers of participants must be reached by August 31, 2007.
- Registration fees for cancelled events will be refunded to registered attendees.
- Full Registration includes Ice Breaker, Technical Sessions, Exhibits, Business Breakfast Meeting, Student Posters, Coffee Breaks, and Registration Package.
- CEU Credits Available.
- Please indicate if you have any special dietary requirements.

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**SPECIAL NEEDS/REQUESTS:**

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**METHOD OF PAYMENT**

TOTAL AMOUNT DUE: $__________

**PLEASE CHECK METHOD OF PAYMENT**

- [ ] Check No._________ Enclosed (drawn in U.S. Dollars on a bank located in the US or Canada.)
- [ ] International Postal Money Order
- [ ] VISA  [ ] MasterCard  [ ] American Express *(Credit cards are processed in US dollar amounts only.)*

Card No. ____________________________ Expiration Date _________

Print name of cardholder:________________________________________

REQUIRED: Credit Card Billing Address (street, city, state, and zip):

_________________________________________________________________

_________________________________________________________________

Authorized Signature__________________________________________

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Mail to:
American Institute of Professional Geologists
1400 W. 122nd Avenue, Suite 250
Westminster, CO 80234

or fax to (303) 253-9226 or register on-line at www.aipg.org

National AIPG Phone Number Is (303)412-6205
In Memory

William G. Wellendorf “Bill”, CPG-06625, was born July 15, 1950, in Youngstown, Ohio, to parents, Lester G. “Bud” and Glydene Wellendorf.

He passed away peacefully June 17, 2007.

Bill is survived by his loving wife, Colette, and his sister, Carol (Nelson) Werkema, of Grand Rapids, Michigan and his nephews, Bret William (Julie) Asper and Benjamin Lee (Chris) Asper.

He graduated from Indiana University (1977) and Arizona State, where he received his master’s degree in geology in 1979, and was a registered Geologist. He was also a veteran of the United States Navy.

He was a former AIPG Arizona Section President, Past Master of Aztlan Masonic Lodge #1 and member of the American Legion Post 6.

He was preceded in death by his mother and father and his first wife, Cathy Schulten.

As a senior associate and primary geologist, he retired from Southwest Groundwater Consultants, where his focus areas were in surface mapping, remote sensing and environmental and geologic characteristics. He shared his expertise with many.

We will miss his laughter, his compassion, and enduring love of life. He will be missed by all who knew him on a personal and business level.

IN MEMORY

John Walker Parker
MEM-1170
Member Since 1/1/2007
Brooksville, Florida

William G. Wellendorf
CPG-06625
Member Since 1984
June 17, 2007
Prescott, Arizona

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Florida Phosphate: Sustaining Success

Wednesday, October 10 and Thursday October 11, 2007

Lakeland Civic Center - Lakeland, Florida

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A Review of

On the Trail of the Ice Age Floods,
A Geological Field Guide to the Mid-Columbia Basin

Reviewed by James G. Bush, CPG-07715

Review

In 2006, Bruce Bjornstad published the book entitled On the Trail of the Ice Age Floods, a Geological Field Guide to the Mid-Columbia Basin. This book provides an excellent summary of the geologic evidence for what V. R. Baker has termed “the most spectacular event to occur during the Pleistocene on our planet” (Baker and Nummedal, 1978). Furthermore, it brings attention to one of the most intensely debated and notorious examples of how the dedication to academic dogma can delay scientific progress and corrupt teaching. By this, I am referring to the famous, if not infamous, debate between the catastrophists and the uniformitarianists surrounding the theories put forth by J Harlen Bretz on the cataclysmic flooding of the northern Pacific regions of the United States (see commentary section).

I work at the DOE's Pacific Northwest National Laboratory and Bjornstad works in a different organization at the same facility. Most of the work completed here is done under the auspices of the Department of Energy But not this book. Bjornstad wrote this book on his own time at his own expense.

Bjornstad has organized the field guide into two parts. Part I consists of 132 pages of geological background and description of four flood-related regions, breaking each region into numerous sub-areas for which he provides descriptions of specific features and geologic exposures. A one-page tribute to J Harlen Bretz is also provided.

Part II consists of 131 pages describing nearly 30 trails, 5 road tours, and 2 aerial tours. The trail descriptions identify important views, exposures and other highlights. A header for each trail provides length, change in elevation, and difficulty. Occasional safety notes are provided in the descriptions. Part II is a valuable departure from previous work, such as Allen and Burns (1986) that provides discussion of key exposures or other features as examples of evidence considered by Bretz or other researchers, but do not provide the information in the order in which it is encountered in the field. This improvement allows one to very efficiently devise a field trip or student research project.

The book is closed with a glossary, selected references (separated as technical and non-technical) and an Appendix listing potential supporting organizations for additional information or access. He has even provided a mileage chart at the end.

Bjornstad has provided us with an excellent key to the remaining evidence of the glacial outbursts of Lake Missoula. Lake Missoula is a glacial lake formed by ice dams created during Pleistocene. Estimates are from 40 to upwards of 100 cataclysmic floods ripped the Columbia Basin resulting from catastrophic failures of the ice dams during the last glacial cycle (late Wisconsin) alone. Many other glacial cycles preceded the last. These were no small events, in that approximately 3,000 square miles were flooded and swept clean of loess cover. Flood volumes are estimated to be equivalent of 10 times the combined flow of all the present day rivers. The size and scope of these events is amazing, but even more amazing is the fact that it required roughly 40 years of acrimonious debate amongst some of the most distinguished geologic researchers of that time to reach agreement that they in fact did happen.

Bjornstad’s actions have led to more than this book. Starting in January of 2005, legislation has been introduced to formally recognize this collection of geologic observations as a first-of-its-kind National Geologic Trail (see end of commentary). Hopefully all of us will be eventually successful in that very noble and proper endeavor.

Commentary

Rarely could there be a topic more fitting for TPG than the scientific controversy over the subject matter of Bjornstad’s book. In the case of Bretz, this debate dominated his career from as early as 1920 to the 1960’s, and affected him in isolated cases to as late as 1971 – the year Richard Foster Flint finally yielded one sentence to Bretz’s credit (Allen and Burns, 1986). The scientific process that imprisoned Bretz’s ideas lasted 40 years. Today, Bretz’s ideas are being used to explain geomorphology not only here on earth, but to large degrees on the other planets of our solar system. It is not too difficult a leap to say the features on Mars or anticipated on Venus or the moons of Jupiter could have been explained – or at least had a reasonable hypothesis put forth - 20 years earlier had the earth-science community been more disciplined in addressing Bretz’s ideas.

The history of scientific research is punctuated by numerous examples of conflicts of interest, and ego outweighing scientific integrity, and geology is not without its excellent examples. Consider three:

Geomagnetic reversals and seafloor spreading. The Canadian geologist, Dr. L.W. Morley proposed geomagnetic reversals and their relationship to seafloor spreading before Vine and Mathews. He is not credited because his initial paper was rejected in both the USA and
Britain. His subject was described by one anonymous reviewer for the prestigious Journal of Geophysical Research, as, “…this is the kind of idea that is talked about at cocktail parties but not published in serious scientific journals.” (Horsfield and Stone, 1972). Morley, a former student of Prof. J. Tuzo Wilson, presented his ideas orally on June 4, 1963, before the Royal Society of Canada, in Quebec. Three months later, Vine and Mathews, to whom the credit for discovery has largely gone, published.

Global Climate Change. More recently Chris de Freitas’ excellent article entitled “Uncertainty in Science” (TPG, Jan, 2000) is another example of speaking out on a process that seemed to be tainted in that political goals, or the search for funding, seem to outweigh the obligation to be technically precise in the most important matter of global climate change. While now dated, his issues still stand. How do we deal with uncertainty in science when it comes time to set policy, make a political stand, or vie for funding?

Discovery of the Dinosaur. The farther back one looks, the more examples one finds. Perhaps one of the most notorious examples lies in the 1800’s, when Gideon Algernon Mantell made numerous discoveries, ultimately achieving possibly the largest paleontological collection in Britain. Left crippled and nearly helpless after a terrible accident, Mantell could do little more than watch as Richard Owen usurped Mantell’s due credit for the discovery of Iguanodon and other significant finds. Owen was relentless, renaming and taking credit for many of Mantell’s discoveries, and even discredited Mantell in Mantell’s obituary. Rarely do the text books tell this story (see Bryson, 2003).

But the aspect that distinguishes Bretz’s saga is that the numerous rejections of his theories of cataclysmic flooding occurred where evidence was available but repeatedly ignored. The rejection was based almost exclusively on allegiance to dogma and traditional thinking1. I’m sure many of us are now thinking of Wegener and continental drift.

The dilemma this brings forth is how to stimulate the best progress via competition and at the same time screen out untenable hypotheses without being closed to sound new ideas. Thesis and anti-thesis resolution through legitimate scientific debate is a healthy process, and forces us into clear and sound logic based on solid evidence. While easy to say, stepping up and giving every hypothesis its due, is difficult to implement.

On the other side of the argument, there seems to be something good that comes from competitive zeal. For example, the leap of faith taken by Watson and Crick, that brought us the double helix explanation of DNA, was stimulated by the competition between them and Linus Pauling and the threat of success destined to be the outcome of the meticulous research of Rosalind Franklin and Maurice Wilkins. Even more, Watson and Crick (and Wilkins) were less than candid, if not unethical, by not completely disclosing their use of Rosalind’s data without her knowledge or permission (Watson, 1968, Klug 1968, 1974), and subsequently to their further discredit by their failure to acknowledge her work in their Nobel Prize-winning paper of 1953. It is, however, likely that without these less than stellar tactics the discovery would have been delayed, or perhaps made by someone else. To Watson’s credit, his book (1968) was designed to not only describe how DNA was discovered, but, as he puts it, also to dispel some of the ignorance about how science is “done” and specifically to call out the “contradictory pulls of ambition and the sense of fair play.”

What are we to do? Are we to preserve ethics in our work at the expense of timeliness or progress? On the one hand competition brings about discovery and advancement likely at a more rapid pace, yet may stimulate behaviors that are not in line with the strong ethics we tout so vividly in school and organizations such as TPG.

What is the right answer, the one type of behavior, to which we should all subscribe? I doubt there is one simple answer. I think we have to do our best and manage each situation individually, and where the opportunity arises, make corrections for mistakes. Having said that, we now have the opportunity to make a correction, and that leads us to the next point of this discussion.

Bretz’s work, now famous and the subject of many undergraduate classrooms, faces a new opportunity. Bjornstad has done as much if not more in the last few years to bring attention to Bretz’s work than anyone else in recent times. Now we have an opportunity to legislate the preservation of Bretz’s work as an Ice Age Floods National Geologic Trail. The trail would extend over the affected four-state area of, Montana, Idaho, Washington, and Oregon. Such a trail has received strong bipartisan support and both branches of Congress have voted unanimously in favor of bills to establish an Ice Age Floods National Geologic Trail. Minor differences in the details of the legislation have yet to be worked out before moving out of Congress. This is an opportunity to help right the wrongs of history as well as augment undergraduate field courses. This would allow students not only to see the geologic evidence in the field but also learn about the progress of science and the pitfalls of dogma.

This is the chance to give Bretz’s legacy its due. I, along with Bruce Bjornstad, invite TPG and its following to embrace and support this action.


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1. Bretz himself may not have helped his situation as some believe his personality was very independent and rubbed a lot of his colleagues the wrong way, which made it easier for them to question his work.
Agricultural Strategies, edited by Joyce Marcus and Charles Stanish and published by Cotsen Institute of Archeology, University of California, Los Angeles in 2006, compiles an overly ambitious (for social scientists) and disappointing (for engineers and water managers) cross-disciplinary conference covering water management in the ancient Middle East, South Asia, Europe, Oceania, Mesoamerica, and South America. It provides an anthropological, archeological, and historical background to the 21st century debate over effective control and distribution of fresh water as the world reaches a projected population of 10 billion, greatly depleting the natural freshwater resource. I say natural because it is more than likely that future freshwater supplies will depend somewhat more on desalination technologies not available to our ancestors. Nonetheless, it is wise to understand how a wide range of subsistence indigenous water-supply systems endured over millennia, undergoing modifications to meet changing socioeconomic, climatic, and political conditions as many of them are employed today, such as draining off of excess water, diversion of rain runoff, floodwater and salinization control, soil erosion management, water storage, water harvesting, and irrigation. The 428-page book’s introduction and 15 chapters focus on Iraq’s Mesopotamian Plain, Southern Arabia and Yemen, South India, Scandinavia, Spain, Polynesia, Mexico, Peru, and Bolivia, and academic discussion of intensification and the political economy, in a manner more interesting to social scientists than engineers and water-resources managers. Figure 1 shows the layout of six century CE Mesopotamian irrigation systems; first century BCE Yemenite irrigation dam; 4000 BCE buried Yemenite terraced wall or check dam supporting ancient flood-runoff agriculture; Aztec ideographic place names incorporating the signs for water (atl), canal (apantli) or planted field (mlli); 1000 BCE Oaxaca runoff canal leading from a large water-storage cistern; and Aztec aqueduct and dike.
Questions:

1. The demise of the “productid brachiopods” is best related to the end of this geologic period:
   a) Devonian
   b) Cretaceous
   c) Permian

2. In the seismic method of exploration, consider two layers separated by a sharp contact. The upper layer has a thickness of 700 meters and a velocity of 3,000 meters per second. The underlying layer has a velocity of 6,000 meters per second. A seismic ray travels downward through the overlying layer at an angle of incidence of 25 degrees. At what angle will the ray travel in the underlying layer?
   a) 57.70 degrees
   b) 19.35 degrees
   c) 87.73 degrees

3. A discovery oil well has been drilled. The pay zone is 30 feet thick, the prospect area is estimated to cover 3,200 acres, the average porosity is 19% and the average water saturation is 35%. What is the “oil in place”?
   a) 56 MMBO
   b) 92 MMBO
   c) 156 MMBO

4. The author of the classic “Principles of Geology” which was first published in 1830 was:
   a) James Hutton
   b) William “Strata” Smith
   c) Charles Lyell

5. Which of the following sulfide minerals has a gray streak, cubic cleavage, hardness of about 2.5, high specific gravity and may be used in the manufacturing of auto batteries, ammunition, paint and in soldering?
   a) Cu₅FeS₄
   b) ZnS
   c) PbS

Answers on Page 35
Earl G. Hoover, CPG-02739

In recent months, newspapers such as the Washington Post, have featured articles on charitable contributions that were based on questionable appraisals or donation intent. Among the donated properties were both mineral leases and fee simple mineral properties. Mineral properties are usually donated to nationally and locally known conservation foundations in order to obtain federal, and in some instances, state tax deductions. Frequently however, these donations do not benefit the foundations as the mineral properties have little or no commercial value; (1) they cannot be legally or economically mined, (2) The minerals have no market potential, and (3) the property cannot be developed because of environmental restrictions. In addition, pressure from local and interested parties against the development of a mine or quarry on the property reduces its value.

Example of an Egregiously Leveraged Donation

The following is an example of a tax-deductible charitable donation of mineral property that shows the egregious leveraging of a basis of $50,000 to a donation of $10 million. In a transaction involving related entities, a land developer purchased approximately 1,500 acres of land for $1.35 million ($900 per acre) and the mineral rights to the property for $52,000 ($35 per acre). The land use is almost exclusively recreational and residential. There is no industrial development or manufacturing anywhere along the perimeters of the property. It seems that it was the intention of the developer to partition the land and sell residential building lots. It is highly unlikely that the developer ever intended to mine the minerals since one of the mineral interests was either too thin to mine economically or was mined-out; and the other, a construction rock, was not economically feasible to mine and probably not legally permitable because of its location near park land and residential developments. Nevertheless, a mine consultant was hired to evaluate the geology and minability of the deposits and conclude a value for the subject minerals.

Several academically qualified geologists and mining engineers with advanced degrees and practical professional experience wrote the consultant's report. However, they did not utilize accepted professional standards to measure the reserve, or determine the economic minability or show that there was a reasonable expectation of a market for construction rock from the property. Although there were no tests of the rock by the engineers and geologists, they concluded a minable reserve in excess of 100 million tons and proposed that an underground mine operating on two levels at a depth of 1,000 feet below the surface was economically feasible. This two-level mine was projected to produce 2.5 million tons of crushed rock per year.

The report on the purported mineral economic viability included numerous inconsistencies, omissions, inferences and wild hypotheses. Some of these included: (1) no consideration of the impact of three existing surface quarries within a 10-mile radius of the subject property that were nearer the principal market for construction rock; (2) did not weigh the remote and unique location; (3) allowed no added consideration for the transportation costs or whether the Department of Transportation would approve use of the low volume and low impact roads for the estimated 60 trucks (30 tons per truck) per hour from the property; (4) did not prove a “bankable” valuation of the property based on a measured geologic reserve, minability, and expectation of a market; (5) did not perform physical or chemical tests of the in situ rock; (6) did not measure any outcrops or do any drilling to confirm the presence and character of the deposit and overburden; (7) provided no realistic capital cost estimates for mine development and mine infrastructure; (8) did not use realistic product sales price and operating costs in the discounted cash flows; (9) did not present a credible market analysis for crushed stone from the property; and (10) used an unrealistic low real risk rate in the DCF. Finally the report provided geologic cross sections that were based on regional geologic maps.

The mine consultant concluded a value of $10 million. Subsequently, the developer offered the mineral rights as a charitable donation. In such a situation, if the donee perceives that the mineral rights donation has little value, a donation is requested, ostensibly to cover the cost of administration. In this case, the donor made a nominal donation and signed the mineral rights to the land trust.

Required Internal Revenue Service Reports

The Internal Revenue Service (IRS) classifies a donation of mineral rights as non-cash charitable contributions. Such contributions are reported on IRS Form 8283 along with an appraisal summary for deductions of more than $5,000, a description of the donated property, a brief summary of the overall physical condition at the time of the gift, the appraised fair market value, the date acquired by the donor, how the property was acquired, the cost or adjusted basis, the amount received if a bargain sale, and the amount claimed as a deduction. Form 8283 also requires an appraisal declaration and a donee acknowledgement as well as qualification under IRS Code section 170(c) and acknowledgement that it received the property described. IRS regulation section 1,117A-1c(2) provides that the fair market value is the price at which the property would change hands between
a willing buyer and a willing seller, neither being under any compulsion to sell or buy, and both having reasonable knowledge of relevant facts. If the contribution is made in property of a type that the taxpayer sells in the course of his business, the fair market value is the price that the taxpayer would have received if he had sold the contribution in the manner in which he would customarily sell at the time and place of the contribution.

**Evaluation and Valuation of the Donated Property**

A donation of this nature usually works to the advantage of all participants, including the public, when: the mineral property is evaluated and valued according to the recognized principles of a resource/reserve base; the property is potentially minable; and there is an expectation of a market for the mineral from the property. When an IRS tax examiner/auditor suspects a mineral property donation is overvalued, the issue is referred to an IRS engineer/geologist. The specialist reviews the appraisal report to ensure that standard principles of evaluation have been used in the evaluation. An important first step is to determine whether the report of mineral resource or reserves provides all relevant and material information necessary for an intelligent layman to make a reasonable and balanced assessment of the mineral resource or reserve being reported.

*A Guide for Reporting Exploration, Mineral Resources, and Mineral Reserves* published by the Board of Directors of the Society for Mining, Metallurgy and Exploration (SME) on March 1, 1999 defines a mineral resource as a “concentration or occurrence of material of intrinsic economic interest in or on the Earth’s crust (a deposit) in such form and quantity that there are reasonable prospects for eventual economic extraction, the location, quantity, geological characteristics and continuity of a mineral are known, estimated or interpreted from specific geological evidence and knowledge.”

Mineral resources are sub-divided in order of increasing geological confidence; inferred, indicated, and measured categories. Portions of a deposit that do not have reasonable prospects for eventual economic extraction must not be included in a mineral resource. On the other hand, a mineral reserve according to the SME Guide is the “economically minable part of a measured or indicated mineral resource. It includes diluting materials and allowances for losses which may occur when the mineral is mined, when appropriate assessments, which may include feasibility studies, have been carried out and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal environmental, social, and government factors.” These assessments demonstrate at the time of reporting that extraction is reasonably justified. Mineral reserves are further sub-divided in order of increasing confidence into probable mineral reserves, and proved mineral reserves.

Many of the mineral resource/reserve reports reviewed by IRS geologists/engineers reveal that the evaluations do not follow standard principles, such as the SME guidelines. In some cases, the evaluations do not include on-site verification of literature and general information provided by the donor. Most reports do not include any consideration of assumed mining, metallurgical, economic, marketing, legal, environmental, social and government factors. Most of the evaluations consist of volumetric calculations converted to tonnage with no consideration for a measured and proved reserve base. In most cases, a simple on-site visit would reveal that the subject property was depleted, the overburden too thick to allow for economic mining, was located in a residential area where public pressure against exploitation would be difficult to overcome, was in an environmentally sensitive area where getting a permit to mine would be impossible, and there was no market for the potential products because the market was adequately supplied by nearby competitive mining operations.

Mineral valuation is dependent upon a valid evaluation of the mineral property. Assuming the evaluation is proper, the next step is valuation using the comparable sales, cost and income approaches. Most egregiously leveraged donations are not based on the same standards that would be required for a fair market determination.

Robert H. Paschall wrote in *Appraisal of Construction Rocks, 2nd Edition*, American Institute of Professional Geologists, 1998, that if the deposit to be appraised is undeveloped and non-producing, that is, raw land, the sales comparison method is preferable. Sales comparison means the appraisal of a property by reference to sales of other properties that are comparable to it. The sales comparison method correctly applies to properties that are indeed similar and for which sales data are relatively abundant; e.g. homes, vacant land, farms, small commercial properties and so forth.

Paschall also addressed the discount rate. He noted that extensive empirical studies have revealed discount rates for natural resource companies ranging from 6 to 9 percentage points above the bond-interest rate that applies to the industry. His example supposes
the industry’s Baa Bond rate is 9.0 percent; therefore, the discount rates will typically fall in a range of 15 to 19 percent, plus the appropriate component for property taxes. Paschall notes that market-derived discount rates apply to corporations, not properties. However, the cited range can also be employed in judging the risks of different deposits of construction rocks, e.g. their location and quality of and market for their materials. Many egregiously leveraged valuations use risk rates that are unrealistically low – in the order of 6 to 9 percent – for deposits that have no proven reserves, or that have not been shown to be economically minable or likely to have a market. Many times the discounted cash flow they offer is merely a mathematical exercise totally devoid of reality.

**Conclusion**

When national papers publish abusive cases of non-cash tax deductible charitable donations, the public is usually outraged, and the Internal Revenue Service takes notice. When a review takes place, specialists utilize valuation methodology as well as the appropriate guidelines on geology, minability and marketability of mineral donations. If a case does not meet the IRS Code, it is referred for legal review.

Recently, a shortage of trained IRS audit personnel has led to decreased referrals of charitable donations for technical review. Because of this lack of oversight, there has been an increase in the number of cases that involve egregiously over-leveraged basis to donation value. This article has attempted to show how a charitable donation should be reported, and the review standards by which a decision is reached as to whether or not it is an egregiously leveraged donation.

Earl G. Hoover was employed by the Internal Revenue Service as a Valuation Engineer specializing in geology and mining since 1979. He retired in 2007. Prior to joining the government, he worked as a geologist and in mining management, related technical areas, and as adjunct faculty at Jacksonville University, Florida, and junior colleges in West Virginia, California, Georgia, and New York. Earl received his B.A. from West Virginia University and M.S. from George Washington University. The attached article was developed as one response to the question as to what a geologist would do at the I.R.S. Earl is a resident of Florida.
Forensic Geology

The mystery of the tragic failure of the 35W bridge in Minneapolis will be solved in time, and our prayers are with the families who suffered losses because of this catastrophe. It appears from preliminary reports that metal fatigue in the center span of the bridge could be the principal cause of collapse. Teams of dedicated public and private sector engineers are at work now, trying to identify the factors contributing to the failure. Because the bridge was essentially a metal structure, the concrete surface of the roadway does not appear to have contributed to this collapse, unlike last year’s disintegration of an elevated portion of freeway in Montreal. In that case, forensic geologists were called on to study the condition of the concrete at the time of collapse and how the condition of the concrete contributed to the collapse. There may be a need for forensic geologists later in Minneapolis, also, as the investigation continues.

Forensic geology takes many forms. I have read fascinating accounts of how geology is used in law enforcement. For example, John McPhee, in his book *Iron in the Fire*, describes how forensic geology was used to track down the killer of Adolph Coors III, by studying the mineral grains in the tires and underside of a vehicle. The FBI geologist who broke the case determined that the small grains of material present in the tires came from an area over 700 miles away from where the vehicle was found, thus placing it at the scene of the murder.

Although the number of geologists who practice in this branch of the science is not large, AIPG is fortunate to have some of those practicing forensic geologists as members and CPGs. Last fall at the St Paul AIPG meeting, I attended a very interesting short course on forensic geology given by Minnesota resident Scott Wolter, CPG-08260, whose firm American Petrographic Services, specializes in concrete. Scott also used his geological training to determine the age of the Kensington Rune Stone, a Viking relic dating back to c. 1362 A.D. Other members are in fields working with unsolved deaths and criminal investigations, similar to the work done by the FBI geologist described by McPhee above: John Lindemann, CPG-09943, co-founded the Colorado-based nonprofit firm NecroSearch International, which specializes in assisting law enforcement in the search for and recovery of human remains; and Robert Hayes, CPG-06035, through his Michigan-based GeoForensics, Inc., has been able to determine by geologic techniques how to show the timeframe in which a wetland was illegally drained and filled. Another member, Dr. Jeffrey Reid, CPG-07390, teaches forensic geology at North Carolina State University.

The scope of our profession never ceases to amaze me. Geologists who practice forensic geology certainly have fascinating careers and AIPG is fortunate to have several as members. A lawyer friend once told me that geology was the complete science: even if graduates of the subject do not pursue careers in the science itself, the grounding in geology complements any scientific career the student chooses to pursue.

Climate Change and Hurricanes

So far in the 2007 Hurricane Season through early August, we have had three named storms. You may recall that two years ago, we exhausted the alphabet of given names and had to resort to the Greek alphabet to name the last storms of the season. This year, the first named system, Andrea, appeared in May. Andrea was not a tropical storm; it was a so-called “extra-tropical” storm because it formed in the North Atlantic Ocean. Prior to 2002, storms like Andrea would have had only a number, not a name. The same goes for our third storm, Chantal, which formed 300 miles south of Nova Scotia (again in the North Atlantic Ocean) and dropped four inches of rain on Newfoundland.

The book and subsequent movie *The Perfect Storm* describe one of these extra-tropical events from 1991. The success of the movie probably did not have anything to do with changing the numeric designation of these extra-tropical events, but now that these extra-tropical storms form part of the given name record, the result is that the number of named storms is skewed to show a greater frequency of storms. When claims of increased tropical activity are made, it helps to know that the size of the sample has been increased as well. As geologists, we know how to interpret statistical analysis with a grain of skepticism.

Kelvin J. Buchanan, CPG-06058
AIPG Outreach

William J. Siok, CPG-04773

Webster’s Dictionary defines outreach as “the extending of services or assistance beyond current or usual limits (an outreach program); also: the extent of such services or assistance”. AIPG efforts certainly fall under both categories.

Unfortunately, AIPG efforts are not always noticed by AIPG members who are not actively involved. AIPG probably does not promote its outreach activities sufficiently either. And AIPG is, as are all sister societies, limited by both resources and time to the type and extent of outreach activities which it can perform.

On the positive side, AIPG is involved in a myriad of outreach activities through its sections and the national committees. The sections function on a state or regional level and the national executive and standing committees function primarily on a national scope.

A few examples of typical outreach performed on the section level include: sponsorship of technical and professional symposia; lobbying and advocacy on behalf of the profession at the state level, including promotion and support of licensure; providing support to earth science teachers in the form of grants and teaching kits (i.e. containing rocks and minerals); joint meetings with sister societies; providing technical expertise to state agencies; establishing regulatory oversight committees; providing financial and mentoring support to geoscience undergraduates; creating scholarships for undergraduates; actively supporting secondary level science fairs; writing articles for local and regional newspapers; and similar activities aimed at promoting the science and the profession.

At the national level, AIPG members actively: participate in congressional visits to advocate for the professional and to offer legislators a technical resource base, namely members’ expertise; active cooperation with sister societies on a national level to promote student participation and encourage joint advocacy projects; active participation on the Joint Task Force on Areas of Practice to benefit practicing geologists, members and non-members alike; active support for the numerous AGI outreach programs, particularly Earth Science Week promotion; developing position statements pertaining to critical national issues; staffing an exhibit at the annual National Conference of State Legislatures with 6 sister societies. (Incidentally, sincere thank you to AIPG Northeast Section members Ray Talkington, Joey Fiore, Jim Zappieri, Jim O’Brien, and Charles Dimmick for coming to Boston and staffing the 2007 exhibit as AIPG representatives, a most worthwhile outreach to state legislators from across the USA!)

It cannot be overstated that any modicum of success enjoyed by AIPG in these and related efforts is thanks to our volunteer members who devote time, energy, and sometimes personal resources to furthering the AIPG mission.

All members must appreciate that AIPG makes progress primarily through the tireless efforts of its volunteers who take the initiative and carry projects through to completion. In a perfect world, AIPG would have assets and staff to perform all AIPG outreach activities. As circumstances exist, AIPG can be proud of its place in the world of professional associations, thanks largely to the phenomenal energy and constructive support of its volunteers.

I think this dynamic organization can accomplish even more if a larger number of members take the lead and come forward. It’s still not too late to register to attend the 2007 AIPG Annual Meeting in Traverse City, Michigan and to participate in the various business meetings. Come and add your perspective to those members who are doing AIPG’s work as officers and committee volunteers!
Defamatory and Similar Statements about Colleagues and Free Speech

Rule 4.2.1 of the AIPG Code of Ethics states, “A Member shall not issue (a) false statement(s), (a) misleading statement(s), or (a) sensational, exaggerated, defamatory, and/or unwarranted statement(s) regarding a professional colleague. Differences of opinion occur and statements regarding opinions should be restricted to and based on logical and scientific principles and should be made in a respectful and professional manner.” An example came to my attention that prompted further reflection on Rule 4.2.1 and its interaction with the right to free speech.

As a hypothetical example, suppose Jane Smith was to say or write, “John Doe salted his samples to make his property look good.” Simply stating that Doe salted his samples would appear to fall squarely in the category of a sensational, exaggerated, defamatory, and/or unwarranted statement of the type prohibited by Rule 4.2.1. The situation changes if Smith provides some evidence that Doe indeed salted his samples. Nevertheless, the term “salting” is clearly sensational and defamatory, even where convincing evidence of the truth of the charge exists.

I chose “salting” in the foregoing hypothetical because “salting” is such a loaded word, a word capturing the idea that something improper deliberately has been done with the samples alleged to have been salted. Suppose that Smith has some good reasons to believe that Doe’s sampling results are erroneous but has not been able to fully investigate the situation. Smith uses the word “salting” to emphasize her opinion that Doe’s results are erroneous but admits that her opinion is based on what is true all similar cases she knows about, but that there might be some evidence that would change her opinion of Doe’s sample collection, preparation, and/or analysis (including analysis of the resulting data) methodologies. Smith can argue that she is attempting to highlight a potential threat to the public’s financial welfare, one of our primary ethical obligations. But Doe can argue that his professional reputation is being harmed and that Smith has violated Rule 4.2.1. How should this conflict between ethical principles be resolved?

It was at this point in thinking about the foregoing situation that I realized that there was a potential free speech issue involved. While the right to free speech allows us to say many things, particularly about public figures, the right is not unlimited. You do not have the right to yell “Fire” in a crowded theatre, unless you really believe there is a fire. There are laws against libel and slander. I understand that determining whether the individual about whom the statements were made is a public figure has a bearing on the issue. Also, one is allowed to make true statements. But how much evidence does one need to demonstrate the truth of a statement? In discussing libel, we have reached questions beyond my professional competence and that of geoscientists in general (although we do have the ability to weigh geoscientific evidence to assess its veracity—but such evidence is frequently subject to differences in interpretation, which is not an ethics violation).

How then should allegations that Rule 4.2.1 has been violated be evaluated to determine whether a disciplinary proceeding is warranted? Returning to the hypothetical case, assuming that Smith has some evidence supporting her opinion, can she claim that Doe salted his samples knowing that “salted” is a loaded word that will highlight her concern? Or must she use less loaded terms? Is a statement like, “Doe’s sampling results challenged” preferable? And, although “Doe’s sampling results challenged” does not contain the loaded word, “salting,” is this statement any less damaging to Doe’s professional reputation? Please contribute your thoughts.

Acceptance then Unacceptance of a Job Offer (column 110, July/August ’07)

The department head whose inquiry prompted this topic in the last column wrote to tell me that the next hiring process “will need to be a more hostile/adversarial process. We won’t advise the runners-up as quickly that they are not likely to be hired by us and we will shorten to a few days the time the successful candidate has to return paperwork to us.”

It is an unfortunate recognition of reality that the hiring process at this institution will change. I suspect that more hiring processes will also reflect the fact that one’s oral acceptance of an offer cannot be trusted, and indeed, that written acceptances will be viewed with greater suspicion until the new hire actually arrives for work, and perhaps, even has been on the job for a while. The news articles on the activities of human resources departments and the stories one hears from colleagues certainly suggest the processes are becoming increasingly bureaucratic, cumbersome, and annoying for a variety of reasons. While I suspect that legal actions affecting the process are a prime driver for this trend, experiences like the one discussed last month certainly contribute to the situation.
The Use of Professional Seals, Electronic and Otherwise (column 110, July/August ‘07)

A little over a week after turning in column 110, I received the May 2007 issue of the Texas Board of Professional Geoscientists (TBPG) newsletter (volume 3, issue 1). Included on page 3, in the “From the Enforcement Office” box, was the following: “Digital seals are acceptable to the Board and can be made via the TBPG website.” Those visiting the TBPG’s home page will find instructions for the creation of a digital seal via means of a downloadable PowerPoint file containing the general features of a Texas Professional Geoscientist’s seal. You merely need to edit in your name, your specialty, and your license number; save the file; send a copy to the TBPG via e-mail; and you’re ready to go.

I commend the TBPG for providing a better means of creating a digital seal than Utah’s Board has done. However, having an electronic seal doesn’t mean that it can’t be misused. Indeed, all one needs to do is look up a Texas PG’s name, license number, and specialty on the TBPG’s website and it will be easy to create a forged, but genuine-looking digital Texas PG seal. It will be interesting to see whether this happens, and if so, how commonly.

Regardless of whether electronically transmitted reports contain electronic seals, the issue of whether they are true and correct copies remains. The following disclaimer may be useful, “Electronic mail copies of this report are not official unless authenticated and signed by [geoscientist’s or firm’s name] and are not modified in any manner without [geoscientist’s or firm’s name]’s expressed written consent.”

Larry Davis, CPG-07105, and I ran a test on a PDF file that I saved with the PDF file’s security set so that only printing and copying for accessibility were permitted. When I created the security settings, Adobe Acrobat provided a pop-up warning that stated, “All Adobe products enforce the restrictions set by the Permissions Password. However, all third-party products fully support and respect these settings. Recipients using such third-party products might be able to bypass some of the restrictions you have set.”

Larry tried gaining full access to the file with 3 different programs. Two did not violate the security settings but the third provided full access. I’ve seen ads for a number of third-party programs that allow users to create and read PDF files and I’m not surprised that some of them allow one to circumvent Acrobat’s security settings. Aside from using such programs, there is always the more brute-force method of printing a copy and the running it through an OCR program, which works on any paper copy.

Ted Wilton, CPG-07659, commented, “This is a question that I too have been concerned about – the possibility of altered reports that are transmitted in electronic files. I do not have any answers to your questions, and I am not as skilled in this area as Larry Davis, but this is something that we should be concerned about. I am especially concerned about NI 43-101 Technical Reports. These documents carry some significant penalties for ‘Qualified Persons’ who prepare them (in the event of inaccurate statements). Given the amount of significance placed on the Technical Reports, and the potential impact on the shares of the issuing companies, it is only a matter of time before a report is altered.” For those of you unfamiliar with NI 43-101 reports, these are the independently prepared mineral reserve and resource estimates that public companies with Canadian stock exchange listings (most junior mining companies) are required to file. Electronic copies of these reports are available through either or both of the company websites or the SEDAR system, the Canadian version of the SEC’s EDGAR system. CGPs can be Qualified Persons who can author NI 43-101 reports.

Which brings me back to the question, what do you think of the electronic disclaimer suggested above? Given (1) the increasing transmission of reports in electronic format and (2) the inevitability that someone’s report will be changed in the future, can such a disclaimer sentence help one avoid liability?

I should note that the problem of altered reports did occur prior to the creation of the word processor. I recall one case where a petroleum geologist called to tell me that a client had inserted a reserve estimate into a prospect report he prepared. The fact of the alteration turned the geologist from a promoter’s witness into the prosecution’s witness. This is why it is important to keep copies of all your reports.

File Management

File management is one of those professional practice issues we should all think about. Failure to save the right materials or failure to delete draft copies, etc. can cause real headaches when lawyers get involved. All e-mails are apparently retrievable by someone, including from your hard drive by those into forensic computing. Cathy O’Keefe,
our former membership services manager, left AIPG to go into forensic computer work and was featured in a story regarding the ability to retrieve all kinds of material, including all the web pages you merely looked at. What prompted this note was Marty Andrejko’s excellent column on file management in the July/August 2007 TPG. If you haven’t read it, do so.

Honesty, responsibility, personal opinions, and Ward Churchill

In columns 99 (Sept. ’05) and 105 (Sept. ’06) I commented on the case of Ward Churchill, the University of Colorado (Boulder) Ethnic Studies professor accused of academic misconduct for plagiarism and making up facts included in his research. After a lengthy process of review by various levels within the university, the Board of Regents voted 8-1 in July to fire Churchill. I’m glad that the majority of those reviewing the case understood that plagiarism and making up facts simply cannot be tolerated in an academic and/or research institution if it is to have any integrity. I’m also not going to vote for the regent who voted against the firing, assuming that I get the chance—CU Regents are elective positions, some from districts within the state and some at-large.

The next day, Churchill followed through on his promise to sue the University for violating his free speech rights. He claims that had an essay he wrote that referred to some of the 9/11 victims as “little Eichmann’s,” not become the subject of public debate, his research work never would have been examined. We’ll see how this plays out in court.
Use of Electronic Seals

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In David Abbott’s Professional Ethics & Practice Column 110 he discusses the “Use of Professional Seals, Electronic or Otherwise”. I was one of the Ethics Committee members that were asked for an opinion on the topic. At the time of Abbott’s request, I was unable to provide an answer as I wanted to do a little more research on the topic. So this column is the result of that research.

My normal response over the past several years to this question and to others related to transfer of electronic documents was that the professional should take several risk management steps to limit their liability. Firstly, the written contract with the client should contain a clause that explains the following points:

- Electronic documents are being provided as a convenience and that hard copies of the documents govern
- Specifically defines which documents/files will be provided electronically
- Specifically defines in which format the documents will be provided
- Specifically defines which software version of CAD, Word, Excel, etc will be the minimum requirement
- Specifically defines an acceptance period (i.e., 30 or 60 days) after which the client will indemnify you for deterioration or defects in the data

Secondly, I have advocated removing company title bocks from electronic versions of CAD drawings and figures to protect the professional from unauthorized alteration and re-release of your drawings.

These are the suggestions in the ideal risk management world. The real world means that sometimes you have to provide drawings with your title block and with your seal and/or signature. In today’s world it is very easy for someone to take one of your deliverables and make alterations. Or someone could take a digital copy of the signed seal and affix it to another document.

Based on an article in the May 2000 issue of the National Society of Professional Engineers (NSPE) newspaper, Engineering Times entitled “Information Technology and Project Documents: Practical Issues for Clients” there are 4 standards that a court will examine in regard to electronic signatures.

1. they must be unique (good luck trying to forge a copy of my chicken-scratch signature)
2. they must be verifiable (a traceable copy of the original signature must be kept somewhere)
3. they must be under the control of the signer (you’ll need to work with your IT department to develop the controls)
4. there must be a clear unalterable attachment to the document in question (again you’ll need to work with your IT department to develop this type of protocol)

It will be up to the courts to determine whether these standards are met. Court proceedings are usually not quick. I came across an engineering bulletin board and a question was posed regarding someone stealing your signature/seal and affixing it to a document without your knowledge. One of the responses went like this:

“I would not have to prove anything. The burden of proof is always on the accuser. You say I sealed something? Prove it. If you can’t prove I sealed it, I have no liability. The only thing I have to do is truthfully answer your questions while under oath: “Steve, did you seal this drawing (holds up a plan Steve did not seal)’’ “No, ma’am, I did not.” “Thank you, nothing further for this witness.” Pretty short trial, don’t you think?”

If only the court system worked like this. The courts would be looking for information regarding the four standards discussed above. If any of those are not met, you are going to have to provide additional information and alternate arguments. When someone files suit against you for negligence, you have to defend yourself against the allegations. The claimant will have experts and witnesses to try to prove that you were negligent. You as the defendant have to provide your own experts and witnesses to show that you weren’t negligent. It is not as simple as stating under oath “I wasn’t negligent”. Steve is being very naive about this issue. The defense costs that your attorney will charge will be significant, not to mention the billable hours that we will be lost to your time gathering information in order to mount a defense.

A Canadian View

While researching this topic, I found that our Canadian counterparts are
looking very hard at this issue of E-sealing. The Summer 2007 issue of The Keystone Professional published by The Association of Professional Engineers and Geoscientists of Manitoba (APEGM) notes that four Canadian Provinces (Quebec, Alberta, Manitoba, and New Brunswick) allow E-sealing. The remaining Provinces are looking into it. In December 2006, APEGM issued “Practice Standard for Authenticating Professional Documents” (http://www.apegm.mb.ca/practice/guides/practice-std-docs.pdf) which is based upon a similar document issued by The Association of Professional Engineers, Geologists and Geophysicists of the Province of Alberta (APEGGA).

Section 4.1 of the APEGM states:
“A professional member who wishes to use an electronic seal may obtain it by generating his or her own electronic copy of the manual seal obtained from APEGM.

The image of an electronic seal must correspond in all aspects to the original seal issued by APEGM in order to preserve its characteristics. The size of an electronic seal image must be sufficient to ensure the elements of the seal are legible.”

This tells the professional how the seal should look. It also gives someone the blueprint as how to forge one as well. Someone could very easily make a digital stamp with a fraudulent name and number but this is something that has been an issue even with embossed stamps.

The document goes further and gives some sound advice to protect the engineer.

Section 4.2 acknowledges that a digitized signature can be copied. It suggests that the electronic signature shall allow for verification that “the document came from the professional member whose seal and signature now appears on it (identification)” and that “the information in the document has not changed since it was signed (integrity)”. This is where your IT department (or yourself if you are your IT department) will be important. The document tracking ability will be very important.

Section 4.3 requires that electronic documents may be issued for use provided that the authentication procedure maintains the integrity of the documents and the authenticity of the seal and signature”. Most importantly it states “if that is not possible, the seal and signature must not appear on the document”. This parallels my advice regarding removal of title and signature blocks when providing electronic copies of drawings.

Section 4.4 requires “electronic documents that have been authenticated electronically shall be stored in a manner that maintains this integrity”. If not, some other means such as paper documents must be employed.

An important concept to keep in mind, is that for members of APEGM, the above is not merely a recommendation but is now the standard of practice. Failure to follow this standard might result in suspension or revocation of license to practice. At this time I am not aware of any State that has put a similar standard in place but it might not be that far off that a State will add e-signature requirements similar to Manitoba’s to their regulations. Even if the State where you practice has not done so, I would still recommend using Manitoba’s model as a guideline to protecting your e-seal and e-signature.

Send comments to: Martin Andrejko, CPG-08512, Assistant Vice President, XL Design Professional, 520 Eagleview Blvd., Exton, PA 19341, (610) 321-9227, Fax (610) 458-8667, e-mail: martin.andrejko@xlgroup.com.

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Ten Cardinal Sins of Small Business Marketing: Part II

Duane A. Carey, CPG-10305

Last issue’s column was the first of a three-part installment of the most common – and deadly – marketing sins committed by small businesses. It contained the first three cardinal sins and is available on our website if you want to read it. This column discusses the next three sins. Do any apply to you?

Sin #4: Building a Better Mousetrap...Just Because

Have you seen The Big Idea with Donny Deutsch on CNBC? It’s a great show for those of us who love entrepreneurs – I watch it almost every night. It features moms, carpenters, lawyers, taxi drivers and all kinds of other regular people who have hit the big time by quitting their day job and launching their own business or inventing a better mousetrap. They make it look almost easy: invent a zipper-top plastic add-on to seal a bag of opened potato chips so you never again have a stale snack, outsource the production to China, and sit back and count your greenbacks. What the show fails to mention, of course, is that there are thousands of failed ventures for every wildly successful one.

The truth is even good ideas are sometimes bad. A good idea can be a bad business idea if there is no market for it. If you consider adding a new product or service to your business, ask yourself these questions:

• Is there really a market for this?
• Besides me, would anyone else want this product or service?
• Would they pay for it?
• If there really are potential customers, are there enough to at least cover your costs and then provide a profit?

• If I do this, what are the barriers to entry that would keep competitors from entering the market?
• You would be surprised by how many people let the excitement about their idea cloud their good judgment when the market is just not there.
• I live and work in Howard County, Maryland, which is one of the “wealthiest” counties in the nation. Interestingly, however, there are few truly rich people here, as in Miami or the Hamptons or Vail. The wealthy designation is a demographic phenomenon; in fact, there are just very few “poor” people here to bring down the average. Most households here, positioned between Baltimore and Washington, D.C., have dual incomes, with one spouse commuting 30 minutes north and the other commuting 60 minutes south. These families are usually stretched thin and barely have time to put a meal on the table, let alone take the dog to the vet.

Under such conditions, it’s easy to see why someone would want to start a concierge service to run errands for these “rich” people. Surely the need is there and they certainly have some disposable income. In the last three years, in fact, I have had four people come looking for marketing help to start such a service. But the market is just not there. Why?

There are several reasons: 1) the cost of living is very high in this region and most people with apparently high incomes are actually house-poor, with an extraordinarily large proportion of the income going to mortgage payments and high taxes; 2) most services that a concierge would provide, such as taking the dog to the vet, standing in line at the DMV, or taking your suit to the cleaners, are very personal tasks that most people would not want to (or be able to) delegate; and 3) most people would not hire a perfect stranger to do any of these things.

So what may have appeared to be a great idea at first, is actually a bad one – especially if you have to quit your day job to do it. This is why it’s always a great idea to test market before you commit completely to the new product or service. You don’t need to hire a market research firm to evaluate the idea, either. Simply ask the right questions of friends, colleagues, and associates as long as you can be confident that they will tell you the absolute truth. Ask them to pick apart the idea – scientists and engineers love to do this, so you should have no problem finding volunteers if you genuinely give them permission to critique the idea.

Sin #5: Singing from Different Hymn Books

Ever notice how you can always spot the owner in any given business? The distinctions are often subtle, but very real and significant. They will never hold a cell-phone conversation with their friends while they are serving your hamburger. They will be genuinely concerned if there’s a problem with the product or service they are providing. They understand the importance of the “bottom line”. They smile - even when they don’t feel like it.

If it’s important for employees to act like owners in large businesses, it’s even more so in small ones. In a small business, each individual employee is a much larger percentage of the whole organization than in a large company. Their performance, positive or negative, is much more significant. So it is very important that priorities and incentives are aligned between employees and
employer; you need to all be singing from the same hymn book.

One of the best ways to align priorities is to share, at least the highlights of, the financial condition of the company. Don’t assume that your employees have any knowledge of the costs of doing business. Chances are they have no idea about the tax burden or any of the overhead. Educate them about these items and explain what they can do to alleviate the effects of costs and amplify the effects of profitable activities. Finally, find a way to share some of the profits, so they can realize the gains of their efforts to help the company be more profitable.

Another great way to keep everyone on the same page is to involve everyone in the marketing. If they understand the financial stakes, they will be more likely to help with the marketing, regardless of their personal comfort level. Empower them to spread the corporate gospel; encourage them to represent you as though they are owners themselves, always looking to bring more work to the firm. For this reason, everyone in the company needs a business card, including the receptionist. For less than $100 per employee, the potential payoff is well worth the investment. When you realize that your receptionist is your first line of communication with current and potential clients, the way your phone is answered is critical to good marketing of your business.

**Sin #6: Too Big for Your Britches for the Details**

If your clients hear from you only when an invoice is due, you’re doing yourself a disservice. If the key to real estate is location, location, location, then the key to marketing is touches, touches, touches. You need to continually “touch” your clients throughout the year to 1) show your appreciation, and 2) maintain share of mind. If they are not thinking about you, they certainly won’t call on you to help solve a problem.

Showing your appreciation is key. Indeed, according to a study on the subject, 60% of the customers who discontinued a business relationship did so because they felt unappreciated, not because there was anything wrong with the product or service. How do you show appreciation? It does not have to be something expensive or elaborate. Handwritten thank-you notes, which have become a long, lost art, go a long way toward showing that you sincerely care because they take time to write. I carry some personalized note cards, envelopes, and stamps in my car. That way, when I leave a meeting with someone who does something nice for me, or if I get a new client, I can sit for about three minutes, fill out the card, and drop it in the mail. Trouble is, I rarely do it. Either I forget or I’m rushing to another meeting and my good intentions are for naught. But I will bang out emails, which are much less personal, throughout the day without a second thought. This really highlights just how rare the hand-written note has become. Use it and your clients will take notice.

How quickly do you return phone calls? How fast do you complete simple tasks for your best clients? These are additional problems of small businesses whose owners or employees are taxed. You don’t want to be “too big for your britches”, but you simply can’t get it all done in 8, 10, or 12 hours a day, so you just fight the fires of the day and let the little details slip away. Classic small business.

The final three sins will be highlighted in the next issue. For now, I will busily try to avoid these pitfalls; I hope you will too.
“Why do I Have to Take This Class Anyway?”

Nancy Price, SA-0382

It is another day in the classroom. The professor is deep into another lecture about the obscure details of some subject you had never heard of before today. You sit and wonder to yourself about the practicality of the topic in the real world. You can only think of a hundred other things you would rather be learning about. You can’t help but wonder: “Why am I taking this class if I am never going to use it?”

It’s a familiar and often whiny lament commonly heard in required undergraduate classes. I myself have uttered such a phrase on occasion in the face of another test on material I had no interest in learning at the time. Yet, it wasn’t until I was recently presented with such a protestation from one of my undergraduate geology students that I really got to thinking about the issue from a teacher’s perspective. As a teacher, how would you answer if someone asked you: “Why am I taking this class anyway?”

My first response would be the standard answer: “Well, you never know when you are going to need to know it, so it is best to learn it now for when you do need it.” Such a response is the academic equivalent of a parent telling a child that it is “for their own good”. True, you never know where your life is going to take you and what branch of geology you are going to end up in. Justifying not learning a topic just because you don’t think it is going to apply to the very narrow subdiscipline you are interested in at the moment is naïve and childish. (Although, I have heard such excuses from students who sounded very serious when they said it.) You may in fact end up 10 years down the road using the very skills you had sworn were useless. Of course, even if you tell someone that it is in his or her best interest to learn a subject that doesn’t mean that he or she is going to care enough to learn it. The “you might need it in the future” argument isn’t good enough to stand on its own.

The argument that I would make next is the strongest one: geology is an interdisciplinary field. Geology applies the basic principles of many subjects to the study of the earth. That calculus that you are forced to learn is important to understand so that you can correctly apply things like geophysical calculations, Gibb’s free energy relationships, and fluid flow equations related to hydrology. The chemistry principles can be directly related to metamorphic, environmental, and aqueous geochemistry. Sometimes it takes trudging through a class without any clear understanding of why you need to be there before you can get to the point where you can apply it in geology. Once you do apply it, things like the solubility constant (K), matrices, and differential equations suddenly make a lot more sense. Despite what you may think at the time, the designers of the curriculum didn’t put all those required classes in there to torture you. The chemistry, calculus, and physics classes are there for a reason. The chances are high that you will see a lot of the basic concepts again in geology classes before you are finished with your undergraduate degree. Learn them well so you can apply them later even if you may not really care at the time. Of course, you could always ask one of your professors to show you an example of how these concepts are applied before you take the chemistry, calculus, and physics classes to answer the “why” question before you even ask it.

When I say that geology is an interdisciplinary field, I am also referring to the fact that processes in geology are interrelated. The earth is a system. Cause and effect are not necessarily limited to only one branch of geology, so it is not smart to limit your learning to everything about only one subdiscipline. Consider the following situation: you have been hired as a field geologist for a state survey. As a field geologist, you will need to have a well-rounded background in all aspects of geology, not just field methods. You may use concepts from your geomorphology class to interpret the landscape and aerial photos in order to identify the extensions of faults that you may not be able to directly trace on the ground. You have both sedimentary and igneous rocks to classify and map requiring more than cursory knowledge of how to identify and name units. You will also have to understand how to correlate units across distances. Basic concepts of structural geology will have to be applied when you tackle complex folding and faulting relationships. In just one field area, you will have to use a good number of the geologic tools you started developing as an undergraduate in order to do a good job and create a good map. Even if you become a consulting geologist instead of a state field geologist, you will still need to be able to understand and interpret the geology that you see before you, before you can make decisions regarding an area. That means knowing a little of all the subdisciplines in order to do your job properly.

On the other side of the issue, coming at a geological problem with an ignorance of geological processes can be a very dangerous thing. The earth is a complex system and you will need to con-
I would like to argue that that is not graduate in order to be a good geologist? an expert at everything as an under-
tered the professional world. are finished with your degree and have future hardships you might incur from 
ning that you get from college classes. It 
leave much room for the level of learn-
all. The life of a professional is just as 
busy sometimes and it certainly does not 
have fun trying to do it while you are attempting to complete a project on time for your employer. Why not learn it at a time when you have a teacher there to help you, lab exercises to instruct you, and time to devote to it. Sure, the life of a student is really busy and challenging and you are having a hard enough time keeping up with classes while maybe even holding down a job to pay for it all. The life of a professional is just as busy sometimes and it certainly does not leave much room for the level of learning that you get from college classes. It may be really hard to see the ideological benefits of learning something you don’t want to learn, but it is easier to see the future hardships you might incur from postponing the material for when you are finished with your degree and have entered the professional world.

Does this mean that you have to be an expert at everything as an undergraduate in order to be a good geologist? I would like to argue that that is not necessarily the case. There is wide con-
tinuum between being aware of a topic and being an expert on it. I would argue that just a little knowledge of a subject is better than no knowledge at all. With the familiarity of a topic, it is possible to refer to a textbook or related reference even if you don’t know the answer by heart. A lot of the details you learned for a test as an undergraduate will be forgotten due to a lack of use, but the important thing is that you understood the concept and you could look up the details at another time if needed. You can always understand concepts more easily having seen them once before. Without an introduction to the material, it is difficult to understand where to go and what references to use if you need a little more information. It is also difficult to dive into the material because it may be the first time that you have seen it. Therefore, it is better to remember than to learn anew.

Many students don’t take the classes that intimidate them and they will avoid classes they think they are going to fail. It is hard to remember that learning is a part of going to college. Sometimes you have to fail at something before you learn it. Sometimes you have to take a class more than once in order to really understand the material. However, in today’s academic culture, maintaining a high GPA is just as important as the material you learn. GPA has become an indicator to school officials and future employers of how good of a student you are. The luxury of failing may not be an option for many people. If there is a chance of failing a class, it may be better for your GPA not to take it. Of course, if you don’t take the class, then you obviously won’t learn the material. Can you imagine ten years down the road how much harder it will be to try and learn something from a class you are afraid to take now? I would argue that it is worth the lower grade to at least get the introduction, but even I hate to get a bad grade.

The opportunity of auditing a class can provide the most benefit to someone who needs to take a class that he or she is afraid of failing. If you are given permission by the professor and/or university, sit in on a class without officially signing up to be a student. Go to the class like you are an official student. Learn the mate-
rial, do the homework, and make your mistakes. Sitting in on a class allows you to take the class without worrying about hurting your GPA. If you were to officially take the class a second time, your chances of understanding things and getting a good grade are much higher. Even if you never actually take the class a second time, you at least have been introduced to the material. That introduction is important if you ever have to apply the concepts in the future. Be advised that the rules for auditing vary from institution to institution and you may have to still pay for the class. It is worth it to do your research on the details of auditing at your school before you do it.

It is natural to wonder why you have to learn something if you don’t see the benefit or the connection to geology. Ever I still find myself second-guessing the need to learn obscure parts of a lesson. It is hard to remind yourself that you are doing this for your own good; that you will someday need to call upon the knowledge that you are now amassing. The geology curriculum was designed to be comprehensive and to prepare you for any geological challenge you may face in your future career even if right now it only seems to be designed to make you take classes you don’t want to take. Have faith that the geologists who designed the curriculum had your best interests in mind. Learning that curriculum is part of becoming a skilled professional. However, when the ideological argument fails and you are having a moment of despair, just remember, it is more dif-
ficult to learn it later. Putting the effort in now to get a good understanding of all the basic geologic concepts will make your professional life much easier in the future. In the end, your labors are worth it, even if right now you may not think so.

If you have any ideas, questions, or comments about this article or any other issues, please feel free to contact me via email at: nancyaprice@yahoo.com.

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Answers

1. The answer is “c” or the “Permian” Period.

The end of the Permian Period and the Paleozoic Era are marked by mass extinction, including that of the productid brachiopods, rugose and tabulate corals, trilobites, many families of bryozoans and blastoids, jawed fishes (acanthodians) various amphibians and reptiles and many other organisms. Drastic climate change and sea-level drop accompanied the formation of the super continent of Pangaea. Also, at the close of the Paleozoic, the eruption of 1,600,000 cubic kilometers of flood basalts in Siberia buried about 340,000 square kilometers of land.

The end of the Cretaceous Period and Mesozoic Era are also marked by pronounced mass extinction including that of the dinosaurs and ammonites, sea-level fall, the eruption of about 2,000,000 cubic kilometers of flood basalts in India covering about 2,000,000 square kilometers of land and the asteroid impact at Chicxulub in the Yucatan area of Mexico. The Devonian Period, along with the preceding Silurian Period, is best known for and designated as the “age of fishes.”

2. The answer is “a” or 57.70 degrees.

The computation is simple, based on Snell’s Law:

\[ \sin \theta_1 / \sin \theta_2 = V_1 / V_2. \]

In our problem,

\[ \sin \theta_1 = \sin 25^\circ = 0.42262. \]
\[ V_1 = 3,000 \text{ meters per second.} \]
\[ V_2 = 6,000 \text{ meters per second.} \]

Thus,

\[ \sin \theta_2 = (\sin \theta_1 * V_2) / V_1 = 0.84524 \]
\[ \theta_2 = \sin^{-1} (0.844524) = 57.70^\circ \]

3. The answer is “b” or “oil in place” is equal to about 92 MMBO.

“Oil in place” (Oip) is given by:

\[ \text{Oip} = 7,758 \times (h)(A)(\bar{\Phi})(S_o) \]

In the above equation, 7,758 is the number of barrels in one acre-foot, \( h \) is the average pay zone thickness or 30 feet, \( A \) is the prospect’s drainage area or 3,200 acres (e.g., equivalent to 5 sections of 640 acres each), \( \bar{\Phi} \) is the average porosity of 19% and \( S_o \) (the oil saturation) is \( S_o = 1 - S_w \) (where \( S_w \) is the water saturation) or \( S_o = 1.00 - 0.35 = 0.65 = 65\% \).

Thus,

\[ \text{Oip} = 7,758 \times (30)(3,200)(0.19)(0.65) = 91.98 \text{ MMBO or about 92 MMBO.} \]

4. The answer is “c” or Charles Lyell.

Sir Charles Lyell (1797-1875) published the initial volume of “Principles of Geology” in 1830. The work grew to four volumes and was popular in the Great Britain of Queen Victoria. Lyell not only expanded on the ideas and principles of his predecessor, James Hutton, but is also credited with the authorship of the “principles of cross-cutting relationships and inclusions.” In the “principle of cross-cutting relationships”, Lyell recognized that a geologic feature that cuts across or penetrates another body of rock must be younger than the rock unit it cuts or penetrates. In the “principle of inclusions”, Lyell recognized that fragments contained within a larger rock mass must be older than the rock mass within which they are enclosed.

James Hutton (1726-1797) was a physiologist and geologist from Edinburgh, Scotland. He recognized the earth as a dynamic, ever-changing place, a view that contrasted sharply with Abraham Gottlob Werner’s (1750-1817) theory of “neptunism” (calling for an aqueous origin for all rocks) and a more static earth that had changed little through time. Hutton is credited with advancing the theory of “plutonism”, introduced the concepts of the “geologic cycle” and “uniformitarianism” and recognized the importance of “unconformities” and the substantial magnitude of the “geologic time scale.” He published his “Theory of the Earth” in 1785.

William “Strata’ Smith (1769-1839) was an English surveyor and engineer from Edinburgh, Scotland. He recognized the earth as a dynamic, ever-changing place, a view that contrasted sharply with Abraham Gottlob Werner’s (1750-1817) theory of “neptunism” (calling for an aqueous origin for all rocks) and a more static earth that had changed little through time. Hutton is credited with advancing the theory of “plutonism”, introduced the concepts of the “geologic cycle” and “uniformitarianism” and recognized the importance of “unconformities” and the substantial magnitude of the “geologic time scale.” He published his “Theory of the Earth” in 1785.

5. The answer is “c” or PbS (galena).

Galena or PbS is a silvery gray lead sulfide that has a hardness of 2.5, a dark gray to gray streak, cubic cleavage and a specific gravity of 7.4-7.6. As an ore of lead, it has been used for TV glass, auto batteries, solder, ammunition and paint.

Bornite or Cu_9FeS_8 is an iridescent copper-red, blue or purple copper-iron sulfide with a gray to black streak, a hardness of 3.0, no visible cleavage and specific gravity of 5.1. As an ore of copper, bornite has been used in the manufacturing of copper pipes, electrical circuits, coins, ammunition, brass and bronze.

Sphalerite or ZnS is a brown to yellow or black, sub-metallic zinc sulfide with a hardness of 3.5-4.0, a white to yellow-brown streak, dodecahedral cleavage and specific gravity of 3.9-4.0. As an ore of zinc, sphalerite has been used for die-cast automobile parts and in the development of brass, batteries and in the galvanizing process.
What is vapor intrusion? Is this really a concern? What are the risks? With more and more development on and around chemically impacted sites, these are very common questions in the development industry. Today, development of such impacted properties is often influenced by the lack of the availability of “clean” properties and incentives offered through site development under Federal and State Brownfields processes. Developments at such properties are often permitted to leave some soil and/or groundwater chemical impacts on a site, which could result in the potential accumulation of hazardous vapors.

So What is Vapor Intrusion?

The United States Environmental Protection Agency (EPA) has described vapor intrusion as the “migration of volatile chemicals from the subsurface into overlying buildings”. Volatile chemicals in the soil and groundwater can volatilize and migrate upward through the soils that underlie buildings (or proposed buildings), penetrate the building foundations/slabs, and accumulate inside the building to concentrations that may be harmful to human health and the environment. Common volatile constituents with sufficient volatility\(^1\) and toxicity\(^2\) to be potential concerns include some volatile organic compounds (VOCs) (such as dry cleaning solvents and petroleum compounds), mercury, polychlorinated biphenyls (PCBs), and certain semi-volatile organic compounds (SVOCs). The EPA has identified 107 compounds meeting these criteria.

Is This Really a Concern?

Consider this: The average adult consumes approximately 2 liters of water per day. Based on this calculated water consumption, the EPA has set the maximum contaminant level (MCL) for benzene (a primary component of gasoline) and tetrachloroethene or PCE (the chemical often used in dry cleaning) at 5 micrograms per liter (\(\mu g/L\)). With this, the EPA has determined that an average adult can consume 10 \(\mu g/L\) of benzene or PCE per day in water without a significant risk for developing adverse health effects.

Now relate this water consumption rate to the amount of air breathed by the average adult per day, which is about 20,000 liters per day. At this consumption rate, it would only take an initial air concentration of benzene or PCE of about 0.0005 \(\mu g/L\) to be exposed to 10 \(\mu g/L\) per day. Although these concentrations cannot be directly cross-referenced to risk, clearly, it can be seen that it only takes a minor amount of vapors in the air, to equate to a significant inhalation exposure throughout a 24-hour period.

Vapor Intrusion has become a major concern to both the EPA and state agencies as corrective action criteria have moved from cleanup standards of background concentrations to low contamination concentrations allowed to remain on sites. The first guidance document developed by the EPA for vapor intrusion assessment was Assessing Potential Indoor Impacts for Superfund Sites in 1992. In the mid 90s, both the American Society for Testing and Materials (ASTM) and the EPA issued additional guides for vapor assessment including the Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (1994) and Soil Screening Guidance: Users Guide (July 1996).

When vapor intrusion was first evaluated using the above means in the 1990s, the EPA determined that it was not a concern if the chemical impacts were greater than 15 feet from a building. However, in early 2000, a chlorinated VOC plume in Colorado resulted in residential vapor intrusion even though the early EPA model predicted little or no contamination. Since then, the EPA has made modifications to the evaluation recommendation/protocols. This included the development of the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway (December 2001), which has

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1. A chemical is considered sufficiently volatile if its Henry’s law constant is 1x10\(^{-5}\) atm-m\(^{3}\)/mol or greater.
2. A chemical is considered sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than one in a million (10\(^{-6}\)) or a non-cancer hazard index greater than 1.
been superceded by the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), 67 Federal Regulation 71,169, (November 29, 2002).

The draft guidance recommends assessing the potential for vapor intrusion based on a tiered approach. Generally, if chemical impacts are present with sufficient volatility and toxicity to be potential concerns and the impacts are within 100 feet of an existing or proposed building, additional assessment is needed.

What are the Risks?

The presence of these volatile and toxic vapors in buildings was not previously anticipated, and was thus not part of investigations until recently. The risks present include the risk for intrusion itself (whether there is a complete or incomplete pathway) and the risk for potential adverse health effects associated with such intrusion. The presence of these risks present potential liability to persons such as property owners, building owners and lessees. These risks should be evaluated by these individuals with the assistance of consultants and attorneys. Several computational models have been developed to quantify these risks. Once the risks have been assessed, an appropriate business decision can follow.

Should This Stop Development?

Vapor intrusion concerns can be assessed and if potential completed vapor pathways are identified along with an exceedence of acceptable risk, mitigation can be implemented. Vapor intrusion can commonly be effectively mitigated with the installation and operation of a single or combined mitigation system. The type of effective mitigation system can vary depending on numerous site conditions including the stage of the development, whether buildings are existing or proposed, subsurface geology, and the magnitude of the chemical impacts present.

If chemical impact concentrations are low to moderate, passive systems are often sufficient for vapor mitigation. In limited situations, passive systems could simply include increasing a buildings indoor air exchange rate by opening doors and windows or installing a fan to blow air in and/or out of a building. Other passive systems include gravel collection layers with discharge piping or a simple vapor barrier. Passive systems seem to be the most common types of systems installed, with the majority of sites having low to moderate impact concentrations. Costs for such systems are nominal compared to overall development costs, with some passive systems costs being in the range of $2 to $5 per square foot (for ground floors only).

If higher chemical concentrations are present, or site conditions limit passive systems, an active mitigation system may be required. Active systems can be very complex and could include physical excavation of impacted media and/or the installation of a soil gas extraction system. Although these systems can be considerably more expensive than passive systems, for large developments, these costs may remain nominal for the overall project.

Conclusion

Vapor intrusion assessment is an evolving science. Significant assessment and case studies have not yet been completed, which makes the evaluation more difficult. As time moves forward, expect significant debate over this issue. Some states already have their own guidance and expect remaining states to develop their own guidance documents in years to come.

The potential for indoor vapor intrusion at or adjacent to chemically impacted sites is real. Developers should be aware of this potential and be prepared to assess the risks associated with such intrusion. If an intrusion pathway is complete and the applicable risk level is exceeded, then an effective mitigation system should be designed, installed, and operated. The costs for such systems are economical and should not deter the development of such impacted sites.

References:


http://www.epa.gov/correctiveaction/eis/vapor.htm

Reviewed by AIPG Associate Editors: Solomon A. Isiorho, CPG-07788 and Thomas E. Jordan, CPG-09384.
Margaret E. Venable, CPG-11080

One of my first impressions upon arriving at my post in Siuna, Nicaragua, in April 1988 was of the “Hilo”, as it is called here. “Hilo” (pronounced eé-low) in Spanish means “thread”, and in the colloquial Spanish of the Atlantic coast of Nicaragua it refers to any small rich gold deposit, generally having an elongate form. One such “hilo” of unbelievable richness occurs in the otherwise low-grade and ill-defined gold deposit remaining in the open pit in Siuna. I arrived as a freshly graduated mining geologist hired in an attempt to reactivate the mine. The reasons why this never came to pass are better left for another tale, but here I will relate one of the more entertaining of the many incredible and often outrageous aspects of the past two years.

Siuna, a town of about 15,000 tucked in between the mountains to the west and the wide meandering rivers and jungle of the coastal plain to the east, owes its existence to what was once the largest gold deposit in Central America. Mined for over 70 years, both in open pit and underground operations, it was abandoned in 1968 when the dam burst and washed away the hydroelectric power plant that had supplied the mine and town with electricity. The inhabitants now make a living from agriculture, commerce, and small scale mining activities, especially the last of these.

The open pit itself is a thing of beauty, if one ignores one’s ecological sensibilities. Having been mined in recent years with an eye to the richest parts, the upper levels are a confusion of different levels and abandoned warts. The rock is colored in a rich variety of reds and oranges from oxidizing iron minerals, with occasional sprays of vivid blue and green where local concentrations of copper occur, and patches bleached white as sulfuric acid from weathering sulfide zones leached out all but the most resistant elements. In one part, a collapse left a vertical face of nearly a hundred and fifty feet, plunging breathtakingly down into the deep green clear waters of the pit’s lagoon, which has flooded the lowest levels. There, an active imagination can envision some primitive creature, some Latin Loch Ness Monster, hiding from Darwin’s theories in the safety of its depths. For those with a narrower knowledge of the world, there are always rumors of alligators, although available evidence indicates that little at all lives in the lagoon mine’s.

In one of the lower levels, about 60 feet above the waters of the lagoon, exists the noisy exception to the otherwise serene abandonment of the pit, known locally as The Hilo, with capital “H”. If anyone in Siuna (and possibly the entire Atlantic Coast of Nicaragua) refers to The Hilo, there can be no confusion as to which they mean. In the time of my arrival in Siuna, people came from as far away as Puerto Cabezas, over one hundred and forty arduous war-ridden miles of dirt road and unbridged rivers from Siuna, to get a chance at the famous Hilo. They waited in line for up to two days to be permitted to descend for ten minutes into the cramped hell of the makeshift mine.

For their troubles they would pry out at best a few pounds of the precious meat of the Hilo, a succulent combination of ground up olive green rock, large crystals of white calcite, streaks of deep yellow chalcopyrite and yellow-white pyrite, cubic silver-gray galena and resinous brown sphalerite. With luck, your samples could also be encrusted with gold, as well as being permeated in every fiber and pore with the sought-after metal.

This mineralogical toy box formed along a pocket in a fault zone, where one massive block of rock ground passed another leaving a conduit for hot metal-laden fluids to release their dissolved burdens. This soft, incredibly rich zone, rarely more than six to twelve inches wide, is imprisoned in walls of extremely hard rock, from which it takes many determined blows with a sledge hammer to knock a single chip.

Due to the softness and richness of the Hilo, the solidness of its encasing rock, and the disorganized nature of the gold seekers, little effort was put into developing proper audits. To gain access to the ore, one had to slither down a narrow twisted shaft for about 25 feet, carve out a bit of rock from the far end of a narrow crevice using a bayonet tied to a pole, and finally dangle a slender juvenile accomplice by his feet to collect the precious cargo from the crevice floor. The air was nearly non-existent, the heat unbearable. Ten minutes was about the maximum a person could possibly spend there, and in any case if a greedy miner broke protocol by attempting a longer stay, the bayonets on the long poles could find other uses.

Such an agglomeration of hundreds of people inevitably brings still others providing services, and in the lower levels of the pit ice cream vendors wheeled their carts, dowdy old women cooked huge pots of soup and other edibles, small children hawked cakes and cold drinks, and rumor had it that there was even a bar and prostitutes after dark. The only thing that was not to be found there was anything resembling a restroom, and the perimeter of mining activities became a virtual mine of human waste.

This multitude of people and their by-products made work in the open pit difficult in my first weeks in Siuna. The problem was not only the odor or the difficulty of moving about with so many people there; whenever I tried to examine a rock with my hand lense, the
sunlight was blocked by a swarm of the curious, wanting to know if I had found any gold. We could not possibly do any blasting with so many people about. The situation was nearly impossible; even though we had a legal right to move people out of the pit, there was effectively no law in Siuna, and the only enforcement agency capable of forcing people out was the army. So it was.

At five in the morning on the thirteenth of May, 1988, the town was awakened to a chorus of machine gun fire, punctuated by mortar and rocket explosions. Memories of the Contra attack of December 1987 were still fresh, and from the hill where I lived I could see families from the outskirts of town dragging their swarm of small children in towards the center. Sirens wailed, and trucks full of soldiers roared and lurched in every direction. Most importantly, in the open pit the army hastened the still reluctant miners away from their golden hole, saying that they needed the position for the defense of the town and that they could not risk having civilians there. In the house where I lived, marked by bullets and mortar shells from the previous attack, we soon realized that there was something odd; in spite of the voluminous fire from our side, there was apparently no response. Later on word was given that it was all just a practice maneuver, and that the Contra were nowhere near. Nonetheless, the army maintained their control of the pit, forbidding entry to the swarm of gold seekers, and we filled in the hole with a bulldozer and began to work unhindered.

During the next nine months, as mine security guards replaced the troops, we somehow managed to prevent the hordes of small miners from returning openly in the daytime. Nonetheless, there were constant efforts after dark on the part of the more determined townsmen to regain access to their treasure. At first we would arrive every morning to find the hole partially or totally reopened, and the security guards claimed to have been and heard nothing. After we bulldozed it for a few weeks on a daily basis, it appeared that they had given up. However, someone finally tipped us off, and an investigation revealed a small tunnel partway down the nearly vertical slope from the bank to the lagoon. A twisted passage barely big enough to crawl through led in to their golden bounty, albeit with less air than ever. The local mining engineer, in an understandable display of overkill, devoted their entire work to undoing the mess we had made, shoring up dynamite shattered entrance and getting rid of that huge boulder. We also had to make a much safer and more comfortable operation than the previous tenants. We spent several weeks making a proper shaft, and the director of the mine, an economist who understood more about the ore with a large mortar and pestle. Nonetheless, it rapidly became clear that our golden thread wove a much richer fabric than we had ever hoped for. We showed the gold encrusted rocks to the director, but since little of it had appeared as yet as a finished product, he was still not properly enthusiastic.

In this same period the financial difficulties of the company and general government policy forced a severe cutback of personnel. Government agencies and state-owned companies all over the country were subject to this housecleaning, and more than half of our 300 mostly under-employed workers were given the boot. Unlike workers in other areas, however, they saw an option and were quick to seize it. Several of the more clever and ambitious among them organized the entire lot in a huge cooperative, and pulled some strings with a brother-in-law and some cousins in the local government. It was even rumored that a tape player, a hundred pounds of beans, and a watch changed hands, and some hefty promises based on future production were made. Late one night a
few days after the layoff the entire 150 members of the new cooperative walked in and took over the Hilo. No one stopped them.

After many heavy rounds of negotiations, a working arrangement was hammered out. Our company rented or sold them some drills, compressors, dynamite and other needed equipment and materials. The government received 40% of the production in a bonanza of civic mindedness on the part of the cooperative, and also because it was tolerating an entirely illegal operation. This money, among other things, helped construct a new marketplace and a movie theater in Siuna. The rest of the proceeds were divided equally among the members of the cooperative, with the exception that the women, no matter how sturdy and hard-working, earned less than the men, no matter how old and weak.

The cooperative functioned remarkably well for nearly a year, with incredible earnings when the richer pockets were mined, and a still respectable booty when poorer sections were encountered or it was necessary to do development work. When the luck ran thin, the members of the cooperative spent as many as several months with a weekly wage only slightly higher than our workers earned in a month. The workers who had been left in their posts begged to be laid off so that they would have the right to join the cooperative, and the director had to issue a decree that there would be absolutely no more layoffs for any reason whatever. During the year it operated the cooperative processed about 100 tons of ore, with an official production on nearly 2000 ounces.

Besides the official production, there was a great deal of gold seeping out the seams in every direction. The members of the cooperative seldom went home with their pockets empty, and in the town there was a constant drumbeat of mortar and pestle from all sides. There were accusations and scandals, rumors and raids, and many went to jail, at least temporarily.

Outside the cooperative there were as many ambitious townspeople as ever, and at night the waters of the lagoon were full of surreptitious swimmers trying to rob the ore and tailings piles. As time went on and the cooperative got less cohesive, the raiders got bolder. One night in February 1990 about 9:00 PM the lights of the town went out in an exchange of submachine gun fire. The town spent a restless night sleeping in the hole without falling.

One night in February 1990, as the richest parts of the Hilo had apparently petered out, the cooperative reached an agreement with the company to grind and process the tailings and lower grade ore in the processing plant. This had a potential for creating difficulties, since mining law dictated that any ore ground in a processing plant belonged entirely to the state, but in any case laws have difficulty traveling as far as Siuna, with the roads as bad as they are.

However, in the end this plan also came to nothing, as do so many plans in Siuna. Although the Sandinistas (doubtless in part due to the bonanza of the Hilo) won the 1990 elections in Siuna, on a national level they lost by a goodly margin. With the elections lost, the cooperative began to have doubts about the future and the ability of the government company to carry through with agreements. They decided instead to give away the low-grade ore and tailings, and within an hour of having announced this, the pit was swarming like a wasps nest. At night it appeared as if the lower levels had been invaded by a plague of fireflies. No one was satisfied with just the tailings, and the cooperative could no more stop outsiders from entering the mine than the company was able to stop the cooperative a year before almost to the day. The wife of my chief surveyor, a tiny woman about 50 years old, boasted of how she had managed to climb down in the hole without falling.

Once again the hordes of hopeful small miners, the ice-cream vendors, dowdy old women with pots of soup, the small children hawking cakes and cold drinks, the bartenders and prostitutes, have made the pit their own. And the Hilo, faithless friend of the boldest, lives on.

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Performance Comparison of Passive Structures with Multiple Gates and Funnels for Capturing Contaminated Groundwater

Paul F. Hudak

Abstract

The objective of this study was to evaluate the capability of passive interceptors with multiple gates for directing the flow of contaminated groundwater. Linear structures consisting of multiple funnel (wall) and gate segments were aligned perpendicular to regional groundwater flow and fully penetrated a hypothetical unconfined aquifer. Five structures were evaluated: a structure with one interior gate, two structures with two gates, and two structures with three gates. Configurations with multiple gates included both interior and exterior gate positions. A particle tracking model and sub-regional water budget identified widths of capture zones and discharge patterns for each structure. Results suggest that, for equivalent total gate width, more (smaller) gates with exterior and central positions may enhance the overall performance of passive interceptors. Multiple gates more efficiently convey groundwater through structures and (especially external configurations) widen capture zones.

Introduction

Field and modeling studies demonstrate that permeable reactive barriers may be a viable alternative for capturing and treating contaminated groundwater in various settings (McMurtry and Elton, 1985; Puls et al., 1999; McGovern et al., 2002). By capturing naturally flowing groundwater, passive barriers use considerably less energy than alternative remediation systems. Passive interceptors may consist only of trenches filled with reactive media, or a combination of trench (gate) and funnel (wall) segments. Funnels direct contaminated groundwater toward permeable gate segments. Reactive media in gates promote physical, chemical, and/or biological processes that transform contaminants or reduce their concentrations to acceptable levels (Scherer et al., 2000). Requiring less reactive media, funnel-and-gate systems generally are less costly than gate-only systems of equivalent overall size (Striegel et al., 2001).

Previous authors modeled the performance of permeable reactive barriers (Eykholt et al., 1999; Gupta and Fox, 1999; Mayer et al., 2001; Elder et al., 2002; Hudak, 2004a, 2005; Hemsi and Shackelford, 2006) and funnel-and-gate systems with one gate (Sedivy et al., 1999; Bilbrey and Shafer, 2001; Cirpka et al., 2004; Hudak, 2004b). Starr and Cherry (1994) quantified the capability of several single-gate systems and illustrated capture zones for three multiple-gate systems. In that study, collinear systems with funnels on either side of a gate were effective among single-gate systems, and multiple-gate systems produced wider composite capture zones than single-gate systems. Gate segments had identical widths in alternative configurations.

The present study builds upon previous work by providing a quantitative comparison of width and discharge parameters for single- and multiple-gate passive interceptors. To facilitate performance comparison, total gate width was identical in alternative structures.

Methods

A numerical model, MODFLOW (McDonald and Harbaugh, 1988), simulated groundwater flow in a hypothetical, unconfined aquifer (Figure 1). The model utilized a block-centered finite-difference grid of 70 rows and 80 columns. Node spacing was 1 m along
rows and columns. Constant-hydraulic head (H) boundaries at the west (H = 7.5 m) and east (H = 7.105 m) edges of the model established a regional hydraulic gradient of 0.005 (west to east). Flow did not traverse the north, south, or bottom edges of the model. Elevation at the bottom of the model was 0 m. The water table formed the top of the model. Input hydraulic conductivity was 5 m/d, 50 m/d, and 0.0005 m/d for the aquifer, gates, and funnels, respectively. Effective porosity was 0.30 for the aquifer, 0.50 for the gates, and 0.40 for the funnels.

Simulated funnel-and-gate structures were collinear, perpendicular to regional groundwater flow, and 30 m wide. Five different configurations were evaluated, each having a total gate width of 6 m (Figures 1-3). These configurations included: a 6-m long interior gate (Configuration 1-I), two 3-m long exterior gates (Configuration 2-E), two 3-m long interior gates (Configuration 2-I), three 2-m long gates, with two exterior gates and one interior gate (Configuration 3-E), and three 2-m long interior gates (Configuration 3-I). Gates and adjacent funnels were 1 m thick and completely penetrated the unconfined aquifer. Funnels simulated slurry walls often used in practice.

PMWIN (Chiang and Kinzelbach, 1998) processed model input and output data, the latter including hydraulic head fields and groundwater discharge through model cells. From hydraulic head distributions and model input parameters, the PMPATH module of PMWIN calculated and displayed groundwater flow paths terminating at gates, as well as travel times along those flow paths. Flow paths collectively defined widths and shapes of infinite-time and time-dependent capture zones. PMWIN also computed sub-regional water budgets for different zones in the model, including groundwater discharge: (a) toward the area occupied by the interceptor structure (through the 30-m, western model boundary segment directly upgradient of the structure), (b) through gates, and (c) through funnels. Flow around the ends of structures was computed as (a) minus the sum of (b) and (c). Dividing (b) by (a) established relative discharge through the structure. Alternative configurations were ranked according to widths of infinite-time capture zones and relative discharge. Shapes of 500-d capture zones were also compared among configurations.

Figure 2. Capture zones for Configurations 2-E (top) and 2-I (bottom). Symbols: solid line – infinite-time capture zone; dashed line – 500-d capture zone; dotted areas – gates; Q – discharge through adjacent gate or funnel segment.

Figure 3. Capture zones for Configurations 3-E (top) and 3-I (bottom). Symbols: solid line – infinite-time capture zone; dashed line – 500-d capture zone; dotted areas – gates; Q – discharge through adjacent gate or funnel segment.
Results and Discussion

Discharge ($Q$) through the area occupied by the structure was 5.479 m$^3$/d. Despite equivalent total widths of gates and funnels, alternative structures produced markedly different results (Figures 1-3) (Table 1).

Table 1. Performance Comparison*

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Capture Zone Width (m)</th>
<th>Relative Discharge (%)</th>
<th>Average Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-I</td>
<td>16.39-17.89 (5)</td>
<td>51.8 (5)</td>
<td>5</td>
</tr>
<tr>
<td>2-E</td>
<td>19.36-30.14 (2)</td>
<td>58.6 (4)</td>
<td>3</td>
</tr>
<tr>
<td>2-I</td>
<td>19.60-21.76 (4)</td>
<td>62.9 (3)</td>
<td>3.5</td>
</tr>
<tr>
<td>3-E</td>
<td>22.25-30.03 (1)</td>
<td>69.9 (1)</td>
<td>1</td>
</tr>
<tr>
<td>3-I</td>
<td>21.34-23.70 (3)</td>
<td>68.8 (2)</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*Rank in parentheses (capture zone rank based on midpoint of width range).

Configuration 1-I produced a relatively narrow capture zone, ranging from 16.39-17.89 m wide. The midpoint of the width range was 17.14 m, or approximately 57.1% of the total width of the interceptor. Though narrow, the infinite-time capture zone had relatively uniform width, varying by only 1.50 m over the model domain. Such uniformity facilitates capturing a similar width (measured perpendicular to regional groundwater flow) of contaminated groundwater both close to and farther upgradient of an interceptor. The upgradient edge of the time-dependent capture zone conformed to that of a typical contaminant plume, thus facilitating capture within a prescribed time frame. Total discharge through the gate and relative discharge were lowest, and end flow was highest, for Configuration 1-I compared to the other configurations. A small amount of water passed through the funnels, consistent with their low hydraulic conductivity.

Characterized by two smaller gates, Configuration 2-E produced a time-dependent capture with two distinct lobes propagating upgradient of the interceptor. The time-dependent capture zone extended the least upgradient of the funnel segment’s midpoint. Groundwater approaching the midpoint of the structure took longer pathways and moved more slowly toward either gate; this tendency delays plume capture and reduces total gate discharge. With multiple gates accessing different areas, Configuration 2-E discharged more groundwater than Configuration 1-I. However, total gate discharge for Configuration 2-E was low among the entire set of alternatives. More groundwater flowed through the funnel(s) in Configuration 2-E than in other configurations, though this amount was low relative to gate discharge.

The infinite-time capture zone for Configuration 2-E attained much greater width, but also had considerably more range in width, than for Configuration 1-I. Relatively wide near the interceptor structure, the capture zone for Configuration 2-E tapered abruptly upgradient of the structure. This pattern reflects divergent flow induced by the interior funnel segment.

Groundwater passed more efficiently through Configuration 2-I. Interior gates and smaller funnels induced less outward flow, and the infinite-time capture zone had relatively uniform width. Groundwater flowing toward the middle of the interceptor moved more efficiently through either gate; thus, variations in the upgradient edge of the time-dependent capture zone were less pronounced for Configuration 2-I. Total gate discharge for Configuration 2-I was the median of the five configurations.

Configuration 3-E discharged the most groundwater through gates and the least groundwater through funnel segments and around the ends of the interceptor. A relatively large number of gates, including one in the center of the structure, efficiently captured groundwater relative to alternative configurations. Width of the infinite-time capture zone tapered upgradient of the structure, though not as pronounced as for Configuration 2-E. Average width of the infinite-time capture zone for Configuration 3-E was also highest among all configurations.

The irregular upgradient edge of the time-dependent capture zone for Configuration 3-E reflects alternating funnel and gate segments in the interceptor. Similar to other configurations, the time-dependent capture zone extended the least upgradient of the funnels and farthest upgradient of the gates. Configuration 3-I had the second highest gate discharge of alternatives, reflecting a relatively large number of gates. Interior gate positions produced a relatively uniform infinite-time capture zone. The time-dependent capture zone was similar to that for Configuration 2-I, but with three lobes instead of two, resulting from three interior gates.

Results outlined above suggest that, for equivalent total gate width, interceptors with more gates may outperform those with fewer gates. More gates allow water to pass through interceptors more efficiently, with less groundwater moving through funnel segments or around the ends of structures. Using three gates enables placing one in the center of an interceptor while maintaining structural symmetry, an efficient arrangement for capturing groundwater. More gates (especially exterior positions) also widen capture zones, thus expanding the influence of interceptor structures. Upgradient edges of time-dependent capture zones for multiple-gate structures are irregular, extending the farthest and least upgradient of gate and funnel segments, respectively.

Particle tracking simulations such as those performed in this study may be effective for evaluating potential interceptor configurations. However, site-specific field and laboratory studies (Morgan et al., 2005), and mass transport simulations, should accompany particle-tracking analyses when designing interceptors in practice. Hydrologic and chemical monitoring should verify the performance of operating structures (EPA, 1998).

Passive interceptors are not suitable for all situations. For example, it may take too long for contaminated groundwater to move through interceptors in aquifers with low hydraulic conductivity. While interceptors may be excavated using several methods (Gavaskar, 1999), bedrock, buildings, and other structures may restrict or prohibit their use as...
remediation alternatives. In deep aquifers with predominantly horizontal flow, partially penetrating (hanging) interceptors may be an effective alternative to fully penetrating structures, which may be too costly or difficult to install.

References


Working in a Foreign Country
One Geologist’s Experiences, Realizations and Advice

William C. Feyerabend Jr., CPG-11047

The phone rings. The line crackles. “Hello. I’m calling from Timbuktu.”

Timbuktu. Peru? It could be from anywhere in the world. It is your wake-up call: a job prospect in a foreign country. It is your opportunity to become an expatriate – not to be confused with ex-patriot. You’re still free to pay taxes. In fact, on my first job I paid American and foreign taxes. Still, it was a financially lucrative and educational experience.

It is also a great way to rack up frequent flyer miles. Once I only dreamed of seeing the Nazca Lines, the pyramids, Machu Picchu, Angel Falls or Foz do Iguacu. Now, “I’ve been there, done that”.

For me, working in foreign countries was a great career move. In this day when one’s employment address changes with the seasons, working in foreign countries opens a much wider playing field for potential employment. When I went thru the corporate downsizing in 1992, I found six job openings nationwide for geologists and three of those were with a company that within six months chucked out all their geologists. The complete lack of hope for domestic employment forced me to look elsewhere and the elsewhere that worked was in the southern hemisphere, south of the border.

I had assumed there was no reason to go foreign because those countries probably generated all the geologists they needed through their universities. I was half wrong and therein was the key to my continued employment.

Make no mistake, foreign university graduates are some very well trained geologists. In my experience, what these new graduates lack, as do many practicing geologists is experience that they could not possibly have, because their countries have only recently been opened up to ideas and development. They can identify Prousite, but they do not know how to do reconnaissance and they do not know how to manage a development drilling program. There is a real need for professionals experienced with implementing new ideas for exploration and development to provide that experience. From talking with engineers and metallurgists, the same probably holds true for their fields.

Note that there may be a built-in career booster with such employment here. The need is for experienced people to manage things. Had I survived all the changing of and disappearing of employment addresses, I would probably be just as proficient at logging chips and core and constructing sections. Since I didn’t survive, I now have experience managing projects drilling up to 20,000 feet a month thru the pre-feasibility audit. I have acquired the language and cultural skills to work from Alaska to Argentina, which provides a much larger job catchment basin than Reno alone. Those language and cultural skills are extremely important to one’s success and longevity in many foreign locations.

Still, working overseas is not for everyone. I’ve heard anywhere from half to 90% of Americans that venture out return within a year. There are some real negatives.

Like returning in a coffin. There is an undeniable element of danger. I have to admit that I was a bit taken back when one geologist in Peru told me, “I’ve been here two years and have met eight Americans. Three are still alive, including you and me.” Granted, a truck load of American geologists driving off an Andean cliff at night made a dent in his Christmas card list. Looking back, my own personal experience includes having one acquaintance executed by Sender Luminoso. I’ve been detained for a day by village vigilantes, rolled over at 4:30 AM to see a burglar walking by the bed with an arm full of things from the bathroom and been jumped by three guys with pistols while parking the car at my house. My total loss through all of this was less than $100. I lost far more when all the wedding gifts were stolen from my luggage passing thru the Caracas airport or when my wallet was lifted in the La Paz bus station as I started days off.

One of the hard parts of working overseas is accepting that you do stand out and are an easy and probably profitable target for stalking. Yet, if you let that control your life, you have constructed your own prison and become the off-kilter parody of a sane professional. One can be appropriately cautious and still be open to the great friendships that the world has to offer.

Illness is another issue. You’re practically guaranteed to get sick — a lot sicker than tourist tummy. There are some serious bugs out there that your body has never seen. Drag those back with you and you’ll probably end up paying a lot of money playing stump the American doctors. My experience is that it is better to go to a nearby city where the doctors know the local stuff and know how to treat it. Plus you can amuse your friends with stories about the natural curiosity of all the clinic nurses and even the receptionists who are given the opportunity to see a foreigner in a medical examining position. In time you even learn some local tricks. Always wear a woolen scarf around the neck in the high mountains and put plugs of wadded up toilet paper in the ears when bathing in the tropics.

A potentially sticky point is dealing with the nationals on a project. Your reception can range from respect for your experience to jealousy that you are there. When there are problems, one needs to remember that you’re the new guy on the block. You cannot outplay them at their games and they have friendships going back long before your arrival. It is best to stick to what you were brought in to do: bringing professional experience...
to bear on a project – and keep your options open.

The phone call from a potential foreign employer should make you think about all of those things and what you really want in life. Do you want travel and adventure? Would you have left coastal Virginia and walked across the North American continent in 1849? Its easy to say yes, but when you look around you realize that the people who pioneered Canada and the United States begat an awful lot of people that pretty much stayed put. Very few people are wanderers at heart. Human behavior is generally pretty rational and it is usually pretty hard to leave everything behind. Most who do, do so because they’re in a personal situation where there’s more to potentially be gained by moving on, and staying put doesn’t look all that attractive. After all, there is some sense of foregoing that goes with the going.

Like foregoing American plumbing. The feeling is difficult to describe when you’re standing in the shower all lathered and shampooed up and the water peters out. One quickly learns two things: wash thy body in sections and a pail of water in the shower is a beautiful thing. And, yes, do carry all the toilet paper you could possibly need folded up in a pants pocket.

Like foregoing good old American food. To the American palate, most foreign food ranges from kind of OK to getting your stomach pumped in reverse. You know those fuzzy animal slippers with the cute animal heads over the toes. Fry them up and you pretty much have the Andean delicacy cuye that looks back. Casaba tastes precisely like a paper napkin. One geologist noted, “I can see making an arepa one time by using that order. Deal with a settlement for exploration access across to their communal lands and they’ll present you with a wish list; better schools, better roads, better health care and a better future for their kids.

On another level, you find that we are different. The economy in many countries is incredibly informal. Commercial streets are crowded with people, litter, hawkers and serenaded by a cacophony of jaunty music blaring out from dueling ghetto blasters. Huge amounts of goods are sold by street vendors, kiosks and tiny, hole-in-the-wall shops. My favorite were two shops, about 12 by 12 feet, in Bambamarca, Peru, which sold only beer and toilet paper. I’ve always wanted to see their vision statement.

Some cultures just rest on a different foundation. Go at 9AM to a veterinarian’s office that shows hours of 8:30 to 5:00 and you can join the line of people waiting for him. Which is better from the vet’s standpoint. Show up at 8:30 and take people and their pets as they come in or show up at 11AM and have a waiting room full of people that are so glad to (finally) see him. My Iowa German upbringing leans towards the former. A whole lot of world operates on the latter. Everyone complains and uses an Army phrase about how their society works (or doesn’t), but that is how they do it.

Those societies actually have a certain charm because they work on the basis of friendship, not some abstract idea of customer service. There is a saying in Brazil: for my friends, anything; for my enemies, the law. Slip some chocolates to the vet’s secretary or someone in the bank and pretty soon they will help you get your business done in a reasonable time.

There are other charming aspects. In the United States, we are raised to expect a certain orderly timetable to life. We expect to be students in our teens, have children in our twenties, raise them in our thirties and become grandparents in our forties. Life is ordered like the seasons and only dirty old men mess with that order.

But there is no natural law that life should be such. In a big part of the world, there are no seasons as we recognize them and life is disordered and is for anyone with the energy to jump in and enjoy. A 54 year-old driller was telling me once about talking with his girlfriend’s 16 year old sister. He asked her what she thought about her sister going out with an older man. She gave him a blank look and said, “My boyfriend is 32.” While it is a man’s world, I’ve seen several examples of the same happening to women.

I fit a common Latin pattern when at age 50 and three days, Rosanna Gabriela Feyerabend Palomino was born in Venezuela of Peruvian and American stock. It is an entirely normal fate of gringos who wander south of the border. One Caracus columnist wrote that his Venezuelan daughter plays with his American grandchildren when he visits his kids in California. I think we all share a sense of amused disbelief that it really happens to us. But it is and it is like getting to do your twenties over again, but with more wisdom and less hormones. And Gabby is here because I said yes to the phone call.

Dirty, dangerous, fun, exciting, interesting, challenging, rewarding: working overseas is all of those. It pegs my meter.

Don’t Miss the AIPG 2007 Annual Meeting
Traverse City, Michigan
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Register Online at www.aipg.org
The ‘Where In Michigan?’ photograph in the last issue of TPG (Photograph 6) was of Natural Wall Ravine, which is located approximately 2.5 miles east of Calumet/Laurium in Houghton County of Michigan’s Upper Peninsula. The Natural Wall is a bed within the Jacobsville Sandstone which has a near vertical attitude. Because it is more resistant, it forms a wall which extends outward from the walls of a steep-sided erosional ravine. The generally flat-lying Jacobsville Sandstone has been folded and turned to a near vertical attitude at this location, due to the close proximity (approximately 1,200 feet) to the Keweenaw Fault. The Keweenaw Fault is a reverse fault that juxtaposes the older Portage Lake Volcanic rocks with the younger Jacobsville Sandstone. The Jacobsville Sandstone is approximately 1.0 billion years old.

Congratulations to Mike McDuffee, CPG-09332, for correctly identifying the last Michigan contest photo.

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Michigan Section

The March 1, 2007 Michigan Section meeting was held at Tony M’s in Lansing, Michigan. At the meeting, the 2006 Educational Advancement Award was presented to Mr. Chad Scholten and Ms. Susan Tolbert of Forest Hills School District located near Grand Rapids, Michigan. The award is worth $1,000.

The July 26, 2007 Michigan Section meeting was the Woodland Meadows Landfill tour and presentation in Wayne, Michigan.

Mr. Eric Wallis, CPG-09518, of Waste Management lead the landfill tour and presentation.

Timothy Woodburne, CPG-10532

New Mexico Section

The New Mexico section held its spring field trip and meeting on April 14, 2007. The field trip was to the Blanchard Mine in Bingham, New Mexico where owner Ray DeMark made his claim available to AIPG members and students for collection of blue fluorite, galena, barite and other mineral specimens. New Mexico Tech geologist Dr. Virginia McLemore, CPG-07438, led the field trip and provided an on-site introduction to the geologic history of the Bingham area. AIPG stalwart Dr. John Hawley, CPG-02309, is shown at the mine access as he assisted students entering the tunnel.

After the field trip, a general business meeting, well attended, was held at the El Sombrero restaurant in Socorro.

Bill J. Siok, CPG-04773
North Carolina Section

The Carolinas Section of the American Institute of Professional Geologists (AIPG) in conjunction with PCS Phosphate Mine sponsored a North Carolina coastal geology field trip on Friday, October 6, 2006 at the PCS Phosphate mine in Aurora, North Carolina. Tex Gilmore, CPG-06039, the consummate host, developed and led a great field trip. I believe there is still debate on whether the geology or lunch was the best part of the trip. The weather was perfect and the small number of attendees provided for a very personal one-on-one discussion with Tex and other folks on the trip. David Wiley, CPG-07086, with Leggette, Brashears & Graham, one of PCS Phosphate’s long time hydrology consultants was in attendance and was able to add his expertise and knowledge about the hydrology of the mine’s dewatering system.

The field trip consisted of about a half dozen stops located throughout the mine. The first stop allowed us an opportunity to view the top 85 to 100 feet of Quarternary sediments. The sediments consist of the Post-Croatan gumbo clay and sugar sands. These sediments are too soft for the large drag lines to sit on so they are stripped with bucketwheel excavators. The sediments are transferred to the spoil piles by conveyor belt. The next stop on the tour included an up-close and personal encounter with the large drag lines. Wow, these are big toys. After a few photo opportunities on the outside of the drag line, we were able to enter the cabin with the operator, where we were treated with a bird’s eye view of what the operator sees as they remove the remaining overburden to get to the phosphate ore. The drag line removes approximately 100 feet of Pliocene and Miocene sedimentary rock, including the Yorktown and Pungo River Formations, to reach the ore. From the vantage point of the operator, the bucket on the drag line looks small, but up close, you could park a dozen vans full of excited geologists in it. After observing the mining operation, we observed the groundwater dewater system and mine reclamation and wetlands program. The reclaimed areas are a naturalist’s dream.

After the field trip, the mine staff treated us to a seafood buffet, which included flounder, shrimp, oysters, baked potatoes, hush puppies, and any drink you wanted. Lemon meringue pie topped the meal off. After lunch those that were still awake had a brief meeting. As a way to increase membership, we entered the names of new members in a drawing for the new fifth edition of the GSA Glossary of Geology. We had six new members sign up and were able to put their names in the hat. Walt Plekan, MEM-0928, walked away with the prize. After lunch we toured the Aurora Fossil Museum and then spent a little time looking for fossils. A few of us cheated and purchased shark’s teeth instead of digging through the spoils. If you are in Aurora on Memorial Day, make sure you bring a shovel and pail and take part in their fossil day celebration. The town, mine, and a group of volunteers have done a fantastic job developing an educational master piece with the museum. It is definitely worth the trip.

We want to thank Tex Gilmore, PCS Phosphate Mine, and Leggette, Brashears & Graham, Inc. for making the field trip possible. We hope to see them again.

John Stewart, MEM-0704, Carolinas Section President

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The 43rd Forum on the Geology of Industrial Minerals was held on May 20-25, 2007 in Boulder, Colorado. The photo on the right was taken at the site of the former marble mill in Marble, Colorado during one of the field trips. Jim Cappa, CPG-11017, was the field trip leader and co-chair of the 43rd Forum Committee. He is standing next to an octagonal piece of Yule Marble originally cut for the Lincoln Memorial in Washington, DC. This piece failed to meet specifications and was rejected.

AIPG Booth at the 43rd Forum on Industrial Minerals 2007

Emma Schlundt from AIPG Headquarters staffs the booth at the 43rd Forum.

Jim Cappa standing next to an octagonal piece of Yule Marble originally cut for the Lincoln Memorial in Washington, DC. Photo taken by David Abbott.

Website Can Aid in Searching for Groundwater-Quality Data

Lexington, KY. – Over 850,000 Kentuckians depend on groundwater for their domestic water supply, and they use about 200 million gallons per day, or 5 percent of the total water usage for the state. Knowing the quality of that water is important, and the Kentucky Geological Survey has just made it easier to find out how pure the water is. Through an Environmental Protection Agency grant awarded by the Kentucky Division of Water, KGS personnel have enhanced and streamlined online searching for water-quality data in Kentucky. Users can now select individual or multiple water quality parameters, view search results in either tabular or map format, and download the data to “delimited text files” for use in spreadsheets or various GIS software packages.

The source of this information is the Kentucky Groundwater Data Repository, maintained by KGS. To date, 38 parameters in five major categories (water properties, volatile organic compounds, nutrients, pesticides, and inorganic solutes) can be searched either as an entire group or by individual compound or analyte. Each analyte also has an associated text file with descriptive information about the substance, possible health hazards, and EPA drinking-water standards. Users can search the entire state; a county or multiple counties; USGS 7.5-minute quadrangles; or by a radius-search from a user-specified location (the user also specifies the radius).

The groundwater data include samples collected between the 1940’s and the present, from both springs and water wells. Data searches can be formatted to include all sample data for every location for which records are available, or as a summary report that provides the median, maximum and most recent result values. The number of samples with chemicals below detectable levels is also included in the summary report. Search results can be sorted by sampling date or by a range of dates.

“In the past, finding groundwater-quality information for your area has been difficult” says Steve Fisher, a KGS hydrogeochemist and principal investigator of the project. “Often one would have to visit several state or county agencies to obtain this information, if it was even available, and it would be difficult to interpret,” says Fisher.

“The new website allows users to search for specific groundwater analyses in their area quickly and easily,” adds Bart Davidson, a KGS geologist who assisted with the project. “With a few mouse clicks, they can then see the site locations displayed on a map and download the data for their personal use.”

“We have tried to make the search process as user-friendly as possible,” says Doug Curl, the Web designer for the new site, “by providing several online help functions to ensure that the users are able to find exactly what they need.”

Additional web sites are listed so a user can find information about maximum contaminant levels set by the Environmental Protection Agency, as well as information from other Kentucky groundwater data sites for agencies including the Kentucky Division of Water and the U. S. Geological Survey.

The new groundwater-quality search engine can be accessed online at the Survey’s web site, http://kgsweb.uky.edu/DataSearching/Water/WaterQualSearch.asp.

For more information on water-quality or water-well data, contact the Survey at 859-257-5500 x162.
Purpose
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Each student who is awarded a scholarship agrees, by accepting the scholarship, to prepare a 600 to 800 word article for publication in The Professional Geologist. The subject of the article must be related to a timely professional issue.

Application Process
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For questions regarding the application process call (303) 412-6205 or e-mail: aipg@aipg.org.

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