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### AIPG 2008 Annual Meeting Information

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**CAPTION CORRECTION FOR MAR/APR 2008 ISSUE: ON THE COVER - Havasu Falls, over 100 feet high, is one of the most beautiful plunge waterfalls in the United States. This is one of three magnificent waterfalls along Havasu Creek, part of the Grand Canyon drainage system of northwestern Arizona.**
Announcing
AIPG’s 45th Annual Meeting
in Flagstaff, Arizona!

On behalf of AIPG, I am pleased to announce the 45th Annual Meeting will be held in Flagstaff, Arizona from September 20th through 24th, 2008. The 2008 meeting is in conjunction with the Arizona Hydrological Society’s (AHS) 21st Annual Symposium and the 3rd International Professional Geology Conference. The organizing committee includes members from each organization. The organizing committee is co-chaired by Dr. David Best, Professor of Geology at Northern Arizona University (NAU), for AIPG and Dr. Aregai Tecle, Professor of Hydrology at NAU, for the Arizona Hydrological Society (AHS). Dr. Robert Font, for AIPG, is the chairperson of the 3rd IPGC. As you can see, this is a team effort and it will be a great meeting!

The world of geoscientists is a diverse community of professionals who work to discover and develop the resources needed to sustain and enhance life and contribute to each nation’s economy, environment, public health and welfare. Exploration and responsible development of energy and mineral resources, and water resources are a few of the many contributions made by geoscientists. The many roles of geoscientists led to the development of the theme for this conference: Changing Waterscapes and Water Ethics for the 21st Century and the 3rd IPGC theme of Global Geoscience Practice, Standards, Ethics, and Accountability. The conference includes a broad range of topics proposed for the presentations of technical talks and poster sessions. The topics include: artificial recharge, aquifer restoration, border conflicts, forest watershed management, groundwater issues and ethics, human vs. ecosystem needs, land subsidence, professional ethics, Southwest water policy issues, surface water – groundwater issues, tribal water practices, urban and rural water policies and practices, water law, water use and water quality of mining operations, and water ethics in a changing global climate. The concurrent 3rd IPGC technical sessions include: Training, Credentials, and Continuing Professional Development of the Global Professional Geoscientist, Professional Ethics and the Global Geoscientist and Expanding International Influence and Reach; Overcoming Challenges and Mapping Successful Strategies. Please be sure to look at the Call for Abstracts for the complete list of these timely topics and check the web site for additional information.

We have planned an exciting meeting with two days of technical sessions, several pre- and post- conference informative and instructional workshops, and several days with field trip opportunities to explore the geology and enjoy the scenery of northern Arizona. The welcoming reception and technical sessions will be held at the new High Country Conference Center on the campus of NAU in the city of Flagstaff. This state-of-the-art facility offers spacious meeting rooms and reception areas with spectacular views of the San Francisco Peaks. The field trips include the Grand Canyon, Fossil Creek, Flagstaff area, Walnut Canyon and Lake Mary; the red rocks of Sedona, Jerome mining district, Montezuma’s Castle and Well, Meteor Crater, Sunset Crater and Wupatki. And, we have planned several social functions featuring southwestern entertainment at the Radisson Hotel, at the High Country Conference Center, and at the Museum of Northern Arizona.

Flagstaff is a wonderful location for our meeting. It is the gateway to the Grand Canyon and so many other spectacular geologic and cultural sites. Walking in Flagstaff is quite enjoyable with the historic area and shopping located close to the Radisson Hotel (the conference headquarters) and the nearby High Country Conference Center. The NAU campus is so picturesque and the San Francisco Peaks dominate the view.

So, come to Flagstaff, Arizona, for the AIPG 45th Annual Meeting!!!!

Barbara Murphy, CPG-06203
AIPG Arizona Section President 2008
General Chairperson AIPG/AHS/3rd IPGC Conference
Welcome to Flagstaff!

I echo Barbara Murphy’s welcome to Flagstaff and to the 3rd IPGC!

The AIPG is delighted to have the opportunity to organize and co-host this important meeting and is honored to have your countries, organizations and representatives as part of the exciting venue. We also welcome the opportunity to give you a taste of the American West and to showcase some of our breathtaking geological features. We certainly hope to follow in the tradition of excellence set forth during our previous two meetings in Spain and the UK, where our local hosts (ICOG and The Geological Society) performed so admirably.

As Barbara pointed out, a great deal of effort has gone into preparing this conference. We have selected a truly outstanding geological location to hold this convention. We have worked hard to make the 3rd IPGC an up-to-the-minute professional gathering with expanded international and domestic participation.

The IPGC forums are used to outline issues affecting the geological profession and professional practice across domestic and international boundaries. The IPGC meetings are also opportunities to exchange ideas on how to solve geoscience-related problems at both regional and global scales. Specifically, the 3rd IPGC will showcase representation from professional organizations from the USA, Canada, Spain, Germany, Belgium, The Netherlands, Ireland, UK, Sweden, Australia, and other countries.

This year, a special effort has been made to have representatives from as many different disciplines as possible within the field of the geosciences in order to address a variety of professional issues of importance to all. Topics to be discussed include:

- **Training, Credentials, and Continuing Professional Development of the Global Professional Geoscientist**
  - Distance learning.
  - The practicality of professional credentials.
    - Professional titles as passports.
  - CPD compliance.
  - Training of the 21st century geological scientist.
    - Current and future topics; what we will need to know.
    - Interaction between academia and industry.
    - Attracting students to our profession.

- **Professional Ethics and the Global Geoscientist**
  - The professional geologist’s role in the protection of the general public.
    - Consulting and licensure, ethics and society.
  - Review of professional international disciplinary procedures.
    - Procedures, systems and actions.

- **Expanding International Influence and Reach; Overcoming Challenges and Mapping Successful Strategies**
  - Societal benefits of geology; how geology can help in social development.
    - Mineral resources and mining.
    - Fulfilling global energy needs.
    - Geology and the world’s water supply.
    - Geologic mapping; the foundation of development.
  - Effectively communicating our message.
    - Geology and politics.
    - Geological legislation: helping the change to happen.
    - Natural hazards in planning policies: Global examples.
  - Great contributions of geology to mankind.
    - Geological Heritage: past, present and future.
  - Geological professional associations: role and global experiences.

We look forward to seeing you in Flagstaff! We will do all within our power to make this a memorable experience for you and look forward to the honor of your presence!

Robert Font, CPG-03953
3rd IPGC Chairman
2005 AIPG National President

Photo by Larry Fellows
### Wednesday, September 17, 2008
- **9:00 am Depart**: 3-Day Backpack Trip (9/17-9/19)

### Saturday, September 20, 2008
- **7:00 am - 5:00 pm**: Registration at Radisson
- **7:00 am - 8:00 am**: AIPG - Executive Committee Breakfast
- **8:00 am - 12:00 pm**: AIPG - Executive Committee Meeting
- **12:00 pm - 1:00 pm**: AIPG - Foundation Luncheon
- **1:00 pm - 4:00 pm**: AIPG - Advisory Board Meeting
- **4:00 pm - 5:30 pm**: AIPG - Joint Executive Committee Meeting and Business Meeting
- **8:00 am - 5:00 pm**: Field Trip - San Francisco Volcanic Field
- **8:00 am - 5:00 pm**: Field Trip - Lake Mary/Walnut Creek Watershed
- **9:00 am - 4:00 pm**: Workshop - Writing for the Reader: Strategies for Communicating Technical Information Effectively
- **9:00 am - 4:00 pm**: Workshop - Water Education - Project WET
- **9:00 am - 4:00 pm**: Workshop - GIS I - Introduction to ArcGIS for the Earth Scientist

### Sunday, September 21, 2008
- **7:00 am - 5:00 pm**: Registration at Radisson Hotel
- **12:00 pm - 4:30 pm**: Workshop - GIS II - Introduction to ARC Hydro
- **12:00 pm - 4:30 pm**: Workshop - Students, Your First Steps in the Profession and the Future
- **9:00 am - 4:00 pm**: AESE - Surveys Breakfast Meeting
- **7:00 am - 9:00 am**: AIPG - Past President’s Breakfast
- **8:30 am - 10:00 am**: Plenary Session/3rd IPGC
- **8:00 am - 5:00 pm**: Exhibits Open
- **10:00 am - 5:00 pm**: Technical Sessions/3rd IPGC
- **11:30 am - 1:00 pm**: AESE - Business Meeting Luncheon
- **12:00 pm - 1:00 pm**: AHS - Awards Luncheon
- **5:00 pm - 6:00 pm**: AHS - Membership Meeting
- **8:00 am - 5:00 pm**: Field Trip - Grand Canyon Sightseeing
- **8:00 am - 5:00 pm**: Field Trip - Jerome Mining District/Sedona
- **6:00 pm - 8:00 pm**: Dinner and Cultural Entertainment Event at Radisson

### Monday, September 22, 2008 (continued)
- **7:00 am - 6:00 pm**: Registration at Radisson Hotel
- **7:00 am - 6:00 pm**: Registration at High Country Conference Center
- **7:00 am - 9:00 am**: AESE - Freelancer’s Breakfast
- **8:00 am - 5:00 pm**: Exhibits Open
- **8:00 am - 5:00 pm**: Technical Sessions/3rd IPGC
- **8:30 am - 5:30 pm**: AESE - Sessions
- **12:00 pm - 1:00 pm**: Luncheon with Speaker
- **8:00 am - 5:00 pm**: Field Trip - Sedona
- **8:00 am - 5:00 pm**: Field Trip - Meteor Crater
- **6:30 pm - 8:30 pm**: AESE - Awards Banquet
- **6:30 pm - 8:30 pm**: Reception/Awards at the Museum of Northern Arizona

### Tuesday, September 23, 2008
- **7:00 am - 6:00 pm**: Registration at Radisson Hotel
- **7:00 am - 4:00 pm**: Registration at High Country Conference Center
- **7:00 am - 8:00 am**: AESE - Freelancer’s Breakfast
- **8:00 am - 3:00 pm**: Exhibits Open
- **8:00 am - 5:00 pm**: Technical Sessions/3rd IPGC
- **8:30 am - 5:30 pm**: AESE - Sessions
- **12:00 pm - 1:00 pm**: Luncheon with Speaker
- **8:00 am - 5:00 pm**: Field Trip - Sedona
- **8:00 am - 5:00 pm**: Field Trip - Meteor Crater
- **6:30 pm - 8:30 pm**: AESE - Awards Banquet
- **6:30 pm - 8:30 pm**: Reception/Awards at the Museum of Northern Arizona

### Wednesday, September 24, 2008
- **8:00 am - 9:00 am**: AESE - Board Meeting
- **7:00 am - 8:30 am**: AESE - Board Meeting
- **8:30 am - 4:00 pm**: Workshop - Important Areas of Law-What Does the Future Hold?
- **8:00 am - 5:00 pm**: Field Trip - Grand Canyon/South Rim
- **8:00 am - 5:00 pm**: Field Trip - Flagstaff’s Water Supplies: Past, Present, and Future
- **8:00 am - 5:00 pm**: Field Trip - Montezuma Castle National Monument and Well
- **9:00 am Depart**: 3-Day Backpack Trip (9/24-9/26)
Field Trips

3-Day Backpack Trip

Date: Wed., Sept 17th to Fri., Sept 19th or Wed., Sept 24th to Fri., Sept 26th
Time: Depart at 9:00 am from the Radisson Hotel
Cost: $275/$345 (includes box lunch and beverages)
Leader: Dave Palmer, CPG-09960

There is no better way to experience the geology of the Grand Canyon than to view it from the bottom up. This 3-day backpacking trip will examine the geologic formations that display 1.7 billion years of earth’s history, from the Precambrian metamorphic basement rocks at the canyon bottom along the Colorado River to the Permian sedimentary rocks exposed on the canyon rim. On Day 1, we will backpack down 4.5 miles to Indian Garden campground (3 to 4 hours), stopping along the way to study upper Paleozoic rocks. After making camp and unloading our gear, we will have an evening meal, then hike 3 miles to Plateau Point (3 hours round trip) to an overlook of the river below to discuss the geologic history of the Grand Canyon area and view the sunset, weather permitting. On Day 2, after breakfast, we will hike 5.5 miles down to the river and Phantom Ranch, studying the lower Paleozoic and basement rocks along the way. After lunch, at the river, we will hike back up to camp at Indian Garden (8 hours round trip). On Day 3, we will backpack out of the canyon (3 to 4 hours). Dave Palmer will lead the field trip, with logistical support and a guidebook provided by the AIPG Arizona Section.

The trek into and out of the Grand Canyon is strenuous and requires participants to be in good physical condition and be able to hike steep, narrow trails in extreme conditions while carrying a 30(+)-pound pack. The elevation at the rim is 7,000 feet, with less oxygen and cooler temperatures (70 to 80°F), while at the canyon bottom, it can be 100°F in September. Participants will be provided all basic camping equipment including pack, tent, sleeping bag and pad. Meals and cooking equipment will be provided and prepared by a support crew. Participants will need to provide and carry personal items including clothing, water, camera and guidebook, and wear sturdy hiking boots. Detailed information will be provided to each participant before the trip. This trip will take place prior to the meeting and also after the meeting.

San Francisco Volcanic Field

Date: Saturday, September 20th
Time: 8:00 am to 5:00 pm from the Radisson Hotel
Cost: $100/$150 (includes box lunch and beverages)
Leader: Dr. Michael Ort

The San Francisco volcanic field is located north of Flagstaff, Arizona. It contains some 600 cinder cones, as well as five large composite volcanoes. This geologic field trip will take a look at some of the youngest cinder cones of the field, in the northeast sector. We will start at Sunset Crater National Monument, which contains a colorful cinder cone and crater that erupted into part of what was likely the most agriculturally productive sector of the Flagstaff area. This eruption occurred about AD 1083 and eventually led to new agricultural techniques and settlements at previously uninhabited (on a year-round basis) altitudes to the north. The field trip leader, Dr. Michael Ort of Northern Arizona University, has worked extensively on the interactions of humans with this volcano, so he will discuss these in detail, as well as explaining the eruption story. We will then continue through Wupatki National Monument, looking at the countryside to which people moved and examine the well-preserved Wupatki ruins. We will also stop at Doney Mountain, a ~70,000-year-old cinder cone that erupted along a fault, producing a fissure eruption with several cones. We will then head to SP Crater, a very young cinder cone with a fantastic lava flow field to explore. Finally, if time permits, we will go to Colton Crater, a large cinder cone that was erupting and building when groundwater gained access to its plumbing. This water flashed to vapor and provided the force for some large explosions, blowing out a large and spectacular crater. Some of this field trip includes short hikes in rugged, high desert terrain, and sturdy hiking boots are recommended.

Lake Mary/Walnut Creek Watershed

Date: Saturday, September 20th
Time: 8:00 am to 5:00 pm
Cost: $100/$150 (includes box lunch and beverages)
Leader: Paul Whitefield

This geologic and hydrologic field trip will provide an integrated overview of the geology, hydrology, and land use history in the Lake Mary/Walnut Creek watershed, along with post-settlement changes in the ponderosa forest, watershed function, and Walnut Canyon riparian corridor. We’ll drive through the scenic ponderosa forest of the Mogollon Highlands region southeast of Flagstaff, with the San Francisco Peaks lying on the northern horizon and reflecting in several lakes along the way. The trip will first visit Mormon Lake, the largest natural lake in Arizona, created as lobes of basalt from the Mormon Mountain volcanic field encircled to form a basin. We will stop in areas that demonstrate ponderosa pine forest changes over the last 140 years, and discuss effects on watershed function. The trip then returns to Upper Lake Mary and Lower Lake Mary, man-made reservoirs constructed in 1941 and 1904, respectively. The lakes fill a narrow graben, bounded on the northeast by the Lake Mary Fault, with Anderson Mesa on the up-thrown side. The surface bedrock in the graben is fractured and jointed Kaibab Limestone,
with leakage along the fault greatly compromising the ability of the lower lake to hold water. After lunch along one of the lakes, we will hike about 3 miles near Walnut Creek, from the base of the Lower Lake Mary Dam to where the creek enters Walnut Canyon. The canyon walls quickly rise to 400 feet, with the Kaibab Limestone, Toroweap Formation, and Coconino Sandstone exposed from top to bottom. During regional uplift, the sinuous Walnut Creek stream course was captured in the erosionally resistant limestone, and the modern topography reveals strong geologic structural control by local faults and fractures. The natural flow regime of Walnut Creek was disrupted after the Upper Lake Mary Dam was constructed, with effects on the stream channel and riparian vegetation. Locally perched waters in stream terraces and leakage in the sandstone at the bottom of the canyon appear to be sustaining pockets of riparian deciduous trees, but some species are likely in long-term decline. The City of Flagstaff, Coconino National Forest, and National Park Service recently agreed to explore ways to maintain the integrity of the lakes while increasing the possibility of flows into Walnut Creek. A range of preliminary ideas to accomplish these objectives will be discussed. The 3-mile hike along Walnut Creek will involve moderate exertion at an elevation of 7,000 feet, requiring descent and ascent of about 200 vertical feet of switchbacks at two locations along the trail. Field trip leader is Paul Whitefield, who is a Natural Resource Specialist with the National Park Service.

Fossil Creek

Date: Sunday, September 21st
Time: 7:00 am to 5:00 pm
Cost: $100/$150 (includes box lunch and beverages)
Leader: Dr. Charlie Schlinger, CPG-09554 and Dr. Abe Springer

Fossil Creek, once one of Arizona’s premier watercourses, had its flow diverted for hydropower generation beginning in the early 20th century. A feat of construction for the era, the facility was prominent in the history of Arizona’s Verde Valley mining centers and, during a time of drought in the late 1920s, even provided electricity for Phoenix. In 2005, Arizona Public Service (APS) commenced decommissioning of the Childs-Irving hydroelectric facilities. At that time, the full base flow of nearly 46 cfs was restored to 14 miles of creek below the Fossil Springs, which supply the near-constant majority of the Fossil Creek base flow from a series of discrete vents in the Naco Formation. The Fossil Springs flow is supersaturated with respect to calcium carbonate and a travertine system is actively building characteristic step pool morphology. This hydrologic trip will include an 8-mile round-trip hike into the Fossil Springs, a visit to the historic Irving power plant, along with overviews of native fish restoration efforts, modern day concerns regarding ground water resource development in adjoining communities, and aspects of the ongoing facility decommissioning. Time permitting, we will visit the Clover Springs stream restoration site, a large-scale channel stabilization and re-vegetation project of an upland wet meadow. Field trip leaders are Dr. Charlie Schlinger and Dr. Abe Springer of Northern Arizona University.
Field Trips

Grand Canyon/South Rim

Date: Sunday, September 21st
Time: 8:00 am to 5:00 pm
Cost: $100/$150 (includes box lunch and beverages)
Leader: Paul Lindberg, CPG-06344

This field trip is designed for geologists and will examine the geologic origin and history of the Grand Canyon, arguably the world's premier location for exposure of rocks that display the geologic record. There are three geology field trips planned, and the itinerary may vary slightly depending on the field trip leader. [There is also a non-technical field trip on Monday that is recommended for non-geologists.]

This field trip will travel north to Cameron and look at the Little Colorado River gorge. We will then travel west to view the Kaibab monocline and the deepening of the Little Colorado River gorge. When we enter Grand Canyon National Park, our first stop will be at Desert View overlook, where a 3-story tower provides a spectacular view to the north (up the canyon) and west (down the canyon). The trip will continue west to Lipan Point and a short hike to a vantage point to discuss the geologic evolution of Grand Canyon, including a take-apart geologic model. This stop will include a lunch break (box lunch provided). We will then continue west and view roadside view points, and take a one mile hike to Shoshone Point over easy terrain. The final stop will be at Mather Point to view the Great Unconformity, and/or Hopi Point to view a patented (private) uranium mine that operated inside the park until 1965. The trip includes a hike along the rim, which is at an elevation of 7,000 feet. Sturdy hiking shoes, hat, sunscreen, and cameras are recommended. Field trip leader on Sunday is Paul Lindberg, AIPG geologist from Sedona.

Sunset Crater/Wupatki

Date: Sunday, September 21st
Time: 8:00 am to 5:00 pm
Cost: $80/$120 (includes box lunch and beverages)
Leader: Michael O’Hara,
Erick Weiland, CPG-06892, and Pam Palmer

This is a field trip designed for those who wish to experience the volcanic scenery of northern Arizona and explore ancient Anasazi and Sinagua ruins. The field trip will travel by bus north of Flagstaff on Highway 89A, then east to Sunset Crater National Monument. There will be a brief talk on both the geology and the history of this geologically young region. We will have the opportunity to walk among recent lava flows and cinder deposits. The bus ride will continue through the many volcanic craters and cinder cones of scenic San Francisco volcanic field to reach Wupatki National Monument. There will be a walking tour of the multi-room ancient ruins, ball court, and other features. The tour will include a history of the anthropology and archaeology of the area. After leaving Wupatki, the next stop will be for lunch at the world-renowned Cameron Trading Post, famous for its huge Navajo tacos. The trading post also offers an opportunity to shop for gifts of Native American jewelry, pottery, and art. The trip includes a couple of short hikes at high elevations (about 7,000 feet). Sturdy hiking shoes, hat, sunscreen, and cameras are recommended. The field trip leader is Pam Palmer, with technical guides Erick Weiland, a geologist with Malcolm Pirnie; and Michael O’Hara, an anthropologist with Arizona State University.

Grand Canyon Sightseeing

Date: Monday September 22nd
Time: 8:00 am to 5:00 pm
Cost: $100/$150 (includes box lunch and beverages)
Leader: Dr. Larry Fellows, CPG-04447 and Pam Palmer

This field trip is designed for non-geologists and will primarily be a guided sightseeing tour of the Grand Canyon and vicinity. The trip will include a general discussion of the geology within the context of the spectacular scenery of the Colorado Plateau region. The field trip will travel northwest out of Flagstaff through the inactive volcanoes and cinder cones of the San Francisco volcanic field and onto the Coconino Plateau. At the Grand Canyon we will first stop at the new visitor center for an overview of the canyon’s attractions. There are many viewpoints, turnouts, and scenic views along the south rim. The field trip leaders will select several stops to showcase the awesome views of the canyon that change during the day depending on lighting conditions. Suggested stops include Hopi Point, Mather Point, Lipan Point, and Desert View, where a 3-story tower offers a panoramic view of the eastern half of the canyon. There will be time at each stop for photographs. The trip may include a short hike along the rim, which is at an elevation of 7,000 feet. One of the scenic stops will include a lunch break as part of the trip. Time permitting, we will stop at an overlook of the Little Colorado River gorge east of the canyon. The final stop will be at world-famous Cameron Trading Post, which offers an opportunity to shop for gifts of Native American jewelry, pottery, and art. Sturdy hiking shoes, hat, sunscreen, and cameras are recommended. Field trip leaders are: Dr. Larry Fellows, retired Arizona State Geologist, and an excellent resource for techniques on taking landscape photographs; and guest trip leader, Pam Palmer.
Field Trips

Jerome Mining District/Sedona

Date: Monday, September 22nd
Time: 8:00 am to 5:00 pm
Cost: $100/$150 (included box lunch and beverages)
Leader: Paul Lindberg, CPG-06344

This geologic field trip begins on the Colorado Plateau and travels southwest into the Transition Zone to the Basin and Range Province. The trip leaves Flagstaff and stops at the Oak Creek Canyon overlook for an orientation to the local geology. Dropping down into Oak Creek Canyon, we will stop to observe ancestral and modern phases of faulting that have shaped the canyon. The third stop is in Sedona for a view of the Mogollon Rim and red rock cliffs, which mark the edge of the Colorado Plateau. In Sedona there will be a short hike to Devils Kitchen sinkhole, which is a modern collapse feature underlain by a solution cave in the subsurface Redwall Limestone. The trip continues southwest and stops at Dry Creek bridge to view one of many Verde graben faults characteristic of the transition zone. We will stop in the Verde Valley to eat a box lunch and a geologic discussion of the graben faults. The field trip will climb up to Jerome, a small former mining town built on a steep mountainside, and visit the mining museum at the Jerome State Historic Park. The next stop will be the United Verde open pit where the geologic history of the 1.738.5 million-year-old Early Proterozoic world class copper-zinc-gold-silver ore deposits will be explained. An interactive fault block model will help demonstrate the geology of this volcanogenic massive sulfide ore deposit. The final stop in Deception Gulch will visit Precambrian rhyolite host rock. Because some hiking is planned, we recommend sturdy hiking shoes, hat, sunscreen, and camera. Field trip leader is Paul Lindberg, AIPG geologist from Sedona.

Sedona/Sedona with Jeep Tour

Date: Tuesday, September 23rd
Time: 8:00 am to 5:00 pm
Cost: $155/$200 (with optional Jeep Tour)
(lunch on your own)
Leader: Steve Maslansky, CPG-04431 and Pam Palmer

This is a non-geologic field trip designed for those who wish to relax and experience the famous red rock scenery of northern Arizona. The field trip will travel by bus down the winding road of Highway 89A through scenic Oak Creek Canyon to beautiful Sedona, the jewel of Arizona. In Sedona, for those not registered for the jeep tour, you will be free to explore the town. For those registered for the pink jeep tour, you will enjoy a 2-hour tour up Schnebly Hill and around the red mesas and buttes. The morning jeep tour will offer a majestic, panoramic view of the town and the surrounding area, with plenty of photographic opportunities. There will be a brief talk on both the geology and the history of this beautiful red rock country. Upon returning to Sedona, participants are free to explore the town. Lunch will be on participants’ own in one of the many wonderful restaurants. The two main art gallery and shopping areas are connected by a free town trolley: the Uptown area, where the jeep tours originate; and the always popular Tlaquepaque (pronounced tuh LOCK ee pock ee) at Los Abrigados Resort, which resembles a Mexican village. There are many art galleries and novelty shops accessible by walking or by riding the trolley. On the way back to Flagstaff we will stop at the scenic Oak Creek Canyon overlook, where local Navajo artisans have tables set up to display authentic Native American jewelry, pottery, and other crafts for sale. Field trip leaders are Steve Maslansky, AIPG geologist from Prescott, and guest field trip coordinator Pam Palmer.

Meteor Crater

Date: Tuesday, September 23rd
Time: 8:00 am to 5:00 pm
Cost: $100/$150 (included box lunch and beverages)
Leader: Dr. Carleton Moore and Dr. Dale Nations, CPG-06364

Meteor Crater, located about 45 miles east of Flagstaff, is recognized as the premier meteor impact crater on the planet. It was formed about 50,000 years ago. In the 1960s it was used by the Apollo astronauts as a training location for moon walks. This geologic field trip will examine the origin and history of Meteor Crater. On the way to the crater we will stop for an overview of the San Francisco volcanic field and a narrative of geology along the route. Upon arrival at Meteor Crater, we will walk along the rim and hear a discussion of the crater’s origin and history, including many attempts to locate fragments of the meteor. This is a relatively easy hike on a well-traveled trail. Box lunch will be provided at the crater with an informal discussion during this lunch. The trip will include a visit to the Museum of Space Exploration (one hour) and a historical film. Field trip leaders are Dr. Carleton Moore, and professor emeritus Dr. Dale Nations, Northern Arizona University.
Grand Canyon/South Rim

**Date:** Wednesday, September 24th  
**Time:** 8:00 am to 5:00 pm  
**Cost:** $100/$150 (included box lunch and beverages)  
**Leader:** Dr. Ron Blakey

This field trip is designed for geologists and will overview the spectacular geology of Grand Canyon as seen from the South Rim. There are three geology field trips planned, and the itinerary may vary slightly depending on the field trip leader.

Field trips are from Flagstaff northwest through the San Francisco volcanic field and enter the park at the South Entrance Station. We will visit several viewpoints in the Grand Canyon Village area. There is a geology museum at Yavapai Point that we will visit, and we can take a short hike on the nearby “Trail of Time” or on the rim that provides many photo opportunities. Traveling east along the canyon rim road we will make stops to discuss the canyon geology and history, and view the spectacular scenery at Grandview Point, Moran Point, and Lipan Point. One of these stops will include a lunch break (box lunch provided). Our last stop in the canyon will be at Desert View overlook where a 3-story tower provides a spectacular view to the north (up the canyon) and west (down the canyon). We will leave the park at the East Entrance with a drop in elevation at the Kaibab monocline. We may stop at the Little Colorado River overlook, time permitting. The trip includes one or more short hikes along the rim, which is at an elevation of 7,000 feet. Sturdy hiking shoes, hat, sunscreen, and cameras are recommended. The field trip leader on Wednesday is Dr. Ron Blakey, Northern Arizona University geology professor.

Montezuma Castle National Monument and Montezuma Well

**Date:** Wednesday, September 24th  
**Time:** 8:00 am to 5:00 pm  
**Cost:** $80/$120 (included box lunch and beverages)  
**Leader:** Steve Maslansky, CPG-04431 and Pam Palmer

This is a non-geologic field trip designed for those who wish to experience the scenery of northern Arizona and explore ancient Sinagua ruins. The field trip will travel by bus south of Flagstaff on Interstate 17 to Montezuma Castle National Monument. The monument protects a 20-room ancient site. There will be a brief talk on both the archaeology and history of this region and an opportunity to walk around the monument. The bus ride will continue to Montezuma Well, which is separated from but a part of the monument. The well occupies an unusual geologic formation and water enters the well at more than 1 million gallons per day. The feature is still used for farmland irrigation. A lunch stop with box lunches will be provided at Montezuma Well. The field trip will return to Flagstaff via Sedona and Oak Creek Canyon. Many photo opportunities will present themselves on that route, including Bell Rock. We also will stop at the scenic Oak Creek Canyon overlook, where local Navajo artisans have tables set up to display authentic Native American jewelry, pottery, and other crafts for sale. The trip may include a couple of short hikes at moderate elevations (about 5,000 feet). Sturdy hiking shoes, hat, sunscreen, and cameras are recommended. Field trip leaders are Steve Maslansky, AIPG geologist from Prescott, and guest field trip coordinator Pam Palmer.

Flagstaff’s Water Supplies: Past, Present and Future

**Date:** Wednesday, September 24th  
**Time:** 8:00 am to 5:00 pm  
**Cost:** $100/$150 (included box lunch and beverages)  
**Leader:** Dr. Abe Springer and Dr. Charlie Schlinger, CPG 09554

Since Flagstaff was established in the 1880s it has relied on a combination of surface-water and groundwater sources for a water supply. The first sources of water for the City were from springs and later from reservoirs. In the 1950s, in response to a long-term drought, the City drilled its first deep boreholes to tap the deep regional aquifers. In the 1990s, in response to increasing growth, the City developed reclaimed water as a new supply and launched a new campaign to explore for additional favorable locations for deep wells to relieve pressure on existing wellfields. In the past few years, the City has begun looking for solutions to water supplies for anticipated growth out to the year 2050. This hydrogeologic and hydrologic field trip will discuss these historical sources for the City, their responses to climate change, and the options the City and region have for the future and all of the innovated science, management, and planning which have made the City and region a model for other communities to follow. Field trip leaders are Dr. Abe Springer and Dr. Charlie Schlinger of Northern Arizona University.
Workshops

GIS I - Intro to ArcGIS for the Earth Scientist
Date: Saturday, September 20th
Time: 9:00 am to 4:00 pm
Location: Geospatial Research and Information Laboratory (GRAIL) at Northern Arizona University
Maximum: Limited to 12 attendees
Cost: $175
CEU'S: 0.7

Mark Manone will teach this introductory GIS class geared towards the earth scientist. The participants will learn how to build ArcGIS database and how to import maps and overlays. The course will be taught at the new GRAIL laboratory on the NAU campus. This state-of-the-art facility offers the participants the opportunity to work with the newest technology. A 1.5-hour lunch break will allow participants time to walk to the many restaurants in the area.

Writing for the Reader: Strategies for Communicating Technical Information Effectively
Date: Saturday, September 20th
Time: 9:00 am to 4:00 pm
Location: Radisson Woodlands Hotel
Cost: $99 (lunch included)

This workshop will be taught by Nancy Riccio, Director of Plateau Technical Communication Services. Nancy is a writer, editor, and recovering hydrogeologist who specializes in developing watershed plans and other resource-management documents. Understanding how readers process information is your most valuable asset in writing effective reports, proposals, and papers. In this nuts-and-bolts workshop, Nancy will cover basic information-processing principles and analyze structural components of language used in typical hydrology reports. You’ll learn how to “embrace” verbs, use active and passive voice, and break information into manageable chunks that provide a clear path for readers. You’ll also learn some strategies for organizing reports and targeting a variety of audiences. Best of all, you will apply these strategies to writing samples from actual reports through hands-on exercises. Each participant will receive a workbook that includes an industry-specific style guide.

GIS II - Intro to Arc Hydro
Date: Sunday, September 21st
Time: Noon to 4:30 pm
Location: Geospatial Research and Information Laboratory (GRAIL) at Northern Arizona University
Maximum: Limited to 12 participants
Cost: $100
CEU'S: 0.5

Mark Manone will teach ArcGIS users the Arc Hydro program. The participants will learn the basic principals behind the Arc Hydro package and to manage water resources using the database and modeling tools. The course will be taught at the new GRAIL laboratory on the NAU campus. This state-of-the-art facility offers the participants the opportunity to work with the newest technology.

Students, Your First Steps in the Profession and the Future
Date: Sunday, September 21st
Time: Noon to 4:30 pm
Location: Radisson Woodlands Hotel
Cost: $20

Robert A. Stewart, Ph.D., CPG and Raymond W. Talkington, Ph.D., CPG will lead this short course. Stewart and Talkington each has over 25 years’ geological experience in mineral exploration, academic teaching and research, and environmental management. Both leaders presently hold senior managerial positions with their respective employers, and are responsible for interviewing and hiring geologists at varying levels of experience.

The purpose of this short course is to introduce advanced undergraduate and graduate geoscience students to (1) various post-graduate employment opportunities; (2) resumes, cover letters, transcripts, and references; (3) interviewing strategies; and (4) expectations of newly-hired geologists.

The short course material is presented using PowerPoint slides. The tone of the short course is informal to encourage discussion between workshop leaders and the audience. Supplementary reprints from a variety of sources are provided to expand on various aspects of the presentations.

Water Education Workshop - Project WET
Date: Saturday, September 20th
Time: 9:00 am to 4:00 pm
Location: Radisson Woodlands Hotel
Maximum: Limited to 30 attendees
Cost: $25 (lunch included)

The focus of this workshop is to provide educators with the tools to teach the Project WET Arizona Conserve Water Curriculum.
Workshops Cont.

Important Areas of Law – What Does the Future Hold?

Date: Wednesday, September 24th
Time: 8:30 am to 4:00 pm
Location: Radisson Woodlands Hotel
Cost: $99 (lunch included)
CLE: Credits may be available

This workshop will focus on where the law field is going in regards to Southwestern US Water, Climate Change, Environmental, and Mining disciplines. Experts in each area of law will present where they see the field is headed given the ever changing practices and regulations.

Social Events

Welcome Reception

Dates: Sunday, September 21st
Time: 6:00 pm to 8:00 pm
Cost: Included with Registration
Location: High Country Conference Center

This is a chance to get to know your fellow colleagues attending the annual meeting. This Sunday evening reception is the perfect opportunity to renew acquaintances, meet new people, visit exhibitors, and view the student posters. The reception will feature a cash bar and hors d’oeuvres.

Dinner and Cultural Entertainment Event

Dates: Monday, September 22nd
Time: 6:00 pm to 8:00 pm
Cost: $60/$75
Location: Radisson Woodlands Hotel

Monday evening will be a pleasant one in the company of friends and colleagues. The festivities will begin with a general reception and banquet. The evening will conclude with a remarkable Dineh (Navajo) cultural demonstration. This event is intended to be informal, relaxing, and an opportunity for all attendees to meet and socialize in a convivial atmosphere, as well as catch a glimpse of Native American cultural history.

Museum Reception/Awards

Dates: Tuesday, September 23rd
Time: 6:30 pm to 8:30 pm
Cost: $60/$75
Location: Museum of Northern Arizona

The Tuesday evening reception will be held at the Museum of Northern Arizona. The evening will open with a brief Awards Ceremony during which AIPG will recognize members who have made extraordinary contributions to AIPG and the profession. The reception itself will include superb hors d’oeuvres, refreshments, a cash bar and an opportunity to tour the exquisite museum and to peruse the excellent artwork available for sale in the extensive giftshop.

Founded in 1928 as a community effort by a group of Flagstaff citizens, the Museum of Northern Arizona (MNA) is a private, nonprofit institution that was originally established as a repository for Native American artifacts and natural history specimens from the Colorado Plateau. The original founders, zoologist Dr. Harold S. Colton and artist Mary-Russell Ferrell Colton, were dedicated to preserving the history and cultures of northern Arizona.

Over its 75-year history in Flagstaff, MNA has evolved into a regional center of learning with collections, exhibits, educational programs, publications, and research projects that serve more than 100,000 people each year. As the only accredited museum within 150 miles of Flagstaff and the only natural history museum within 250 miles, the Museum of Northern Arizona plays a vital role as interpreter of the Colorado Plateau.

To enhance the lives of those who share an interest in and love for the natural and cultural heritage of the Colorado Plateau, the Museum of Northern Arizona has created a dynamic and ever-evolving community where people of all ages, interests, and cultures come to build relationships with each other on a forested, nearly 225-acre intergenerational campus.
SPONSORSHIP, EXHIBIT BOOTH AND ADVERTISING OPPORTUNITIES

The American Institute of Professional Geologists (AIPG) and the Arizona Hydrological Society (AHS) are hosting their Annual Meetings in conjunction with the 3rd International Professional Geology Conference (3rd IPGC) at the High Country Conference Center at the Northern Arizona University (NAU) and the Radisson Hotel in Flagstaff, Arizona. Overall meeting attendance is projected to reach 400-500 individual registrants.

Sponsorships are available at the Platinum, Gold, Silver, and Copper levels, for the Welcome Reception, and for Student Programs. Exhibit booth space is also available for advertising your products and services to gain maximum exposure to this large group of professionals.

Information about sponsorship, exhibit booth, and advertising opportunities is also available at <http://www.aipg.org/2008/AIPG-AHS-3IPGC.htm>.

SPONSOR PROSPECTUS

The AIPG/AHS/3rd IPGC meeting in Flagstaff is a great opportunity to promote your company to hundreds of professionals locally, throughout the US, and worldwide. Following is a summary of available sponsor levels, and the associated benefits to you as a sponsor. Sponsorships at the Platinum, Gold, Silver, and Copper levels are available to support the conference.

PLATINUM (PT) LEVEL: $10,000
Benefits:
- Company logo on conference website with a link to your company website
- Company logo on cover of Proceedings of the conference
- Company logo on sign at event entrance at the High Country Conference Center and the Radisson Hotel
- Company acknowledgement during Opening Remarks
- Company logo prominently displayed on sponsor page of conference program
- Two complimentary registrations to the conference
- Acknowledgement as sponsor during technical session breaks or on Field Trip Guidebooks (sponsors choice)
- Marketing material will be included in conference registration packet (if desired)

GOLD (AU) LEVEL: $7,500
Benefits:
- Company logo on conference website with a link to your company website
- Company logo on sign at event entrance

SILVER (AG) LEVEL: $5,000
Benefits:
- Company logo on conference website: http://www.aipg.org/2008/AIPG-AHS-3IPGC.htm
- Company logo on sign at event entrance
- Company logo on sponsor page of conference program
- One complimentary registration for the conference
- Acknowledgement as sponsor during technical session breaks or on Field Trip Guidebooks (sponsors choice)

COPPER (CU) LEVEL: $2,500
Benefits:
- Company name on sponsor page of conference program
- Company name on sign at event entrance
- Acknowledgement as sponsor during technical session breaks or on Field Trip Guidebooks (sponsors choice)

SUNDAY EVENING WELCOMING RECEPTION: $1,000
Benefits:
- Company logo on sign at Welcome Reception area and bar during reception
EXHIBITOR AND ADVERTISING

Exhibitor Information

The exhibit booths will be located at the High Country Conference Center in a prime area for visibility and exposure. Exhibits may be set up on Sunday, September 21st from 10:00 am - 4:00 pm. Booth tear down is Tuesday, September 23rd from 3:00 pm to 5:00 pm. Exhibit space is 8' wide 6' deep and a 6' skirted table and two chairs will be provided. Exhibitors will also receive one complimentary meeting registration that includes a continental breakfast, breaks, and lunch for both Monday and Tuesday. There is limited space available (36 exhibit booths) so reserve EARLY!

Advertising Information

As co-host of the meeting, AIPG has put together an advertising package to provide the maximum exposure for your advertising. In addition to advertising which will appear in the AIPG bi-monthly journal, The Professional Geologist (TPG), an “AIPG 45th Annual Meeting, AHS 21st Annual Symposium, 3rd International Professional Geology Conference Program,” will be published. All advertisers will be listed on the conference website: http://www.aipg.org/2008/AIPG-AHS-3IPGC.htm. Your advertisement will be included in TPG which is available online and is mailed to over 5,700 members of AIPG plus the over 400 attendees expected at the meeting. Provide a camera-ready copy or a high resolution electronic file for advertisement. Advertisement sizes include:

- Full-page - $800 (add $200 for color ads)
- Half-page - $400 (add $100 for color ads)
- Professional card $100

Do you have questions about the details? Want to try something a little different? Want your brochure inserted into the registration kit? Do you want to make an in-kind contribution?

For answers to your questions or more information, call Cathy Duran, AIPG Headquarters, at 303-412-6205 or e-mail cld@aipg.org

Thank you!

We look forward to seeing you at the:

AIPG 45th Annual Meeting  
AHS 21st Annual Symposium  
3rd International Professional Geology Conference  
September 21 – 23, 2008  
Flagstaff, Arizona

To learn more about becoming a sponsor, contact:

Kel Buchanan, Sponsorship Chair  
Phone: (775) 786-4515/Fax: (775) 786-4324  
E-mail: SummitCrk@aol.com

or

Wendy Davidson, AIPG Assistant Director  
Phone: (303) 412-6205/Fax: (303) 253-9220  
E-mail: wjd@aipg.org

SPONSORSHIP FORM AGREEMENT

AIPG 45th Annual Meeting  
AHS 21st Annual Symposium  
3rd IPGC

YES!! We want to be part of the AIPG, AHS, 3rd International Professional Geology Symposium, September 21 - 23, 2008 in Flagstaff, Arizona. The 2008 Meeting can count on us as a Sponsor, to participate in an Exhibit Booth, and/or to be an Advertiser.

- Platinum Level ($10,000)
- Gold Level ($7,500)
- Silver Level ($5,000)
- Copper Level ($2,500)
- Welcome Reception ($1,000)
- Student Programs ($1,000)
- Other _________ ($1,000 minimum)

EXHIBIT BOOTHS AND ADVERTISING PACKAGE

Exhibitors, Guests, and all speakers must register.

- Exhibit Booth ($2,000) Includes one complimentary meeting registration.
- Exhibit Booth for Platinum Level Sponsors($1,500) Includes two complimentary meeting registrations.
- Advertising Package ($100 - $1,000) Enclose electronic and camera-ready copy.

TOTAL AMOUNT: $ ____________ Date: ____________

- Check enclosed (payable to AIPG)
- Please invoice immediately - payment due within 30 days.

Sponsoring Individual or Company: ________________________________

Contact Name: ___________________________________________________

Signature: ________________________________________________________

Title: ___________________________________________________________

Company: ________________________________________________________

Address: _________________________________________________________

City __________________ State ______ Zip_________

Phone: __________________ Fax: __________________

Contact’s E-mail: ________________________________________________

Company’s Website Address: _______________________________________

Send checks (payable to AIPG) and Sponsorship Form Agreement to:

AIPG, 1400 W. 122nd Ave., Suite 250,  
Westminster, CO 80234  
(303) 412-6205 • Fax (303) 253-9220  
http://www.aipg.org/2008/AIPG-AHS-3IPGC.htm

AIPG will contact you upon receipt of this form to complete arrangements.
AIPG/AHS/3rd IPGC 2008 Symposium
September 20-24, 2008
Flagstaff, Arizona

DRIVING DIRECTIONS
Radisson Hotel
1175 West Route 66
Flagstaff Arizona 86001
(928) 723-8888
High Country Conference Center
201 West Butler Avenue
Flagstaff, AZ 86001

HOTEL PARKING
Complimentary parking for hotel
guests and visitors.

LOCAL AIRPORT
Flagstaff Pulliam Airport
Airport Code: FLG
Air service daily by American West
Airlines from Phoenix Sky Harbor
Airport

TRANSPORTATION SERVICES
Shuttle Service - Open Road Tours
(928) 226-8060 or (877) 226-8060
Provides regular scheduled shuttles
from Phoenix Sky Harbor Airport as
well as custom itineraries.

Rail - The historic downtown train
station offers easily accessibility to
Flagstaff with Amtrak providing daily
service to and from the city.
# AIPG/AHS/3rd IPGC 2008 Symposium

**Changing Waterscapes and Water Ethics for the 21st Century and Global Geoscience Practice, Standards, Ethics, and Accountability**

**September 20-24, 2008**

Flagstaff, Arizona, USA

## REGISTRATION FORM

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*SPouse/GUEST NAME |

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## FEES AND PAYMENT INFORMATION

### ANNUAL MEETING REGISTRATION

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### FIELD TRIPS (Must be Registered)

(All field trips depart from the Radisson Hotel)

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### WORKSHOPS

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<td>Writing for the Reader: Strategies for Communicating Technical Information Effectively (Sat., 9/20, 9:00 am – 4:00 pm)</td>
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<tr>
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<td>$25.00</td>
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<tr>
<td>GIS I – Introduction to ArcGIS for the Earth Scientist (Sat., 9/20, 9:00 am – 4:00 pm) (0.7 CEUs)</td>
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<td>GIS II – Introduction to Arc Hydro (Sun., 9/21, Noon – 4:30 pm) (0.5 CEUs)</td>
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<td>Students, Your First Steps in the Profession and the Future (Sun., 9/21, Noon – 4:30 pm)</td>
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<td>Important Areas of Law – What Does the Future Hold? (Wed., 9/24, 8:30 am – 4:00 pm)</td>
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<td>AIPG Foundation Luncheon (Sat., 9/20, Noon – 1:00 pm)</td>
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<td>Welcome Reception (Sun., 9/21, 6:00 pm – 8:00 pm)</td>
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<td>AIPG Past-Presidents Breakfast (Mon., 9/22, 7:00 am–9:00 am)</td>
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<td>AESE Surveys Breakfast (Mon., 9/22, 7:00 am – 8:00 am)</td>
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<td>Dinner and Cultural Event (Mon., 9/22, 6:00 pm – 8:00 pm)</td>
<td>$60.00</td>
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<tr>
<td>AESE Freelancers Breakfast (Tues., 9/23, 7:00 am – 8:00 am)</td>
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<td>Museum Reception/Awards (Tues., 9/23, 6:30 pm – 8:30 pm)</td>
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<td>DONATIONS TO FOUNDATIONS (Voluntary)</td>
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<td>AIPG Foundation</td>
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Organization Meetings (see Program for Dates and Times) – Please indicate if attending

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<tr>
<th>AIPG National Executive Committee Meeting (9/20)</th>
<th>Attending</th>
<th>Welcome Reception (9/21)</th>
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<tr>
<th>AIPG 2008 Advisory Board Meeting (9/20)</th>
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<th>AESE Business Meeting Luncheon (9/22)</th>
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<th>AIPG 2008-2009 Joint Executive Committee (9/20)</th>
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<th>AHS Membership Meeting (9/22)</th>
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Note
Full Registration includes Welcome Reception, Technical Sessions, Exhibits, Student Poster Sessions, Continental Breakfast, Lunch, Refreshment Breaks, and Registration Packet.

I understand that by registering for this event, I release and agree to indemnify the American Institute of Professional Geologists (AIPG), the Arizona Hydrological Society (AHS), the 3rd International Professional Geology Conference (IPGC) and the agents, officers, volunteers and employees of AIPG, AHS, IPGC from all liability for any loss, damage or injury sustained by me while involved in any way with the convention and its events including field trips except that each of AIPG, AHS, IPGC is not released from such liability to the extent the same is caused by its actual gross negligence or willful misconduct. I have read and understand this waiver and release.

I also understand that submission of this registration form gives AIPG the authority to utilize any photograph taken of me at the conference for conference related publicity (e.g., photo gallery on cd, web site, TPG, etc.). AIPG agrees not to use my likeness for any other purpose. Please contact Vickie Hill at AIPG if you DO NOT wish to have your image used.

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 (in U.S. Dollars)
☐ 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):

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Authorized Signature __________________________

Mail to:
American Institute of Professional Geologists
1400 W. 122nd Avenue, Suite 250
Westminster, CO 80234
or fax to (303) 253-9220 or register on-line at www.aipg.org
National AIPG Phone Number is (303) 412-6205

Refund Policy: A 90% refund of total fees paid (10% withheld to cover administrative costs) will be given upon receipt of a written request until 7/18/08. Cancellations made by written notification received between 7/19/08 and 9/1/08 will be assessed a charge of 20% (to cover administration costs) of the total fee paid. NO refunds will be given for cancellations received after 9/1/08 or for no-shows after the meeting. Based on the decisions of AIPG/AHS/3rd IPGC, field trips and workshops are subject to cancellation due to lack of participation. Notification and a full refund for field trips or workshops will be given in case of required cancellations.
The mission of the American Institute of Professional Geologists (AIPG) is to be the superior advocate for geology and geologists, to promote high standards of ethical conduct, and to support geologists in their continuing professional development.

American Institute of Professional Geologists (AIPG) is the only national organization that certifies the competence and ethical conduct of geological scientists in all branches of the science. It adheres to the principles of professional responsibility and public conduct of geological scientists in all branches of the science. It was founded in 1963 to promote the profession of geology and to provide certification for geologists to establish a standard of excellence for the profession. Since then, more than 10,000 geologists have been certified by AIPG.

I live in the southeastern part of the continental United States, where over the past year or so the media has covered a number of water resources issues. Well, ‘covered’ is probably not the most appropriate descriptor from the scientific perspective, but at least there have been headlines and front page coverage on occasion. Topics have included: too much water (flooding); too little water (drought); not enough water to satisfy the wants of some part of the economy (water usage restrictions); pharmaceuticals in water supplies (water quality); efforts to divert water from a drainage basin (water quantity); allocations of surface water supplies (environmental versus human needs); or my lakefront property now overlooks a muddy area because the lake suddenly drained through a sinkhole (personal economics); to cite a few. In your area of the country, you have heard and read of similar things on the nightly news or in the daily newspapers. After all, we are geologists, albeit with different interests, so these topics grab our attention for some period of time.

In reviewing a piece that Joseph Price has written for a future edition of TPG, where he examines some of the answers and motivations behind student responses to the standard classroom questions of “Why are you taking geology?” and “What do you expect to get from this course?”, I thought back to some of the news coverage noted above and our background and training as geologists. One of responses that Joseph did not include is that “…this is a required course for elementary education majors, and I really don’t like science…” I can almost guarantee that students coming out of that class will have a negative impact on 30 or more kids a year, for perhaps 30 years. And this teacher is responsible for the first introduction K-12 students have to geology. I have had this type of teacher in my geology class, as well as in in-service programs, and I have seen their former students. This is scary.

For those of us working as teachers, or consultants, or regulators, or planners, or just plain geologists, we must maintain the geologic mindset that goes beyond a particular contract, or job, or working lifetime, or tenure in an elected or appointed position, because we “KNOW”, and must effectively communicate that “KNOWING.”
Alaska Section

The winter season brings many friends out for an interesting evening in January, and a combined meeting with AIPG and the Alaska Groundwater Association. To provide a topic that blended both groups’ professional foci, we invited an engineer to talk to us about groundwater in the steep, but densely populated area called the Anchorage Hillside. Our informative presenter was Mr. Glenn Foust, P.E. who shared the findings of a recent water quality study conducted on behalf of the Municipality of Anchorage, to measure nitrates in residential groundwater drinking water supplies. We enjoyed the combined occasion with our friends in the Alaska Groundwater Association.

Our next Alaska AIPG Section meeting is planned for April to the north in the City of Fairbanks. A field trip and evening presentation are planned for our members in the northern tier of AIPG in Alaska.

The Alaska Section had a table at the University of Alaska Anchorage Geology Club Career Fair on February 14th. It was a very busy day, especially for the geology students looking for employment. There were about 30 potential employers there, and they were taking resumes. Many students were looking for summer employment and internships.

Colorado Section

The section gave out several awards at their December meeting. Tricia Beaver, CPG-07664, is receiving the Distinguished Service Award this year in recognition of her years of service to the Section as a member of the Executive Committee (ExCom) and Past President. She also worked on the Legislative Reception for a number of years.

Logan MacMillan, CPG-04560, Peter Barkmann, CPG-09524, and Curtis Johnson, CPG-05103, are receiving Service to Geology Awards. Logan for his chairmanship of the Legislative/Regulations (Leg/Reg) Committee, Peter for service as Section Editor, and Curtis in recognition of many years as an ExCom member and generally as a solid supporter of Section activities.

First CO-AIPG Scholarship Awardee: It is with great pleasure that the Colorado Section of AIPG announces Laura Pommer as the first recipient of the Rex Monahan Geological Scholarship. This annual award of $500 is for academic year 2007-2008. Laura is an undergraduate student at the University of Colorado, in Boulder, and is currently working toward a dual major in Geology and Integrative Physiology. In addition to her studies, which include a current structural geology research project with Dr. Karl Mueller, Laura has served as an undergraduate learning assistant for an introductory geology class and is currently working two part-time jobs for work experience and to be able to afford her education at CU. Laura has expressed an interest in attending graduate school down the road with an aim to focus on structural geology.

California Section

The California Section of the American Institute of Professional Geologists awarded Sam Blakeslee with the AIPG California Section Earth Science and Environmental Award for 2007. The award was given for public service advocating strong earth science and environmental policies. Most recently, he was an author of a variety of environmental laws that the governor has signed.

Georgia Section

On January 11, 2008, we had geoprobe drilling by The Probing Company and the consultant for the site was URS. They showed the student proper screening and sampling. I would like to thank Jim Cole with The Probing Company and Jeff Retzke with URS.

Ronald J. Wallace, CPG-08153
Michigan Section

For 2007 the following members received: Longevity Awards:

25 years: Jon Ercole, Lawrence Austin, Robert Hayes, Edward Everett, and Tyrone Black.

20 years: Susan Peelen-Streidl, Emily Cord-Duthinh, and John Morehouse.


2007 Significant Contribution to the Michigan Section Award

The Executive Committee unanimously chose Adam W. Heft, CPG-10265 as the recipient for the Significant Contribution Award in 2007. The Significant Contribution Award is given to one member for contributions to the Section that are deemed significant.

Adam represented Michigan Section as General Chairman of the 44th Annual AIPG Meeting held in Traverse City in October 2007. He organized and assembled the Planning Committee, comprised of 10 committee chairmen, who helped plan the meeting. The 44th Annual AIPG Meeting was very successful and resulted in slightly more than $19,000 profit for the Section. The Executive Committee felt that the 44th Annual AIPG Meeting success was largely due to Adam’s vision and leadership. Congratulations to Adam Heft.

Timothy B. Woodburne, CPG-10532

AIPG Foundation has New Trustee

The AIPG Foundation is pleased to announce the appointment of P.K. Rana Medhi, CPG-01913 as new Trustee.

Rana has been an active member in AIPG for many years. He has run his own consulting practice in Casa Grande, Arizona for the past 14 years. He was recently appointed to serve as the Chairman of the General Metals corporate Advisory Board. He also serves as the Chairman of the Board of Governors of the Arizona Department of Mines and Mineral Resources, a Trustee of the Boards of the Mining Foundation of the Southwest, and on the Board of Rockydale Quarries Corporation, a major limestone and aggregate producer in the southeastern US.

Let’s all welcome Rana as a new Trustee.

I look forward to your continued support of the AIPG Foundation. Please contact me if you are eager for a challenge and are passionate about supporting the Geosciences.

LBG Names Nils Thompson Head of New Georgia Office

KENNESAW, GA – Nils Thompson, PG, CPG-09234 has been named an Associate and Manager of the new Kennesaw, Georgia office of Leggette, Brashears & Graham, Inc. (LBG), a professional ground-water and environmental engineering services firm with offices nationwide.

A Professional Geologist registered in 13 states, Mr. Thompson has over 20 years of environmental consulting experience. He has served in roles as project manager and senior hydrogeologist on projects involving hydrogeologic and hazardous waste assessments, remediation and regulatory compliance. He has worked with various industry, power and mining companies on ground-water supply and permitting issues. In addition, he has assisted industrial clients with environmental compliance and corrective action issues and has managed numerous environmental site assessments throughout the southeast.

Mr. Thompson holds an M.S. degree in Geology from Fort Hays State University and a B.S. in Geoscience from the Pennsylvania State University. His professional affiliations include the American Institute of Professional Geologists, the Association of Ground Water Scientists and Engineers and the Georgia Construction Aggregate Association. He currently serves as president of the Atlanta Geological Society.

LBG has expertise in almost every aspect of water supply, contamination and mine dewatering hydrogeology. Established in 1944, it was the first consulting firm in the United States to specialize in ground-water geology. With 21 regional offices throughout the U.S., the firm has completed projects in 48 states and 19 foreign countries.

What is the International Year of Planet Earth?

The International Year of Planet Earth aims to ensure greater and more effective use by society of the knowledge accumulated by the world’s 400,000 Earth scientists. The Year’s ultimate goal of helping to build safer, healthier and wealthier societies around the globe is expressed in the Year’s subtitle ‘Earth science for Society’.

Past AIPG President Larry Woodfork, CPG-02370, speaks at the IYPE Global Launch Event of the International Year of Planet Earth held in Paris.
In Memory

Richard Jefferson Councill, CPG-01103, 84 has joined and is bound in eternal love to his predeceased wife Doris T. Councill, January 28th, 2008. His prayers were answered on February 16th when he passed peacefully to be reunited with his beloved wife.

Mr. Councill, a native of Salisbury, North Carolina, was born May 26th, 1923. His surviving cousins will remember his deep tarheel roots. He was distinguished man of science receiving his Master of Science degree at his alma mater, The University of North Carolina at Chapel Hill. In World War II, he served in the Army Air Corp. After graduation from Bombardier school, he was commissioned as Second Lieutenant and was awarded the “silver wings” of the aerial bombardier. In 1944, he was stationed in England and assigned to the 384th Bombardment Group where he flew several missions. His professional career led him to assignments in Los Alamos, New Mexico, with the United States Geological Survey. He authored scientific chronicles, new discoveries and complex analyses encompassing the early geology of The State of North Carolina. These publications are still used in textbook and class lectures today. He is the recipient of the prestigious “Order of the Long Leaf Pine” North Carolina, lifelong member of the scientific society of Sigma XI, Sigma Gamma Epsilon (Professional Geological Fraternity), member of the AIPG, fellow of the Geological Society of America, Carolina Geological Society, Society of Mining Engineers, and the Southeastern Geological Society. He was a resident of Jacksonville since 1960 and was the Chief Geologist and Manager of Industrial Development with CSX until his retirement in 1988. He continued his professional career as a consultant and joined his fellow colleague and eminent Geologist Bobby Timmons who was a dear and devoted friend.

Melvin James Hill, CPG-00462 a native of Santa Ana, California, passed away peacefully in his apartment at the Academy Retirement Community in Boulder, Colorado, on December 17, 2007 in the presence of his daughter Candace and son-in-law Steven. He was 88 years old.

Mel received his degree in geology from the University of California at Berkley in 1941 and worked for the Gulf Oil Corporation from 1941 until he retired in 1984. During his career, he traveled extensively, and rose through the company to become President of the Gulf Oil Research and Development Company, President of General Atomics Technologies in San Diego, and Executive Vice President of the Gulf Oil Corporation. In retirement, he enjoyed building model steam engines in his metal shop, reading extensively, writing poetry, supporting local arts, and studying modern physics.

In his community, he was blessed with numerous friends who regarded him as a brilliant scientist, a good-natured and gentle human being, and a man of impeccable integrity.
Earl H. Linn, CPG-02353, age 83 of North Palm Beach Florida and Henlopen Acres, died peacefully after a lengthy battle with cancer at his Henlopen Acres residence on Monday January 28, 2008. Mr. Linn was born on September 20, 1924 in Pittsburg, Pennsylvania, son of the late Andrew and Ruth(Dils) Linn. He graduated from the University of Pittsburgh in 1949 following service in the U.S. Army 45th Infantry Division during WWII, where he saw service in Africa, Italy, France, and Germany.

Mr. Linn was the personal geologist and engineer for Michael L. Benedum, as well as chief geologist and engineer for Bendum Trees Oil Company. Additionally, Mr. Linn was formerly a director of Penn-Ohio Gas Company, Sunflower Royalty and Hiawatha Oil and Gas Company from 1949-1960. In the 1960’s Mr. Linn formed Merex, Inc., Meridian Exploration Corporation, and Venango Petroleum Co. He had authored many oil and gas articles regarding the Appalachian Basin and was considered a foremost geologist in this area.

Mr. Linn was a member of the American Association of Petroleum Geologists, the Certified Petroleum Geologists, Registered Geologists of Pennsylvania, Registered Certified Professional Geologists of the American Petroleum Institute, Independent Oil and Gas Producers Association, and the Society of Petroleum Engineers.

A member of The Palm Beach Yacht Club, Mr. Linn was an avid sailor. He competed in numerous open-water sailing races, and enjoyed sailing on the Chesapeake Bay during the summers. Mr. Linn spent many happy hours playing golf, and was a member of the Rehoboth Beach Country Club. He had served on the Henlopen Acres Planning Commission.

Dr. James A. Peterson, CPG-00349, a distinguished petroleum geologist and retired geology professor at the University of Montana, died peacefully in his sleep on Tuesday, February 19th, at the age of 92. Dr. Peterson authored more than 150 professional papers and articles in journals and guidebooks, and was the recipient of numerous awards and honors for his work, including an Outstanding Achievement Award from the University of Minnesota (his Ph.D. alma mater) in 1996, the Outstanding Scientist Award from the Rocky Mountain Association of Geologists in 1987, the Distinguished Service Award from the American Association of Petroleum Geologists in 1992, and the Silver Medallion Award from Montana Tech in 2005. He was very active with many professional organizations, and was the editor of the Journal of Sedimentary Petrology in 1976 and 1977. After leaving the university in 1976, he worked for many years for the United States Geological Survey (USGS), where he contributed his skills to such important projects as the World Energy Resources Program, which assessed worldwide petroleum reserves.

In his early years as an employee of Shell Oil Company, Dr. Peterson was actively involved with a number of significant oil discoveries in Wyoming and Montana, as well as a wildcat well in 1954 in Nevada that was the first oil strike in that state. Reminiscing later about those years, he said, “I thought all you ever did was find oil.” In 2004 he was the keynote speaker at an event in Reno, Nevada that commemorated 50th anniversary of the Nevada discovery.

Dr. Peterson was also a beloved teacher and mentor at the University of Montana, guiding numerous students into successful careers. One of his proudest moments happened in 1965, when he became the faculty advisor to a young student named Jack Horner. Horner had already flunked out of the university due to very bad grades, but Dr. Peterson saw something in the young man—an enthusiasm and intelligence that seemed very promising—so he wrote letters on Horner’s behalf to school officials. These letters were the main reason why Horner was able to stay in school. As it turned out, Horner was severely dyslexic—a fact not discovered until years later. Horner went on to become one of the most famous paleontologists in history—the man who revolutionized our ideas about the nature of dinosaurs, and on whom the Jurassic Park movies were loosely based. “Fortunately I had an advisor named James Peterson who believed I wasn’t lazy or retarded, and he wrote letters of support for my quarterly returns to school,” said Horner in an autobiographical essay. “He had to write five such letters.”

Dr. Peterson was born in 1915 on a farm in southwestern Michigan, and later moved to Greencastle, Indiana, where his family ran a small-fruit farm that failed during the Depression years. He finished high school in Indiana, but turned down a full college scholarship so he could help his family, who had moved to the Chicago area. He worked as a butcher for many years before enrolling at Northwestern University in 1941. He spent the war years as a meteorologist in the Army Air Corps, receiving his training at Chanute Field, Illinois. On a blind date he met a journalism student from the University of Illinois named Gladys Pearson, and they were married in 1944 at Blytheville, Arkansas, where he was stationed.

After the war he received his Bachelor’s Degree in Geophysics from Saint Louis University, and was granted a Ph.D. from the University of Minnesota in 1952. He taught briefly at Washington State University in Pullman, and worked for the USGS before taking the position with Shell, where he eventually became Division Stratigrapher and Senior Geologist.

He moved to Missoula, Montana in 1965 to teach at the University of Montana, and lived in Missoula for over 42 years. He and his wife, Gladys Peterson, were also the creators and principal authors of Bonner: A Grass Roots Tribute, the 1976 history of Bonner, Montana. Dr. Peterson was active with many Missoula organizations, and especially loved the Bitterroot Mountains, where he spent countless happy hours fishing and backpacking. In his retirement years he was also a distinguished supplier of tomato plants to the discerning tomato growers of Missoula. Each spring he carefully planted more than 500 tomato seeds, using old milk cartons in his home-made greenhouse. He transplanted the seedlings, labeled each one with its future home, and delivered them personally. In January the Petrosens moved to Arizona to be near their son James D. Peterson.
Dear Editor,

Having read a commentary on climate change entitled “Skepticism of Global Warming Skepticism”, by another geoscientist, Charles Tiller, which appeared in the last month’s edition of “TPG”, the magazine of the American Institute of Professional Geologists, I read with interest the opinion piece, Goring the Nobel Peace Prize (ME, December 2007), by Douglas Silver. Doug accepts that climate change is a fact but he argues that it is a natural process and human greenhouse gas emissions have little or nothing to do with the matter. He cites Singer and Avery’s book Unstoppable Global Warming Every 1,500 years in support of his argument. He is correct in that there are many different perspectives on this issue and scientific dialogue mandates that the various viewpoints be heard, researched and debated. When considering Singer and Avery, Tiller invokes the by-line “Follow the money”, in that they have a long history with conservative think tanks and have received considerable financial support from oil, tobacco, and chemical industries throughout their careers, and he cites several glaring examples to make his case. That said we all recognize that climate change is not a simple issue. At its simplest, Tiller points out, climate is the transfer of heat in an attempt to equilibrate the Earth’s surface temperature. Any basic physical change will have an effect whether it is carbon dioxide, methane, water vapor or indeed solar input due to long-term changes in earth’s orbit. Tiller might think Doug shortsighted to pooh-pooh those who take the potential for abrupt and grave climate change seriously, when there are known factors – atmospheric composition – over which human has some influence. Most of us old timers recognize that the world has warmed significantly during our lifetime, and that human greenhouse gas emissions could be a significant part of the puzzle (but of course, not the only piece). This being so, Tiller makes the argument that as professional scientists and members of the human community, perhaps it is time to get serious. By actively promoting an agenda to undermine the “inconvenient theory” we may be leaving the impression that SME is out of touch on one of the preeminent scientific and policy matters of our day. A good start to correct this impression might be for SME to initiate a dialogue by publishing Tiller’s TPG perspective.

Mark Emerson, CPG-02800, SME-926750

Dear Editors,

I expected some serious blowback in the March/April issue of TPG from my global warming commentary in the January/February issue. I must acknowledge a great appreciation for Mr. Nuhfer’s “Commentary for students on scientific skepticism versus political advocacy.” He hit the nail on the head in directing budding scientists to view the evidence and learn to think for themselves, rather than having someone else tell them “the answer.”

However, I feel a need to respond on three counts that Mr. Nuhfer inadvertently mischaracterized. Firstly, my commentary made it quite clear that we need to evaluate scientific cases on their own merits – and then proceeded to do so – rather than just considering the source. Secondly, the source does still matter; I did not intend to cast personal aspersions on Mr. Corbett or Mr. Dannemiller, but rather to point out that a primary reference cited in their article reflects mixed motives and a history of dubious science for political ends.

Thirdly, I stated a personal observation that global warming skepticism tends to be vocalized by older members of the profession, a greater proportion of whom spent careers in mining rather than environment. My commentary did not provide any statistical support for that assertion, and thus could perhaps be characterized as a stereotype. However, my primary point was that we (scientists among others) make subconscious accommodations to our environments and that those adjustments can affect our conclusions as much as any “true” scientific reading of the evidence. We must all remain vigilant to avoid that innate human tendency as much as possible. I will acknowledge my personal weakness is a visceral response when I sense that skepticism is rooted in distaste for the social phenomenon associated with global warming rather than with the science itself.

In closing, allow me to reiterate that Mr. Nuhfer's article was well received at my desk, despite some uncomfortable critiques.

Charles Tiller, CPG-10811

Dear Editor

I read with some interest the response of Mr. Charles Tiller in the January-

February issue of TPG. I believe that the agenda Mr. Tiller suspects to exist amongst older generation geologists is real, but that he may not yet understand it completely. One thing about older geologists is that they often have been exposed to more geology. Oddly enough, almost the entire study of geology tends to center around the past, as even with the most rapid geologic events (possibly earthquakes), we still are not all that good at predicting the future.

It is different in the realm of climate prediction in two ways. First, as we all know, climate is difficult to predict more than a few weeks out (anyone know what the weather will be like, precisely, on election day?), due to the large number of variables. Admittedly, over my lifetime, this has gotten better. But if we can't predict climate change more than a few weeks out, what confidence does that give us that we can predict it even better a few centuries out? And that brings us to the second problem, which I will get to later.

Being a geologist, and an older one at that, I have a tendency to harken back to the past to help me understand what the options are for the future. Having been a firm believer in the Greenhouse Gas Theory (GHG) from the 1970’s, I was surprised when the Intergovernmental Panel on Climate Change published their findings that sea levels might go up 40-60 centimeters over the next century. I was only one tenth as surprised when former Vice President Al Gore upped that to 20 feet. That is because we sit today about 100 feet shy of where we have ended up after at least the past four interglacials. So, the question that comes to mind is that if we have 100 feet to go, which of those 5 - 20 foot rises will ours be?

We are at a crossroads, yet again, in scientific thought. Can the past really be any help with us in predicting the future, or is this now the exclusive province of modelers? This brings back a line from an old Steely Dan tune that heralded the international geophysical year “A just machine to make big decisions, programmed by fellows with compassion and vision. We'll be clean when their work is done, we'll be eternally free, yes, and eternally young.”

Which brings back the old dilemma of faith vs. science.

If science is any guide here, we can start with the Vostok ice core data, which records climate at the Vostok ice station in Antarctica some 420k years back.
My old, trained geologist’s eye discerns four things here in short order. These are:

There are four ice ages recorded in this ¼ of the Pleistocene. Dan Ponti (USGS) has 16 in the whole Pleistocene and having four in ¼ is spot-on. Nice to get a match;

1. Next, notice how punctual these four events are. Nice 100,000 year long ice ages. Back to back. The closest thing to a finely tuned clock in all of nature;

2. Notice how each ice age terminates abruptly? Be thinking of ways that at the end of each 100,000 year long deep freeze, when just about everything is either long dead or close to it, you will need a massive source of GHGs that can not only cause a 2 or 20 foot rise in sea level as predicted by the IPCC or Gore from anthropogenic sources today, but a 400 foot rise without any anthropogenic contribution, and in what researchers now think may be just a few short years or decades; and

3. Last but not least, pay close attention to how those 100k year-long slow slides into the deep freeze occur. There are quite a few fits and starts (periods of global warming and global cooling) associated with each ice age. Some periods of global warming/cooling individually lasting tens of thousands of years. Just so no one misses the point, I edited the Vostok graph to place as closely as I could the beginning and ends of several hominid species. I have a strong suspicion that none of these events were caused by hominids (in fact, we were dependent on them).

Now we must face the age-old question of which came first, the chicken or the egg. Because THE TRUTH is that carbon dioxide concentrations and the Earth’s temperature are tied. That fact is not disputed. But the WHOLE TRUTH is that according to the most meticulous researchers studying the 420k year long Vostok core (and the 800k year long Dome C core) temperature goes up and the consensus seems to be that something like 1-3k years later, CO2 goes up.

An exhaustive study by Mudelsee (2001) puts it this way:

“On long timescales, variations in Vostok’s CO2 record lag behind those of its air-temperature record (dD) by 1.3±1.0 ka, and lead over global ice-volume variations (derived from Vostok’s d18Oair and marine d18Omar) by 2.7±1.3 ka.”

So, in the most recent past, CO2 has been a spectator at these abrupt climate change events (as we were), not an agent provocateur. Of course, these same ice core records show the occasional anomaly where the opposite occurs, but as most workers in this field have shown, statistically, this is the rarity not the norm.

Now why would this be? I thought about this and decided to do a little test. I took two of my favorite carbonated beverages and placed one in the fridge and one on a solar exposed kitchen window sill in summer. I came back two days later and opened them both and put them back. I waited another two days. I then took them both outside and placed my thumb over the opening and shook them. Lo and behold, the one that had been in the refrigerator had the most CO2 left. Why? Because cold water can contain more dissolved CO2, and it takes the oceans from several centuries to several millennia (depending upon currents, tectonic shifts etc.) to come into thermal equilibrium with the atmosphere, and the ocean is the largest sink for CO2 on Earth.

However, since the industrial age, CO2 seems to have led temperature change. My question here is who is surprised? Certainly the rapid increase in the use of fossil fuels has contributed to this circumstance. I have no problem with that. But is that the only thing that can cause such a temperature change? Actually, the answer is no. The current best estimate is that we could easily double the atmospheric concentration of CO2 from 0.04% to 0.08% over the next 300 years at current rates. And that has a lot of people scared.

My question is are you really on the right side of the decimal point here? Have you really done all your homework on this? Or are you in denial as to what the true anthropogenic problem might actually be?

First, let’s take a long hard look at CO2 before we get to what else might be involved here. The vast majority of climate change models ascribe 20% of the GHG potential to CO2. The oft quoted fact is that the earth is 33 degrees Celsius warmer due to the trace gases in our atmosphere. Now, since oxygen and nitrogen make up 99% of our air, that leaves only 1% of everything else. CO2 is just 0.04%. However in that 33 degree statement, the climatologists that cooked this dish up assign 20% of the GHG effect to CO2 and 80% to water. Let’s look at that ratio for a moment. If CO2 is responsible for 20% of GHG effect at a concentration of 0.04% in the Earth’s atmosphere, then dividing 20% by 0.04% we can readily calculate a thermal insulation effect to concentration ratio of 500. Making it, arguably, the best insulator known to man.

If, instead of 0.04% CO2, we used pure CO2, a concentration increase of 2,500 times, we would have the best insulator in the known universe, and since one can achieve an 8:1 compression with common air compressors, we can get an enormous amount of CO2 in compressed insulation applications, such as between the outer and inners shells of any kind of an oven. I mean, we are talking infrared here aren’t we? Isn’t that what the ruckus is all about? Infrared absorption by CO2? Now, since no one has patented CO2 for thermal insulation purposes, either I just gave you the scoop of the energy crisis, or maybe CO2 isn’t all that crash-hot of an insulator after all. We might call this the “Wall Street Test” for as sure as you are reading this, someone should patent CO2 and replace Argon in all those window walls out there, not to mention the myriad of other applications awaiting such an accomplished infrared trapper.

This 20% GHG factor appears to be the most egregious affect accredited to CO2 by climate change artists. It is deeply buried in the mathematics of the “black
body” calculations which most people would not look at too hard given all the high-level math. But it is there, well hidden. According to the USDOE, the actual GHG potential of CO2 is 3.5%, of which anthropogenic contributions make up an almost inconceivably high number of 0.117% (pun intended).

(http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BUMDT?File=ghg_gwp.pdf)

Starting to get unworried? Don’t. Not yet anyway. When we meet up with real culprit here, then you should get very worried.

The single biggest problem humanity faces is the Nine Times Rule, a name I have given something I learned decades ago in an advanced psychology course. Simply put it states that the human being is nine times more susceptible to rumor than it is to fact. If you think about that for a moment, it explains an awful lot of human behavior (like which is the correct religion, for instance). Mathematically it means that either 88.9% of the time we are off on the wrong track or only 11.1% of us actually get it. You decide. If you still find this unacceptable, consider that not too far from the beginning of the industrial age, a great many homo sapiens still approved of the practice of burning witches at the stake. I am coming around to the idea that maybe this was not so bad an idea……..

So, by relying on a gas going from 4 one hundredths of one percent to 8 one hundredths of one percent to be the real issue ignores the 800 pound gorillas in the room. In the last half of that timeframe it took for us to industrialize, we have wiped out 50% of the Earth’s forests, 50% of the Earth’s grasslands, 33% of amphibians are on the endangered species list, 25% of all mammals. Try the rate of extinction at about one species an hour. At a conference held on deforestation in December 2007 in Bali, Indonesia UN specialists estimated that 60 acres of forest are felled ever minute worldwide, or at the rate of 32 million acres (50,000 square miles, or about the size of Mississippi) per year according to the UN’s latest “State of the World’s Forests”. “If we lose forests, we lose the fight against climate change” declared more than 300 scientists, conservation groups, religious leaders and others at the Bali gathering. Destruction of forests is estimated to account for 20% of anthropogenic greenhouse gas emissions, second only to electricity and heat generation by fossil fuels. Try not to forget that forests store CO2 and carbon. They are pivotal in the extinction crisis. “Short of a miraculous transformation in the attitude of people and governments, the Earth’s remaining closed-canopy forests and associated biodiversity are destined to disappear in the coming decades” says the 2001 UN study’s author Klaus Toepfer.

Another thing older geologists will note before younger geologists will is that soils heat up when they receive insolation. They get warm. This will happen to soils regardless if they are lying on the ground, or swept up by winds to become suspended matter from all that recently cleared land. PM10, PM5 and PM2.5. Lots of lovely aerosols hanging around in the atmosphere collecting heat. Huge quantities. A far, far greater problem than CO2 is ever likely to be.

Now, before we even try to face down what the real problem is, let’s have a think about where we are in the great scheme of things. Recently published work by Arctic sedimentologists suggests that the trigger for sending us down that long slippery slope to the next ice age is actually the complete melting away of the polar ice cap, a situation currently predicted to be complete by 2070. So, this seems to have happened before. Perhaps by means natural but unaided by man many times before, but this time perhaps aided by man.

In “A Few Good Men”, Jack Nicholson rages “The truth? You can’t handle the truth”. So we will see. The truth is that 13 of our 16 largest cities sit on estuaries, the quintessential cradles of life on this planet. In 1999, Kofi Annan celebrated the fact that we had just passed the 6 billion mark of humans on this earth. All of them wanting to live in “American Plush” The UN also published that it would take 7 more “M Class” (my Star Trek interpretation) for this to be possible. And countries such as India and China are hot on the track.

But the way the Nine Times Rule works is so insidious that it can manifest itself in rather bizarre ways. Having picked CO2 apart and found it wanting, I finally replaced my 14 year old car last year with a new Hemi. A friend of mine, who seemingly replaces his cars annually (leasing), roundly castigated me for buying this vehicle, and reacted rather poorly when I went over the facts of how the high quantities of nickel in the batteries of his Prius (this year’s lease) actually require more fossil fuel emissions (think of the amount of lowly refined and questionable sulfur containing fuel massive ore freighters burn) shipping it all over the planet (for multiple specialized processing into batteries) than a Hummer, if you consider the total life cycle impact on the planet. But, as my ex used to say “Don’t let reality intrude on a good story.” He had his third child 2 weeks before I bought this car. Figure 2 moots the entire discussion.

A professor of mine who reviewed this piece in an earlier form related a program he had heard recently on NPR that a new way for the young, over $200k/yr

Figure 2. One American = 1,875 tons of mined, produced and refined energy and materials. Six Billion earthing = 11 trillion, 250 billion tons (in American consumption tonnage)
couple to flaunt their wealth is to have four or more children.

One interviewee even said that her neighbor had just had her fifth child, which makes her want to do the same to show that she and her husband can also support such a large family.

And make no mistake, we are more than just addicted to growth, we are actually dependent on it. We have no way to change that. Think of a negative economy, where you, as CEO, notify less and less shareholders of lower year to year profits, everybody (meaning those that are left) clapping on how much lower their dividend (and planetary impact) will be this year. Only the successful exploitation of fusion, or the next ice age, will change any aspect of that outcome. We will not pass, much less enforce, laws limiting family size or forcing those that do not have this lifestyle from trying to attain it, nor do we have the technology to get us those insert pop quiz answer here* additional “M” class planets, to bring their goodies back or simply invade them. So, nature will run its course. California, looking pretty snug, with its carbon credit program, will divert billions that could be used to, say, research fusion, or “fix” our orbit, for instance. Perhaps, appropriately, for California, AB32 will not affect in either way, the 97.78% of non-anthropogenic GHGs, or the eccentricity, obliquity or axial precession the universe has bestowed on planet earth.

And that folks, is how the Nine Times Rule works.

But there is more truth. The Genus Homo underwent the largest encephalization of any mammal in history in the past 2-3 million years (from about 500cc to about 2,500cc). We did it in spurts and stops. In almost perfect synchronization with those awesome (awful?) 100k year long ice ages, where there was lots of time for the intellectually challenged amongst us to make that thing called a fatal mistake. So, there it is, can you handle it?

Editor’s Note: The January 2008 issue of Geotimes includes an article entitled “Rocking the Cradle of Humanity” that addresses the question of East African hominid evolution as related to tectonics and climate.

If you are not so comfortable with the past (old stuff), then let’s just look over the past 11,500 years, the time since the abrupt termination of the Wisconsin ice age. All of human civilization has occurred in that time interval. These interglacials tend to last about 10-15k years on average. A recent and well researched study on north Atlantic sediments concluded that the time for the next ice age is now. So if it has taken a 100k year long ice age to smarten the various iterations of Homo up each time, what is next?

We may not have 100k years to smarten up this time. We might only have about 872 years. So if you are worried about sea level 100 years out, mark your family calendar for the 16th of March 2880. 1950DA may be coming to dinner. It all of the variables associated with solar wind and gravity are not spot on, then it could hit us with the force of 100,000 megatons, or about 4.7 million Nagasaki “Fat Man” atomic bombs. We just may have to smarten up all on our own this time, and quickly.

In summation, we have wreaked havoc on our environment, and there is no question that with such massive effects on our biosphere, and its diverse and intricate equilibria, we have fundamentally altered many of these equilibria, which will be manifesting itself over time. Yes, we are emitting massive amounts of CO2 and other gases that undoubtedly will have some effect, but unless you do the voodoo math thing, you just cannot get to climate change from here. And if you are at all rational, you will have recognized from the Vostok ice core data that CO2 could not have been the agent provocateur of change. You have no rational source for the massive amounts of CO2 you must have at the end of those 100k year long deep freezes to rocket out of them so abruptly. And even a caveman could see that these events are easily tied to our rickety orbit, which we will not change one iota by passing draconian laws against an innocuous, odorless, colorless gas. And no amount of GHG taxation can provide the funds that would be needed to eliminate the other planet’s gravitational effects on spaceship earth.

And we have no reason at present to believe that these astronomically driven events will cease. And it will be somewhat difficult to measure anthropogenic effects against this backdrop of repetitive 400 foot changes in sea level (300 below to 100 above) so regular you can set your geologic clock by them.

If anything, what we have learned is that Homo sapiens is a master of psychological denial on even more massive scales. Locked in to the Nine Times Rule since the Wisconsin Ice Age, we cannot decide which is the correct religion (there are so many to choose from, aren’t there?), but we regularly discard the pantheon of Greek and Egyptian gods while inventing new religions, like GHG-driven climate change. But the real problem with the Nine Times Rule is that we have reached a critical juncture in the last few centuries of this interglacial period. We have dramatically overpopulated ourselves. We have the fossil record to show us that this is a self-controlling phenomenon. Overuse of resources and trashing one’s environment has been the dirge of many a species. And unless we can find enough “M” class planets, and quickly, then just as quickly this becomes a case of intellectual capacity. Do we have enough?

The real question here is do you (get this)? Unfortunately, if the answer is that only 11.1% of us have that potential, I am not sure that is enough. The real problem we face, and that we have no example of any kind which can guide us, is how do we manage ourselves down to a manageable size (given that we know of no other M Class planets yet) so that we really can achieve equilibrium with spaceship earth. How does a negative economy work? How would or does sustainable negative growth work? This is where older geologists have little other practical choice but to pass the baton.

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William F. McConkey
Expectations. Value-Added. The “Experience.”

Or, maybe it’s a follow-up call after the delivery of a service or product. When was the last time someone performed a service at your home or office, which ended with a “check-up” phone call to see if you were pleased? These don’t happen often, but surely stand out when they do. Yet, for the pennies per client it will cost to implement such a “we appreciate you” program, isn’t it worth it?

And, last, but not least, the “experience.” Put yourself in the shoes of your client. From the first encounter with your organization until the last, what does he or she “experience”?

Is the receptionist friendly or do you have an impersonal press-this/press-that greeting? Or, do you make the call an even less personal by asking callers to “key in the last name of the person you are trying to reach” (forgetting that many people don’t know or can’t spell last names of their business contacts)? How about a direct mail letter that says “call this number” or “return the form in the enclosed envelope”, only for the recipient to not find an envelope or for the people who answer the 1-800 number to not know how to help you.

You often see the similar scenario with websites—sites that have not been programmed to work with Macintosh or some with just dysfunctional or user-unfriendly pages. You have to wonder—did anyone from the company try to use this or do they not care if the user is frustrated?

As you can see from the integration of these three concepts, in a slowing economy, there is still a lot a company can do to enhance its marketing—a lot that does not have to cost much money.

Attention to details and to the client “experience” will make the difference. Make it easy and enjoyable for people to do business with you and make them feel appreciated so they will think twice about moving their business elsewhere even if the “offer” to switch is attractive. According to some statistics, more than 60% of business is lost due to a feeling of apathy (the company does not appreciate the business), rather than poor service. Are you losing clients to apathy or a less-than-wonderful client experience?

If your organization is apathetic toward its clients in that it is not proactively client-focused and expressive of gratitude, then your client’s reaction to doing business with you will likely be apathetic in response, and an apathetic client is much more likely to change vendors, perceiving “it can only improve,” rather than to perceive a risk to being disloyal.

How do your clients feel about you?

Duane Carey is President of IMPACT Marketing and Public Relations in Columbia, Maryland. He was a consulting hydrogeologist for 11 years prior to launching a marketing consulting firm in 2003. He earned his MBA at Johns Hopkins University (JHU), and is a Certified Professional Geologist (#10305) and past President of the Capitol Section of AIPG. In late 2005, he took over the helm of IMPACT, which was founded in 1990 by one of his professors at JHU. He can be reached at 410-312-0081 or duane@MilkYourMarketing.com

Columnist’s note: I’m taking a long-overdue vacation, so I’ve asked my business partner, Carolyn West-Price, who founded my company 18 years ago, to write about a topic universally applicable to all professional services providers. I hope you enjoy it. See you next issue.

If you’re wondering the relationship among these words, it’s simple. These are three aspects of the relationship your client has with your company which you can control to ensure that switching to your competition just wouldn’t be worth it...even if they are more aggressively marketing and charging lower prices.

Think about it. If you establish appropriate expectations when you are courting a client, there will be no disappointments...assuming you deliver what you promise as you promise it.

For instance, think about the expectation you have when you go to a restaurant at lunch and their table tent promises that certain meals can be served in 15 minutes so you can be assured of being in and out in a timely manner. Well, what if that meal was served in 10 minutes? or what if it was served in 25? All other factors being equal (quality of the meal and service), you would be thrilled in the first case and disappointed in the other. Had they not promised anything, you may or may not have had an emotional response.

So, the moral to this story is simple: don’t promise anything you can’t consistently deliver.

Now, think about the next concept—value-added.

Look at your product or service and simply think about ways in which you can enhance what you provide. Is it creating a “client conference report,” which summarizes your meetings or phone conferences? Such a simple summary of your notes tells the client how thorough you are and how concerned you are that you both stay on the same page (in terms of your agreements from the specific conversation or meeting.)

According to some statistics, more than 60% of business is lost due to a feeling of apathy (the company does not appreciate the business), rather than poor service. Are you losing clients to apathy or a less-than-wonderful client experience?

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Committee Volunteers Sought

In response to member requests, AIPG President Dan St. Germain has established an ad hoc Committee on Climate Change. The charge of the committee is to explore the feasibility of developing a Position Paper on climate change (as have some sister societies) in view of current scientific discourse. AIPG members interested in serving on the committee are requested to submit a paragraph expressing interest and willingness to participate, along with any comments you may wish to offer. Please send your expressions of interest to aipg@aipg.org. Thank you. Editor
Robert G. Font, CPG-03953

Questions:

1. Which of the following terms best defines “A shallow lake or pond, especially one found lying among sand dunes, where the lakes are formed due to the ponding of inland drainage by beach material and may eventually become filled with silty sediments?”
   a) Gyttja
   b) Étang
   c) Bergrschundra

2. We find the mineral “wollastonite” in a metamorphic setting. What is the most likely parent rock?
   a) Tholeiitic basalt
   b) Calcite-cemented quartz sandstone
   c) Clay-shale

3. The southern-hemisphere seaway (ocean/sea) that separated “Laurentia” (North America and Scotland) from “Baltica” (Scandinavia) roughly between 600 and 400 million years ago is known as the:
   a) Aegean Sea
   b) Iapetus Ocean
   c) Rheic Ocean

4. From laboratory tests, the following table relates shear strength (“S” in MPa units) to water content (“w” in %):

<table>
<thead>
<tr>
<th>Strength “S” in MPa units</th>
<th>Water Content “w” in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.96</td>
<td>18.3</td>
</tr>
<tr>
<td>4.05</td>
<td>16.0</td>
</tr>
<tr>
<td>7.55</td>
<td>11.8</td>
</tr>
<tr>
<td>8.51</td>
<td>10.7</td>
</tr>
<tr>
<td>3.91</td>
<td>19.2</td>
</tr>
<tr>
<td>8.06</td>
<td>17.8</td>
</tr>
</tbody>
</table>

Based on linear regression analysis (method of least squares), what is the equation of the line of best fit that relates strength as a function of water content and what is the coefficient of correlation? (What is significant about it?)

   a) \( S = 12.26 - 38.94(\omega) \); \( r = 0.67 \)
   b) \( S = 12.50 + 39.00(\omega) \); \( r = 1.00 \)
   c) \( S = 12.03; \ r = 0 \)

Answers on Page 43 & 44
Candidate for AIPG National President-Elect

Michael D. Lawless, CPG-09224, Blacksburg, Virginia

One of the most important decisions made by AIPG in recent years was initiated by then-President Dennis Pennington, CPG-04401, in 2000, namely to include the Past President on the Executive Committee. That decision has provided our organization with the continuity and stability to conduct our business with a long-term perspective and allow key initiatives sufficient time to be successfully implemented. This year, under the leadership of Dan St. Germain, CPG-07858, (and the tireless efforts of the excellent staff at Headquarters), the Executive Committee is undertaking several initiatives to further strengthen AIPG. These include launching a Continuing Education Program, providing value to state licensed Professional Geologists, increasing membership, and including students in our goals.

These initiatives will look familiar to those of you who have been involved with or followed the activities of the executive committees during the past ten years or more. Increasing membership and non-dues revenue have been ongoing themes over the years with efforts during some years resulting in greater success than others. In my opinion, we are beginning to see the payoff from the hard work and dedication of successive presidents and executive committees all pulling the same direction. It is my intention, if elected, to continue moving AIPG in this positive direction.

The Continuing Education Program will satisfy two of these ongoing goals, providing reduced cost CEUs to licensed PGs as well as providing non-dues revenue to AIPG. Likewise, a reorientation of our focus to provide more value to students will increase membership over the long term. Students are quite literally the future of our organization. Job opportunities abound in geology today from the booming petroleum and mining industries, to concerns for the environment and sustainable water supplies. Indeed we have several young geologists on our staff that have not yet experienced the historical cyclical nature of the environmental consulting business. Our ability to inform students about potential careers in geology and provide them with a network through which to start and develop a career in all the disciplines within the geological sciences positions us uniquely among our sister societies to attract young, enthusiastic lifelong members.

Energy, environmental and water issues are frequent topics covered by the national media. The focus on these issues provides us with an opportunity to communicate the importance of the geological sciences in developing solutions in these areas. It is likely that the public's attention to these topics will increase in the near future providing us with an ongoing opportunity to communicate with them and our elected officials and continue to raise the awareness of geologists and the profession of geology.

At the section level, we are often not aware of the activities at the National level or the successes resulting from the volunteer efforts of many of our members. This year as Vice President I am contacting each section to raise the awareness of the activities at the National level, and discuss ways in which National can be more supportive of the sections. It is also my goal to act as a conduit of information between the sections to relay ideas and initiatives that have been successful in particular sections and could be implemented in other sections to strengthen those sections. Strengthening our sections will strengthen our overall organization. I would welcome the opportunity to continue these efforts as your President-Elect.

During the years I have been a member of AIPG, I have made many friends, put in some hard work, and had a lot of fun. AIPG has contributed significantly to my career development through the people I have met, the areas of the country to which I have travelled, as well as technical information learned at many of our national and section meetings. One of my favorite aspects of AIPG is the ability to interact with geologists working in all the disciplines of geology. I am honored to be nominated for President-Elect. If elected, I will continue to work for the long-term success and vitality of AIPG.
Candidate for AIPG National President-Elect

Ronald J. Wallace, CPG-08153, Roswell, Georgia

First of all I would like to thank the Nominating Committee and Executive Committee in recommending my nomination as President-Elect. I must tell you that I was completely surprised but I am ready for the challenge. The first national AIPG convention that I attended was in Glenwood Springs, CO in 2003. Since then I have served two years as an Advisory Board representative and am currently in my second year as National Treasurer. In my career I worked for a major petroleum company for 13 years, followed by seven years of environmental consulting, and have worked for the Georgia Environmental Protection Division for the last nine years. I am licensed as a Professional Geologists in Georgia.

As a member of the Executive Committee I support our National President, Dan St. Germain, CPG-07858, in the direction that AIPG is going in supporting all geologists, especially state registered geologists. AIPG must continue to show value to all geologists.

The cost of license registration and membership in professional organizations is always a concern, and it is important for AIPG to have sources of income without increasing membership dues. The National Executive Committee is currently planning conferences on regional issues to help geologists meet their educational requirements and also to raise additional funds for AIPG. AIPG also offers several on-line courses and I would like to see more courses offered in the future.

Currently in Georgia we are organizing our first conference on “Innovative Remediation Technologies”. We plan for this conference to be informative for environmental professionals, provide the professional development hours needed by some PGs and PEs, increase name recognition for AIPG, and attract new members to the organization. Money raised in this conference will be used for student scholarships in Georgia. We currently give a free AIPG membership and plaque to one geology student from each of the six universities in the state that grants geology degrees. Small scholarships would be a great help to our student members. In the last two years I have given career talks at four of these universities and I try to visit each department annually. In the five years that I have been visiting our universities four of the departments have changed chairmen. I enjoy working with the universities although it takes time to develop a good working relationship. Recently we developed a computer presentation which shows different careers in geology. It was sent to each university and to one junior college for use in introductory geology classes and we hope it will encourage some to declare geology as their major. We think this can be a very valuable service to the universities.

Presently AIPG National gives four $1,000.00 scholarships to undergraduate majors. I would like to see this expanded to more scholarships, and to include graduate students. The Northeast Section is a great example of the success of their Angelo Tagliacozzo Memorial Geological Scholarship in the number of scholarships they award. We need to approach the membership and reach out to the consulting firms, petroleum, and mining firms for their support to keep the flow of future geologists to their perspective industries.

We still need to create additional student sections. National can provide the tools to the sections but its up to the sections to make the contacts and get the students and faculty involved in AIPG. At the national convention in St. Paul, Minnesota I gave a CD to all section presidents or representatives in attendance which included presentations on geology careers, how to create a student chapter, the student manual, and student member application. Since then no student sections have been created. It takes time and energy to get a student section going but we have many members who could help start a student chapter at their alma mater. It has been personally rewarding to see many of the Georgia State University students graduate and get their first professional geology job. In several cases we helped the students by sending their resume out to members or posting them on our web site. We can also show students what they may be doing in their first professional job by demonstrating field work such as hollow stem auger drilling, geoprobe drilling, proper soil description, and visits to remediation sites. This is a practical service we can provide our students.

As President-Elect I will support the President in whatever assignments that are needed. We need to continue at the National level to support geologists in their careers by developing additional on-line courses and organizing conferences on regional issues. At the section level we need to support our student members and add more student sections with the tools from National.

AIPG’s 2008 Joint Meeting with AHS and 3rd IPGC will include Student Posters, Technical Sessions and Field Trips
Candidate for AIPG National Vice President

Timothy L. Crumbie, CPG-10433, Lexington, Kentucky

Since the beginning of my professional career I have been advised by my more experienced contemporaries that I should become a member of AIPG. At the time I did not understand why it was so important, but I chose to follow their advice. I, like many others, started the application but initially failed to complete it. Several years later, after I had obtained my license to practice geology in Kentucky, I came across my incomplete CPG application and decided that it was time that I finish and submit it for review. Approximately eight months later I received a letter from AIPG National stating that my application had been approved and that I would now be recognized as CPG #10433. Eager to learn more about the organization, I began scouring the business section of our local newspaper to find out when the next meeting was scheduled. I was perplexed by the fact that I was unable to locate any information concerning AIPG whatsoever. My inability to locate any such references led me to speculate that AIPG must be quite exclusive and that the only way to participate may by invitation only. I mentioned my interest to a few of the active AIPG members with whom I was acquainted and eventually a colleague invited me to attend my first meeting. I quickly learned that the meetings were not exclusive; they just weren’t publicized. It was only after I became active within the organization when I begin to understand AIPG’s purpose.

The Kentucky Section is experiencing the many of the same difficulties associated with expanding its active membership as many other Sections. The two most frequently asked questions that I have heard from new and prospective members are “Why should I join” and “What have I done for AIPG” should be the questions foremost in their minds. Far too many geologists believe that the CPG certification is no longer as relevant as it once was, especially since state licensure gained wider acceptance. I must admit that I too, once believed that AIPG’s primary role was to provide a mechanism for professional certification, but I have since learned that our purpose is much larger than that. As an advocate for the profession, AIPG promotes professionalism and competency as well as conveying the importance of geology to the public at large. By educating the public, we will also be securing the future of our profession.

Over the past year, the Kentucky Section has collaborated with the Kentucky Geological Survey (KGS) to initiate a more aggressive campaign to increase public awareness that is intended to spark a renewed interest in geology and the profession. The program, although still in its early stages, has already reached hundreds if not thousands of people. Public contact is currently being fostered through radio talk shows, articles published in periodicals, and public speaking engagements. New ideas are constantly being developed as opportunities arise.

For AIPG to continue to thrive, it is imperative that individual Sections practice advocacy at the local level with renewed vigor. This can be accomplished over an extended period of time by increasing the number of younger members who are willing to assume an active role in the preservation and advancement of their chosen profession. AIPG is only as strong as its membership, and our current, active membership appears to be aging much too quickly. The issues of declining membership and member participation were identified years ago, but they must be understood before they can be rectified. Today’s economy, the strains placed on natural resources by our growing demands and problems generally associated with population expansion afford us a prime opportunity to pool our resources to make our numbers strong. We must take advantage of the collective wisdom and experience that is currently available to us and use it to make our voices heard.

I am honored to have the opportunity to serve my profession in the capacity of National Vice President. One of the primary functions of the Vice President of AIPG is to serve as the liaison between National and the Sections. If elected, I will interact with the individual Sections to gain an understanding as to why active membership is declining in certain areas while it is growing in others. Effective recruiting techniques and other mechanisms that will facilitate participation will be shared between Sections in the attempt to increase our numbers and revitalize member participation.
I am honored to be nominated for the position of National Vice President for 2009. I have served the AIPG at both the National and State levels for the past 11 years. From 2006 to present, I served on the National Executive Committee as Secretary and as Advisory Board delegate. I also served on several AIPG committees from 2004-2008, which included the Seminar/Short Course and CPG Practicality Committees. From 1997 to 2003, I kept in close contact with the Executive Committee through my involvement as Section President for Alaska and Hawaii. This year, I worked with a group of dedicated CPG’s in preparing seminars / short courses as part of AIPG’s CPD program to promote member involvement at the state section and National levels. Other activities included the continued work with CPG’s and State Representatives in preparing legislative resolutions for establishing the Hawaii State Geological Survey and State geological registration.

It would be an honor and privilege to continue serving AIPG on the National Executive Committee as Vice President, and if elected, intend to work with President-Elect John Bognar, CPG-08341, to promote continuing efforts in the following programs.

Promote increased CPG value and practicality: I have worked with the CPG Practicality Committee to prepare a questionnaire for distribution to the general membership. My goal would be to help the National Executive Committee bring value to the CPG title as measure of high competence, integrity and ethical conduct. To this end, I support promoting the profession of geology and the critical roles geologist play in the society by increasing public awareness in environmental hazards, educated land planning and development, construction materials, exploration and mining activities, and the responsible development of earth resources for alternative and /or renewable energy. Continuing efforts I started in Alaska, currently working with the Hawaii State Legislature to establish geology registration for geologists and hydrologists in all arenas (i.e., private, public, and government agencies). This work will continue to the local government agencies towards establishing mutually acceptable terms for all entities to recognize the CPG designation and its professional development programs as an invaluable asset to proposed or existing state sanctioned PG / CHG designations.

Promote increased participation in the CPD program: I support increased participation in the CPD program by working to make the process more “user friendly” and providing more available resources to the membership (i.e., college out-reach, and on-line seminars / short courses for CEUs). I am working with National Executive Committee to prepare seminars / short courses in conjunction with local universities to bring local membership more CPD programs that provide CEUs and/or PDUs that were once only available through larger regional conferences, meetings or venues.

Increased membership: I support the continued use of the member and student categories as a means to bring in new members to AIPG. The member category is an excellent way for those geo-scientists to continue their professional development until such time that they qualify for CPG status. Additionally, I encourage continued development of student sections at the university level and promotion of earth science / geologic hazards awareness at the lower age groups (middle / high school levels). As CPGs, we provide a very valuable network resource for university students as interns or for those venturing out into the job market. The National Executive Committee has performed well on the programs noted above and my goal is to continue the momentum. As president, I will strive to preside at all meetings of the Institute and of the Executive Committee, and shall perform the duties customary to the office.

As Vice President, I would be honored to support and/or assume the powers and duties of President-Elect John Bognar, CPG-08341, and such other duties as are required by the Executive Committee. The Vice-President shall maintain liaison between the Executive Committee and the Section Presidents and shall contact each Section President at least once annually to determine the status, condition, problems, and concerns of each Section and to inform the Sections of Executive Committee requests, initiatives, questions, and concerns. The Vice-President shall undertake special projects requested by the President and report periodically thereon. Thank you.

**Candidate for AIPG National Vice President**

Mark W. Rogers, CPG-08926, Honolulu, Hawaii

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**CANDIDATE FOR AIPG NATIONAL VICE PRESIDENT 2009**

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START AN AIPG STUDENT CHAPTER TODAY!

**AIPG STUDENT CHAPTER MANUAL**

www.aipg.org

The AIPG Student Chapter Manual is available on the AIPG National Website at www.aipg.org.
As the President of the Florida Association of Professional Geologists a Section of the AIPG (FAPG) I am proud to say that we are very active in legislative activities at the state and local level, assisting with development of state law and ordinances at the local level. These activities help to promote and protect our profession. In Florida, we have had great success in being active in these areas by doing some relatively simple things, although the simple things do take time, dedication, and team work.

As important as our technical work is, I find that it is just as important to promote our profession to the lay person who probably does not know the contributions that geologists make, and the expertise we provide. I believe that it is one of our primary duties to let the lay person know that geologists are professionals trained in specific areas and that the lay person can rely on our expertise to help protect the public health, safety, and welfare.

Recent Florida experience serves to illustrate how we have assisted our legislators, as well as county officials.

In the 2005 legislative session, a house member introduced a bill that would require certain testing for the presence, or absence of sinkholes, the definition of a sinkhole (they had a definition that allowed subsidence to be termed a sinkhole), and reporting of testing activities.

I met with the sponsor of the bill and his staff members to offer our support on the sinkhole bill, and as it ended up, educating them on the types of sinkholes, how they form, the difference between sinkholes and subsidence, and the various tests that can be performed to determine whether or not a sinkhole is present. At that time, they had no idea of how sinkholes formed and yet they were writing legislation on how to test for sinkholes, and were writing definitions! They were very grateful for the time spent with them, as it certainly helped them understand what they were doing.

I also testified at hearings on the bill, and basically had 30 seconds to give our opinion and offer a very few words on the bill. The goal here was not to go over the bill in detail, but to tell the legislators that the FAPG is here, I have met and worked with your staff, and offered our assistance. In that respect, I promoted geology and geologists to legislators, and protected our licenses by giving valid opinions and advice on a very hot topic at the time.

The bill was passed with most of our advice taken.

Last year, we were monitoring development of a geologic hazards ordinance in Pasco County which would have required a Florida PG and/or Florida PE to sign and seal a report of investigations on the presence of known and unknown geologic hazards on the property to be developed, and within 50 feet of the property boundaries. I do not know of any PG or PE that would sign and seal such a report, so when the first public hearing was held, I went to the hearing with several of my fellow geologists and local engineers, to voice our concern.

The review committee took the comments to heart, and revised the language that essentially could not be met. They did leave in the requirement that a PG and/or PE sign and seal the report.

This was true through the end of January 2008, and in early March, I received another draft that had the PG requirement removed such that only a PE could sign and seal the report. It made no sense that only a PE could identify geologic features and potential geologic hazards.

The revised draft was to be discussed the next day and the first reading to the County Commissioners the day after. I immediately called Sam Upchurch a fellow AIPG member, who had attended the January meeting and he said that he was “shouted down” by a local engineer and that was how PG’s were removed from the draft. I called two other PG’s that had been working on this, and the four of us met and worked with the three engineers that attended, and we were successful in convincing the loud engineer that we should be included.

The language was reinstated, and at the Commissioners meeting the next day, and the following meeting, it passed with no opposition from the engineers.

I write this because as FAPG president, I am proud to say that we have been successful, and as an AIPG Advisory Board member and nominee for AIPG Secretary, I will continue the work to promote and preserve our profession. My experience is also an example of how you can be effective at the county or city level in promoting our profession.

Is Your Profile Correct?
It is important to keep your address, phone numbers, and e-mail information up to date in our records. Please take the time to go to the AIPG National Website (www.aipg.org) login to the member portion of the site and make sure your information is correct. You can edit your record online. If you do not know your login and password you can e-mail National Headquarters at aipg@aipg.org or call (303) 412-6205.
I am very honored to be considered for the Treasurer position of AIPG, and I greatly appreciate and accept your nomination. I also fully understand the fiduciary responsibility that comes in being elected to the position of Treasurer, particularly for an organization, such as AIPG, whose reputation and motto is competence, integrity, and ethics.

Historically, in organizations such as AIPG, the position of Treasurer is filled by members who generally do not have an educational or professional background in finance. However, many geologists do own businesses or have handled financial issues for the companies where they are employed. And at the very least, I think we would all agree that geologists are multi-faceted!

Having said that, I am pleased to let you know that my professional background includes experience as both a geologist and financial advisor. I have spent almost equal amounts of time in each profession over my 25-year career. In fact, it is my motivation and aspiration to bring the skills and experience I have gained over both my career paths to help solidify and enhance, wherever possible, the financial condition of AIPG and the ongoing missions of the Institution.

Upon completing my Master's degree in geology from the University of Colorado, I was employed as an exploration geologist for Shell Western Exploration and Production Company. However, it wasn't until I moved back to Denver, Colorado and was employed by ICF International Inc., conducting environmental and hydrogeologic work, that I learned about the need and advantages to being certified or registered as a geologist. In 1993, I applied for, and received my certification as a CPG. My certification served me well during my years at ICF, particularly with the demands of contract proposals and in actual contract work. In addition, I have always been proud of my certification through AIPG and with the professionalism of fellow members I have met, and had the opportunity to work or serve with in my career.

In 1996, I made a decision to leave my career in geology and pursue a career in financial services at Smith Barney. Over the past eleven years, I have built a successful wealth management practice that allows me to help my individual and business clients, many of whom are geologists, in the areas of financial planning and investment management. It is this set of skills and experience I have gained over these years of instruction, training and business experience that I believe can greatly benefit AIPG and their financial structure.

The Bylaws of AIPG, in summary, state that the Treasurer shall supervise the collection and disbursement of all funds of the Institute, shall keep complete and accurate records of financial transactions, and shall prepare and submit all reports required by law. This is a good definition of the Treasurer position, and I will, if elected Treasurer, adhere to the bylaws of AIPG, as stated. However, I believe there is much more a qualified Treasurer can bring to the position.

One of the strengths I feel I brought to the Colorado Section of AIPG, in serving as Treasurer from 2005-2006 and as President in 2007, was my ability to provide sound investment advice and recommendations regarding the use and investment of Section assets. As a result of my financial recommendations while Treasurer, and goals while serving as President, we were able to, as a Section, give out our very first scholarship award from the Rex Monahan Scholarship Fund. It is for these same reasons that I was asked to serve on the National AIPG Finance/Investment Committee beginning in 2007.

I am confident that I can provide sound financial advice and recommendations in helping AIPG achieve the institution's financial and overall goals. If elected Treasurer, and as a fiduciary to AIPG, I promise to conduct all financial activities in a prudent and responsible manner. I will adhere to all current policies and guidelines, and only after a careful review and analysis of all relevant data, will consideration be given to new policy recommendations or guidelines regarding financial matters. Every recommendation and decision will be based on ensuring the fiscal longevity of AIPG for all current and future members.
I joined AIPG in 1991, and volunteered to be an associate editor for The Professional Geologist in 1995. In retrospect, I am amazed at the diversity of the articles I have reviewed since then, which have varied from MTBE, public policy and regulations, aggregate resources, uranium mining, groundwater contamination, and environmental geology. Our contributors write about geology as their profession, avocation, and passion. Preparing any article for publication represents a major investment of time, and from personal experience I can appreciate the trepidation felt by authors that their submission may be judged unfavorably, either by the TPG editorial staff, or if published, by the readers.

TPG’s associate editors are asked to review each article in terms of suitability for TPG, interest to the readership, technical adequacy, and style, with the intention of expediting eventual publication in TPG. I have always viewed my task as an associate editor to be that of an assistant to the authors, providing constructive criticism. I have never made my comments anonymously, as I feel that the review process should be interactive. On one occasion, the two original authors of an article invited me to share the authorship in response to my editorial comments, which was particularly rewarding to me. TPG is AIPG’s journal, and my intention is to encourage and not discourage contributions.

My work as an associate editor has focused mainly on the technical contributions to TPG; however, I have always been impressed by the number of TPG contributors who have been willing to offer their personal opinions on a variety of subjects in the form of a brief letter to the editor or a lengthier op-ed piece. Whether you agree or disagree with something you read in TPG, your opinion counts and the only way to make yourself heard is to express yourself!

From 2000 to 2005 I edited the newsletter of the Northeast Section of AIPG, which has been published regularly since 1980. As the editor, one of my jobs was to make sure all the space was filled with news and information, and I enjoyed the prospect of empty space as an opportunity to personally editorialize on geoscience issues, write book reviews, comment on hiring practices, and publish annotated geoscience photographs provided by members and from my own career. Hiring and interviewing practices have been a longstanding interest, and I have written extensively on this subject for the NE/AIPG newsletter. My 2002 article So You Want Me To Hire You - An Employer's Perspective On The Interviewing Process, reprinted in the January/February 2003 TPG, was adopted by the Geological Society of America for its Roy J. Shlemon Mentor Program, which introduces undergraduate and graduate students to careers in applied geoscience. I originally wrote this article somewhat tongue-in-cheek, and it continues to be an excellent icebreaker when I discuss careers with students. Some agree with my views and some disagree, but all are anxious to discuss their post-baccalaureate options with geologists practicing outside academia.

Reviewing my own collection of slides, photographs and memorabilia for newsletter items reminds me how the focus of geoscience careers have shifted in the 30 years since I joined the work force in the 1970s, with mining and petroleum giving way to environmental geology, hydrogeology, and a more holistic view of the earth sciences among academia and government. Now the hiring cycle has come full circle. The market demands of many post-cold war economies, particularly China and India, have prompted resurgence in hiring by mining and petroleum companies. Many dormant, uneconomic prospects discovered in the 1980s-1990s can now be developed, but with sensitivity for human and ecological impact that barely existed when I was first hired (1977, by Bethlehem Steel, to prospect for manganese in Montana and Wyoming).

My tenure as NE/AIPG editor also spanned the section’s transition to using email as the principal means of communication for section meetings, field trips, and most importantly, the 2004 Annual Meeting. Our newsletter played an indispensable role in publicizing the annual meeting to from its inception and generating support from the section.

Walt Whitman remarked “If you done it, it ain't bragging.” I have thoroughly enjoyed my work and accomplishments as the NE/AIPG editor and AIPG associate editor, and my intention would be to bring the same level of commitment and enthusiasm as AIPG’s National Editor.

My goals as editor are:
1. Promote greater participation by students, the future of our profession and AIPG
2. Seek innovations for TPG to encourage member participation, and promote AIPG as an organization advocating for the geoscience professions
3. Encourage communications among sections and at national level
Michael D. Lawless

CPG-09224
Blacksburg, Virginia

Statement of purpose or goals you have for AIPG:
To continue implementing the initiatives begun by recent presidents including promoting the profession of geology, supporting professional development and the careers of geologists, fostering cooperation between the Sections and National, and providing value to members and potential members including state licensed Professional Geologists and students.

Universities Attended
- Bates College, B.S., Geology 1986
- Old Dominion University, M.S., Geology 1989

Company
- Froehling & Robertson, Senior Hydrogeologist 1990-1993
- IMS Environmental, Hydrogeologist 1986-1988
- Envirotech Mid-Atlantic, Hydrogeologist 1985-1986
- Dewberry & Davis, Environmental Program Manager/Associate 1996-present

AIPG Activities:
- Virginia Section, Treasurer 1996
- Virginia Section, President-Elect 1997
- Virginia Section, President 1998
- Virginia Section, Advisory Board Representative 1998
- Virginia Section, State Leg/Reg Committee, Chair 1998-present
- Virginia Section, Bylaws Committee, Chair 2001-2005
- Virginia Section, President 2007
- AIPG National, Wetlands Policy Committee, Chair 1998-2000
- AIPG National, State Affairs Committee, Member 1998-1999
- AIPG National, Subcommittee for Professional Practice, Chair 1999
- AIPG National, Secretary 2000-2001
- AIPG National, Membership Committee, Chair 2002
- AIPG National, Honors and Awards Committee, Member 2005-2006
- AIPG National, Vice President 2008

Ronald J. Wallace

CPG-08153
Roswell, Georgia

Statement of purpose or goals you have for AIPG:
To continue the direction that was started within the last few years for AIPG to strengthen the professional development of all geologists, to show value in membership, and to assist sections involved with licensure of geologists. We need to offer regional conferences and additional on-line courses to help all professionals. We need to develop more student chapters and give the students opportunities to learn outside of the classroom.

Universities Attended
- Lamar University, B.S., Oceanographic Technology 1973
- University of Kansas, M.S., Geology 1979

Company
- Skidaway Institute of Oceanography, Research Technician 1973-1976
- Exxon Company, USA, Geologist to Senior Geologist 1997-1990
- Exxon Company, USA, Marketing Engineer 1990-1992
- Sierra Piedmont, Project Geologist 1997-1998
- Mill Creek Environmental Services, Senior Geologist to Advanced Geologist 1999-present

AIPG Activities:
- AIPG Georgia Section, Executive Committee 1997-1998
- AIPG Section – Vice President 1999-2001
- AIPG Georgia Section – President 2002-2008
- AIPG National – Advisory Board Representative 2006
- AIPG National – State Affairs Committee, Chairman 2006
- AIPG National Treasurer 2007-2008

Charles W. Drake

MEM-0933
Orlando, Florida

Statement of purpose or goals you have for AIPG:
To continue to: promote the profession of geology and its importance in our society; the expertise that we provide to city, county and federal legislators when they write and enact ordinances, rules, and statutes; increase our membership such that geologists in the U.S. and our affiliate members have the resources to continue their geologic education and work with states as needed, to promote individual licensure of professional geologists.

Universities Attended
- University of Florida, B.S., Geology 1979-1982

Company
- Universal Engineering and Testing, Hydrologist 1985-1985
- Dyer, Riddle, Mills and Precourt, Inc., Hydrologist 1985-1990
- Tetra Tech, Inc., Hydrologist/Vice-president 1990-2002

AIPG Activities:
- Vice-President of Florida Association of Professional Geologists; Legislative Action committee, assist regional coordinator 2005-2007
- President of FAPG, Legislative action committee 2007-present
- AIPG National Advisory Board member; assist with short course subjects 2006, 2007

David R. Rhode

CPG-08558
Centennial, Colorado

Statement of purpose or goals you have for AIPG:
One of the primary duties of the Executive Committee is to promote the interests of the Institute. It is my commitment, as Treasurer, to serve the best interests of the Institute in regard to financial matters. As an experienced financial advisor, I am confident that I can provide the fiduciary responsibility and insight to ensure soundness and viability of the Institute's financial resources.

Universities Attended
- Fort Lewis College, B.S., Geology 1979
- University of Colorado, M.S., Geology 1982

Company
- Amoco Minerals Company, Geologist 1979-1980
- Smith Barney Inc., 2nd Vice Pres./Financial Advisor 1996-present

AIPG Activities:
- Colorado Section-Treasurer 2006-2006
- Colorado Section-President 2007
- AIPG National-Finance/Investment Committee 2007-Present
CANDIDATES FOR AIPG NATIONAL EDITOR 2009

Timothy L. Crumbie
CPG-10433
Lexington, Kentucky

Statement of purpose or goals you have for AIPG: To revitalize Sections with declining memberships and diminished interaction by sharing successful strategies that have been implemented by more active Sections. Also, to serve as the intermediary between National and the Sections to address and resolve concerns or issues that either may have.

Robert A. Stewart
CPG-08332
East Hartford, Connecticut

Statement of purpose or goals you have for AIPG: Promote membership participation in TPG: encourage student participation, solicit articles from the membership, work on innovations to advance the status of TPG.

AIPG 2008 National Award Recipients

Ben H. Parker Memorial Medal
Dennis Pennington, CPG-04401
Maple Glen, Pennsylvania

Martin Van Couvering Award
Dr. Robert Font, CPG-03953
Plano, Texas

Larry Rhodes, CPG-02250
Lexington, Kentucky

John T. Galey Sr.
Memorial Public Service Award
M. Lee Allison, MEM-0328
Tucson, Arizona

Honorary Membership
Barbara Murphy, CPG-06203
Scottsdale, Arizona
Climate Change

Daniel J. St. Germain, CPG-07858

In the context of learning something new everyday, today did not let me down. At the Annual Meeting in Traverse City, I told the AIPG National Executive Committee that I was not going to try to tackle a position statement on “climate change” because I felt the group had to many other, more pressing, issues to deal with and I did not want them to be distracted from achieving what I felt were more important goals; developing service offerings that are of value to licensed professional geologists, developing non-dues bearing revenue by hosting conference style short courses for continuing education units, and understanding the needs of geology students. Having read the past few issues of the TPG and having received numerous communications over the past few months, I am beginning to understand just how important the subject of climate change is to many of our members. So I have decided to eat my words and to try to facilitate two things; (1) an on-going focused discussion on the potential for anthropogenic climate change in the TPG and (2) assembling a group of members whose goal will be to develop a position statement on climate change.

Climate Change Discussion in the TPG

This issue of the TPG contains an article on climate change by James Howard. It presents his view and technical arguments in support of his position on climate change. My hope is that this article in combination with past articles will continue to stimulate a rational focused public debate on the merits of anthropogenic climate change.

Position Statement

The second thing we will do is assemble a group that will be challenged with developing a position statement on climate change. A call for members was included in the March/April TPG and so far we have about five members for the ad hoc Committee on Climate Change. I have selected Sam Gowan to be the committee chairman. Sam will be responsible for leading this group in developing a position statement on climate change. As of this writing, the group could still use more members. I would like to see the group be fairly well balanced with members that believe and do not believe in anthropogenic climate change. My perception is that right now the group is more heavily weighted with members that do not believe in anthropogenic climate change. So if you are a member and you believe that carbon dioxide plays a major role in climate change then we need your help to balance the group. Failure to speak up and get involved will assure your voice is not heard.

National has assembled a number of position statements on climate change from our sister scientific societies. I will ask National to post them on our website (www.aipg.org) or Sam or I can e-mail them to you for your review. I think they provide an excellent foundation from which to start the development of a position statement on climate change. My interpretation of the statements are that they span a wide spectrum of views from pro anthropogenic climate change from the American Chemical Society, to the need to evaluate climate change in the full context of Earth’s geologic record from The Geological Society of America, to a healthy dose of objectivity from the American Association of State Climatologists.

I want to end this article with an experience I had when I attended the European Federation of Geologists meeting in Rome last year. For those of you who do not know this group, this group is comprised of geologists from each country in the European Union and some non-EU countries including Russia and Romania. Somewhere over dinner, a group of them asked me what the US' position was on climate change. Right or wrong, my answer was that I didn't think the US government had a definitive position on climate change. To my surprise this group of geologists, most of whom are senior well educated geologists, laughed at us (us being the United States). It was clear to me this group felt very strongly about the anthropogenic effects of climate change. A geologist from one northern European country smiled and said something to the effect; “come up and live in my country for a while and we'll see if your opinion changes”!

New Items!

Blue Translucent Travel Mug, 16 oz
Price: $7.50

Visit the AIPG Store online at www.aipg.org

Stainless Steel Travel Mug, 16oz
Price: $9.50
EXECUTIVE DIRECTOR’S COLUMN

Happy 100th Anniversary AASG!

William J. Siok, CPG-04773

How many US geologists do you suppose are aware of the Association of American State Geologists? Undoubtedly all are cognizant of their respective state geological surveys, but probably not of the national association through which our state geologists are able to collaborate on behalf of their constituents and the nation.

In spite of its occasional inaccuracies, Wikipedia provides the following concise description of AASG (presumably submitted by one of the state geologists.) “The AASG is an organization of the chief executives of the state geological surveys in 50 states and Puerto Rico. The responsibilities of the various state surveys differ from state to state, depending upon the enabling legislation and the traditions under which the survey evolved. Almost all function as a basic information source for their state governments’ executive, legislative, and judicial branches. Some have regulatory responsibilities for water, oil and gas, land reclamation, etc.

More over: “The first state geological survey was established in 1823 in North Carolina. By 1840, there were at least 15 state surveys, most of which were charged with the discovery of mineral, energy, land, and water resources in their state or territory. The State Geologists began formal meetings with the United States Geological Survey in 1879, the year that organization was established. Since 1908, the Association has met regularly to discuss issues of common interest and to initiate united actions when warranted.”

On this auspicious occasion of its 100th anniversary, please allow me on behalf of the AIPG National Executive Committee, the AIPG Section Executive Committees, all AIPG Members, and all AIPG affiliates and friends, to send a heartfelt CONGRATULATIONS to AASG and each of our state geologist colleagues! Thank you for your continuous efforts to provide valuable scientific information, adding to the geologic data base, and for acting as the definitive source of geologic knowledge for all the states!

Most of us benefit from the individual surveys regularly. Kudos to our colleagues, the state geologists who comprise AASG! And to another 100 years of extraordinary service to the American taxpayer-citizen!

While by now you have surmised the main point of this column, please allow a little digression. The year 2008 is almost half spent and AIPG is engaged in an endeavor, with the Arizona Hydrological Society (AHS), to bring you a memorable meeting this autumn in Flagstaff, Arizona. This issue of TPG has details which should convince you that this event will be one of the best ever!

Jammed into the short span of 4 or 5 days, the program is arranged to allow you to gaze into the Grand Canyon, hike the Grand Canyon, present a technical or professional paper, listen to outstanding technical or professional papers, participate in collegial social events, visit geologic wonders, walk through Anasazi cliff dwellings, enjoy Navajo cultural events, or merely bask in the salubrious northern Arizona climate!

Suffice it to say that one can never visit and enjoy the Grand Canyon to excess. There are extraordinary geologic features, fascinating cultural history, and simply spectacular scenery. Please join us in Flagstaff!

AIPG 2008 Annual Meeting
Flagstaff, Arizona
Theme: Changing Waterscapes and Water Ethics for The 21st Century
September 20-24

Introduction to Well Logs and Log Analysis for New Hires

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How Safe Is Fieldwork?
(Column 113, January-February 2008)

Ray Talkington, CPG-07935, responded to my request for further information on this subject by providing two of field safety stories. One occurred on the Ungava Peninsula of northern Quebec and involved a research party from the University of Montreal who were doing work on an impact structure (New Quebec Crater) located approximately 26 miles south of the Raglan nickel deposit exploration camp for which Talkington was the crew chief. Talkington recounted, “The rain and wind storm of August 7-9, 1988 was the worst of the field season and particularly severe on August 8 as the wind speed was clocked at 100 mph by the Ministere de Energies et Resources at Akulivik, near the northwestern tip of Quebec. At Raglan that day, loose debris and empty fuel drums were being picked up and hurled through the air for tens of feet before dropping back to the ground.” On the morning of August 8th, Raglan contacted the University of Montreal team by radio and learned that they were okay but damp. Because of the increasing storm intensity during the day, Raglan again tried radioing the University of Montreal team around 11 AM but was unsuccessful then and throughout the afternoon. At 4:15 PM Raglan learned from a regional radio center that the University of Montreal team had put out a ‘Mayday’ call as their camp had been blown away in the storm. By 5 PM Raglan was back in radio contact with the University of Montreal team, four of whom were beginning to experience hypothermia. Although the Raglan team, the Royal Canadian Mounted Police, and the Canadian Armed Forces were in joint radio contact with the University of Montreal team and were planning various possible avenues of rescue, it was not until the next morning that permission was received for the helicopter at Raglan to fly to University of Montreal team’s camp. By 9:02 AM, helicopter returned to Raglan with the most serious hypothermia and exposure cases. The rest of the University of Montreal team was evacuated to Raglan in subsequent trips that morning. Although there were no serious injuries resulting from this event, the story does highlight the rescue problems that can occur in remote and/or rugged terrain, particularly during storms.1

Talkington’s second event occurred in Newfoundland. “A researcher from a prestigious university in the U.S. wanted to go off on her own and collect rock samples for an isotopic investigation of ancient oceanic crustal material (i.e. ophiolitic material that is part of the Bay of Island Complex in western Newfoundland). The site is located several hours walk from a ‘main road.’ You could do the work in a very long day or take two days in case the rocks were really interesting. This is before cell phones, etc. I indicated that this was not a wise choice and that she would have to be accompanied by someone. I had to leave for another location before the they would return, so I wished them well. I heard about a week later that she had stumbled on a scree/debris slope and got her hand trapped beneath a boulder. The geologist with her could not move the boulder so he had to return to the town to get help. This was a 3-4 hour trip each way! When help arrived back at her location, they got her crushed hand out from beneath the boulder and proceeded to walk back to the car. She was experiencing pain in her lower leg on the trip back to the car.

“She was brought to the local infirmary for a quick patch up and then transported by med-flight to a hospital in St. John’s. I visited her a week or so later in the hospital in St. John’s and found out that, aside from the facial bruises, her thumb on her right hand was going to have to be amputated because it was beyond repair and that she had a broken ankle. After she was stabilized in St. John’s, she flew back to the states for her operations. She had one of her big toes transplanted to her thumb. “This was supposed to be a simple and low-risk rock sample collection trip that may have turned very wrong if we had not insisted that she be accompanied by another person.”

The recent shootings at Northern Illinois University during a geology class serve as a tragic reminder that even when we are in a normally safe place, bad things can happen. Unfortunately, no amount of caution can make one 100% safe.

So how safe is safe enough? How much risk are we willing to accept for ourselves and for those working with us? These are among those unanswerable questions because the levels of risk and precaution will always be debated. Nevertheless, it is a question worth contemplating. Our work as geoscientists takes us to a variety of settings with both known and unknown risks. Travel itself has risks. Yet we must travel to our sites of investigation. The weather can make otherwise safe sites dangerous. Safety gear helps protect us, but only to a point. Looking around to observe conditions and acting accordingly are required.

Assumption of Bias, an Ethical Approach?
(Column 114, March-April 2008)

I concluded my last column regarding Charles Tiller’s, CPG-10811, article, “Commentary: a healthy skepticism of global warming skepticism,” with the question, “Is Tiller’s means of argument ethically justified or ethically appropriate?” Ed Nuhfer, CPG-02808, provided an elegant answer in his article, “Commentary for students on scientific skepticism versus political advocacy,” in

1. Just a few days before drafting this topic, two different rescue efforts in Colorado were postponed during blizzard and/or extreme avalanche conditions. In one case, the snowmobilers being sought had found a cabin in which they were able to wait out the storm. In the second, a determination was made to terminate the search until next spring because it was unlikely that the lost party was still alive and the conditions faced by the rescue parties were very hazardous. Although geologists doing field work were not being sought in either rescue, these are more examples of the difficulties some rescues face.
How rapidly will adverse impacts be addressed.

Who is affected?

How can the problem be corrected?

I would also urge Tiller and like-minded folks to follow Tiller’s by-line, “Follow the money.” If anyone thinks that research grants are politically neutral, they’re naïve. Grant money flows in the direction of currently hot topics, and climate change is certainly a hot topic. I’m not asserting that researchers are on the political left-wing or right-wing. I expect they’re both, and in the middle. That’s not the point. But to continue existing grants or obtain new ones, those seeking grants have learned to write proposals that appeal to the hot topic of the day. In the 1970s the hot topic was plate tectonics, a topic to which a wide variety of specialties within the earth sciences could and did contribute. Climate change has a similar interdisciplinary appeal. But do recall that in following the money, unintended bias can creep in.

**Something Bad Has Happened; Who Do You Tell?**

The Sticks and Stones cartoon above depicts a serious problem that cropped up in an experiment. As the cartoon states, who should you tell when something bad happens or might happen?

Problems that require disclosure to someone crop up more frequently than most geoscientists care to admit. In some cases, relevant laws or regulations specify under what circumstances, when, and to whom disclosures must be made. But in many cases the specifications for disclosure are not clear cut. Then the following questions (among others) should be addressed.

- What laws and regulations might apply to the situation?
- Was anyone harmed or could harm to one or more people result? Harm refers to both bodily and financial harms.
- How widespread is the potential harm?
- What will the public think if news articles or public officials’ announcements about the problem alert the public to the situation, regardless of their technical accuracy?

Canon 2 of the AIPG Code of Ethics states, “Members should uphold the public health, safety, and welfare in the performance of professional services, and avoid even the appearance of impropriety.” Standard 3.2 makes clear that protection of the public’s health, safety, and welfare trumps client confidentiality if there is a conflict between the public and the client. But, as asked in the third question above, in many cases there is often time to work out answers with the immediately affected parties, including the client, before wider disclosure is required because the adverse impact(s) will take some time to develop. But there may not be time.

The blockage of a mine drainage tunnel near Leadville, Colorado provides an interesting example. The US government drove a drainage tunnel under the northern part of the greater Leadville mining district during World War II. This tunnel is currently administered by the Bureau of Reclamation. Over the years the tunnel has become blocked in a number of places as timber ground support collapsed. The Leadville area has received significantly greater than normal amounts of snow this winter and it is feared that the increased amounts of water backing up in the tunnel and connected mine workings combined with the increasing hydraulic head as the water level rises, which will be exacerbated by the Spring run-off, could cause a catastrophic failure of the tunnel’s portal. The escaping water would flood a nearby, downstream mobile home community and would release metal-laden and acidic water into the Arkansas River not far from its headwaters. Contamination of the Arkansas River resulting from the postulated failure would adversely affect downstream communities in Colorado and downstream states.

Although the blocked nature of the tunnel has been known for many years, the Leadville community believes that the Bureau of Reclamation was not addressing the situation with sufficient speed or seriousness. This led the Lake County Commissioners (Leadville is the county seat) to make a disaster area declaration, which included calls for Colorado’s Governor and President Bush to make similar disaster area declarations. The resulting publicity has prompted action, including the commencement of pumping from a mine shaft to lower the water level in the mine workings connected to the tunnel and accelerated studies to seek a long-term solution to the problem.

The foregoing summary is based on news reports that have been very weak on technical details. However, the public concern raised by Lake County’s disaster area declaration, the news reports (which made the national news), and the reaction of Colorado’s Governor and state and US Senators means that there is a real problem, regardless of the technical details.

Reviewing the problem in light of the questions posed above indicates that:

- there is a potential problem, which has been known about for some time, that can be corrected by drawing down the water level;
• that the people living just below the tunnel’s portal could be directly and seriously impacted if a catastrophic release occurred;
• that many downstream communities would be adversely impacted by a catastrophic release due to water contamination, and possibly other impacts; and
• that Lake County’s disaster area declaration and resulting publicity have spurred actions to deal with the problem and its remediation.

Should it have been necessary for Lake County to prompt action through its declaration and resulting publicity? Should the Bureau of Reclamation have been more proactive in dealing with a problem they knew about? Perhaps the Bureau’s staff felt that the likelihood of catastrophic failure was remote based on their technical information. Public perceptions have now radically changed the situation, regardless of the interpretation of the technical data. But prior to the dramatic action of the Lake County Commissioners, should the Bureau’s staff have recognized and responded to the potential for the public relations disaster they’ve now encountered?

Have you been faced with a similar situation? How did you handle it? Is potential public perception one of the aspects you consider when evaluating a potential problem? Let me know.

Shunning the Unethical Practitioner

Consider the following situation: you know an earth scientist who you know has practiced unethically. You also know that for one reason or another, this individual’s unethical practices have not been made public, a common situation for a variety of reasons that are not relevant to this discussion. The unethical individual continues to attend meetings of local and national professional societies, meetings you also attend. What should you do?

Not attending the meetings that the unethical individual might attend is not a good solution. You want to attend the meetings to keep up with your professional development, to keep in contact with various professional colleagues, etc. You may not want to have any interactions with this individual because of his (or her) unethical practices, but sometimes interactions occur. Brief exchanges of common courtesy are simple good manners and should be followed. Beyond that, avoiding encounters with the unethical individual are usually not difficult. Because it is likely that the unethical individual knows of your opinion of him or her, it is also likely that the individual will not be particularly eager to engage you either.

Private Actions and Professional Ethical Sanctions

New York Governor Eliot Spitzer was identified as “client 9” in a prostitution investigation and has publicly apologized for failing to live up to expected standards, and has resigned as governor. In a similar case that made local news, the Chief Judge of the Colorado US District Court, Edward Nottingham, has been identified as one of the clients of a high-priced brothel in Denver.

As reflected in the title for this topic, what interests me with these two cases is the connection and impact between private actions and public sanction. Although not as commonly charged as the prostitute, the Johns can be charged and convicted of prostitution. Hiring a prostitute for oneself, as opposed to hiring one for an employee or client, is a private, non-professional action. Should conviction for a private action of this type be grounds for professional sanction?

Judge Nottingham’s case provides an interesting example. According to the legal analyst for my favorite TV station, Judge Nottingham can be sanctioned for conduct unbecoming a judge under the judicial conduct rules. The sanction could include his removal from the bench. However, because the judge’s action was private, any sanction would not be grounds for appealing any of the cases the judge has heard. So in Nottingham’s case, because the applicable professional conduct rules specifically apply to private actions, the judge can be professionally sanctioned.

Eliot Spitzer’s case is somewhat different, in particular because he has made ethical conduct a key part of his professional career as the US District Attorney for the Southern District of New York and as New York’s Attorney General, a career that provided him with the political recognition and a basis for his election as Governor. Because of his standing on the ethical pedestal, Spitzer’s fall from grace was far and hard.

What about an AIPG member who is convicted of prostitution? What can or should AIPG do? AIPG Code of Ethics addresses the question in the Preamble and Canons 1 and 2. “Members of the [Institute] are dedicated to the highest standards of personal integrity and professional conduct” (Preamble). “Members should be guided by the highest standards of personal integrity and conduct” (Canon 1). “Members should pursue...honorable conduct as a way of life” (Standard 1.1). “Members should...avoid even the appearance of impropriety” (Canon 2). These statements suggest to me that personal conduct does affect one’s professional stature and reputation and that AIPG can and should sanction members whose personal conduct does adversely affect their professional stature and, in consequence, the stature of the Institute. What do you think?

Sloppy Proof-reading or Sloppy Writing?

Gail Gibson’s, CPG-09993, Editor’s Column, “Sloppy writing in the third (?) decade of the desktop, laptop, and cell phone age,” in the March-April 2008 TPG is a wonderful piece on the importance of paying attention to detail when assembling cut and paste documents or updating an old report. I’ll admit to being quite willing to cut and paste documents together. But, as Gibson points out, even the “boiler plate” needs to be reviewed and updated from time to time. If you didn’t read Gibson’s article, do it now.

Professional Practice—Time Management 2

Nancy Price, SA-0382, continued her excellent discussion of time management in her Student Voice column 25, “The never-ending game of time management—Part Two” in the March-April 2008 TPG. This installment focused on the importance of getting enough sleep to function optimally. As I write this, I’m preparing to go to South Korea for a 2-day site examination. Long-distance international travel involves long flights and substantial time shifts. Getting enough rest to function optimally when you arrive is a problem, particularly when one’s stay is so short. I’ll spend nearly as much time en route as I will on the ground (which includes two nights in a hotel). I don’t normally use sleeping pills but on trips like these, I make an exception to that rule.

Advice on PowerPoint Presentations

When I was a graduate student, the departmental seminar was half focused
on the mechanics of good presentations, including the accompanying 35 mm slides, at least some of which had to be text or drawings; scientific quality was the other half focus. The faculty was annoyed at the poor presentations all too frequently made at professional meetings and was determined that their students would know better. Just a few years later, the introduction of Harvard Graphics and then PowerPoint transformed the creation of text and diagram slides. Then the use of LCD projectors eliminated the need for 35 mm slides and allowed one to do things that were prohibitively expensive when you had to pay $10 or more per slide to have your digital file converted. Animation suddenly was the “great” new tool.

AAGP has published several editions of its slide creation manual over the years. The latest version is Figuratively Speaking in the Computer Age, 2000, by D.M. Orchard, and others, AAPG Special Publication, 101 p. (available in CD form for $5 from AAPG as Electronically Speaking). These manuals primarily focused on the mechanics of slide creation, although speaking techniques were increasingly included as time went on.

The problem with too many PowerPoint presentations is that too many people believe that one can master PowerPoint in 15 minutes. We’ve all suffered through the results. For example, one fellow I work with can only really deal with printed documents. As a result, he wants his slides to look good printed and so he prefers a white background. For printed documents, a white background is fine. But when projected, white backgrounds really glare, particularly in a partially darkened room. Remember how you hated overhead presentations? This is the reason most good presentations use a dark background with lighter lettering. I recently read and am recommending Why Most PowerPoint Presentations Suck and How You Can Make Them Better by Rick Altman, Harvest Books, www.betterppt.com, 271 p.

Altman then goes on to make a number of interesting suggestions like restricting each bullet point to 3 concise words (try it; it’s amazing), and avoiding the use of “On Click” as one proceeds through each bullet point (a commonly seen animation I’ve used). Rather than including an accompanying CD of examples, the example presentations can be downloaded. You can then see how these presentations work if you want to use similar techniques.

While Why Most PowerPoint Presentations Suck and How You Can Make Them Better certainly contains a good deal of useful information on how to create good PowerPoint presentations, it also focuses on the overall presentation, where you stand, how you speak, what to do with your hands, moving around, and how all these combine with your PowerPoint slides into a superior presentation. Get a copy and see how much your presentations can be improved. Remember that reading and working with books like this counts towards your CPD requirements.

This CD is a collection of articles, columns, letters to the editor, and other material addressing professional ethics and general issues of professional geologic practice that were printed in The Professional Geologist. It includes an electronic version of the now out-of-print Geologic Ethics and Professional Practices 1987-1997, AIPG Reprint Series #1. The intent of this CD is collection of this material in a single place so that the issues and questions raised by the material may be more conveniently studied. The intended ‘students’ of this CD include everyone interested in the topic, from the new student of geology to professors emeritus, working geologists, retired geologists, and those interested in the geologic profession.

AIPG members will be able to update their copy of this CD by regularly downloading the pe&p index.xls file from the www.aipg.org under “Ethics” and by downloading the electronic version of The Professional Geologist from the members only area of the AIPG website.

The cost of the CD is $25 for members, $35 for non-members, $15 for student members and $18 for non-member students, plus shipping and handling. To order go to www.aipg.org. Five dollars from every CD sold will be donated to the AIPG Foundation.

**Topical Index-Table of Contents to the Professional Ethics and Practices Columns**

A topically based Index-Table of Contents, “pe&p index.xls” covering columns, articles, and letters to the editor that have been referred to in the PE&P columns in Excel format is on the AIPG web site in the Ethics section. This Index-Table of Contents is updated as each issue of the TPG is published. You can use it to find those items addressing a particular area of concern. Suggestions for improvements should be sent to David Abbott, dimageol@msn.com

**HAVE YOU SIGNED UP A MEMBER LATERLY?**
Answers:

1. The answer is “b” or “étang.” Examples of “étangs” are found along the Mediterranean coast of France.

A “bergschrund” defines the crevasse that separates the moving ice and snow at the head of an alpine glacier from the headwall of a cirque.

A “gyttja” is a fresh water mud, typically dark and pulpy, containing abundant organic matter and deposited in a lake or marsh whose waters are rich in oxygen and nutrients.

2. The answer is “b” or “calcite-cemented quartz sandstone.”

Under the high pressures and temperatures that take place during the metamorphic process, a calcite-rich sandstone may behave as follows:

\[
\text{CaCO}_3 + \text{SiO}_2 \rightarrow \text{CaSiO}_3 + \text{CO}_2
\]

The mineral “wollastonite” (\(\text{CaSiO}_3\)) and carbon dioxide gas result from this process. “Wollastonite” can also form when impure limestone or dolostone is exposed to silica-rich fluids during the metamorphic process.

The metamorphism of “tholeiitic basalt” (basalt that is poor in silica and sodium) may be expected to yield “greenstone belt” type material as the end product. These rocks commonly contain a mineral assemblage that includes chlorite, epidote and hornblende.

Clay-shale tends to yield “hornfels” through contact metamorphism and “slate”, “phylite” and “schist” through regional metamorphism with progressively increasing pressure regimes.

3. The answer is “b” or “Iapetus Ocean.” The “Iapetus Ocean” is considered as the precursor to the present-day Atlantic Ocean. “Iapetus” comes from Greek mythology and refers to the “Titan” and father of “Atlas.”

The “Aegean Sea” is the seaway that separates Greece from Turkey, found to the south of the “Solonika”, “Kavala”, “Thrace” and “Bursa” basinal areas.

The “Rheic Ocean” defines the Paleozoic (roughly late Cambrian to Carboniferous) seaway separating “Baltica” in the north from “Gondwana” in the south. The term “Rheic” comes from “Rhea”, the sister of “Iapetus.”

4. The answer is “a” or “\(S = 12.26 - 38.94(\omega); r = 0.67\)”. The proof follows:

<table>
<thead>
<tr>
<th>Water content %</th>
<th>Strength MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.3</td>
<td>4.96</td>
</tr>
<tr>
<td>16.0</td>
<td>4.05</td>
</tr>
<tr>
<td>11.8</td>
<td>7.55</td>
</tr>
<tr>
<td>10.7</td>
<td>8.51</td>
</tr>
<tr>
<td>19.2</td>
<td>3.91</td>
</tr>
<tr>
<td>17.8</td>
<td>8.06</td>
</tr>
</tbody>
</table>

\[
\begin{array}{ccc}
\omega\% (x) & S \text{ MPa} (y) & xy \\
0.183 & 4.96 & 0.90768 \\
0.16 & 4.05 & 0.648 \\
0.118 & 7.55 & 0.8909 \\
0.107 & 8.51 & 0.91057 \\
0.192 & 3.91 & 0.75072 \\
0.178 & 8.06 & 1.43468 \\
\end{array}
\]

\[
\begin{array}{cccc}
\Sigma xy = 5.54255 & \Sigma x = 0.938 & \Sigma y = 37.04 & \Sigma x^2 = 0.15301 & (\Sigma x)^2 = 0.879844 & \Sigma y^2 = 250.6784 \\
\end{array}
\]
n = 6
y = mx + b
m = \frac{n \Sigma xy - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)^2}
b = \frac{\Sigma y - m(\Sigma x)}{n}

r = \frac{n \Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{n(\Sigma x^2) - (\Sigma x)^2} \sqrt{n(\Sigma y^2) - (\Sigma y)^2}}

m = -38.942328
b = 12.261317

The equation \[S = 12.26 - 38.94(\omega)\] expresses strength as a function of water content. The line has a negative slope, indicating that strength typically decreases when the water content increases. The value of the coefficient of correlation \((r = 0.67)\) indicates that although the overall trend is established, the correlation is fair at best, since there is significant scatter of points in reference to the line of best fit. Strength values can be approximated from the equation, but not predicted with significant accuracy.

Choice “b” \[S = 12.50 + 39.00(\omega); r = 1.00\] is inaccurate for two reasons. First, the slope of the line is positive, indicating that the strength would increase with increasing water content. This is not the case here. Also, a value of \((r=1)\) would indicate that all points from our table lie directly on the line of best fit. This is also not the case here.

Choice “c” is also not applicable. It indicates a horizontal line \((slope = m = 0)\) relating strength to water content. In other words, the strength would remain constant with changing water content, which is clearly not the case. The \(r = 0\) value indicates that no correlation exists between “S” and “\(\omega\)” values, which is also clearly erroneous.

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Field Safety-Revisited

Nancy Price, SA-0382

Working in the field places a researcher in a setting where it is impossible to completely control the safety of the situation. Encounters with natural phenomena, be it weather or animals, in the natural environment are never absolutely predictable. Even more disturbing is the threat of unpredictable behaviors of our fellow humans, particularly in more remote areas. Human behavior can be even more unpredictable than animals or the weather. As geologists working in the field, how should we plan for these threats and how much planning is necessary?

I originally introduced this topic in the article titled “How Safe is Fieldwork?” (Column 24- TPG Nov/Dec 2007) in response to the murder of Alyssa Heberton-Morimoto, a geology graduate student. I raised a number of questions for the membership to ponder regarding field safety and ponder they did! The number of stories that people shared made me realize how personal an issue field safety is for a geologist even though we may not actively discuss it. Everyone seems to have a story of accidents or encounters involving himself or herself or someone he or she knew. Most of the stories ended well. Sadly, some did not. One could easily fill a 500-page novel with experiences that people have had and still not have the all-inclusive answer for field safety. However, all these experiences provide the more seasoned geologist with the wisdom that only comes from experience. All the wisdom that people shared in their e-mails got me thinking about field safety once again and led to me to revisit the topic once more here.

A common thought among the e-mails I received was that a lot of what would be considered good safety practices in the field are just common sense. For example, Danny and Susan Zampirro (CPG-10258 & CA-PG 7898) said that they “agree with how few guidelines there are regarding safety in the field”, but that “still, much of it seems to be common sense.” John W. Pearson (CPG-10012) elaborated even further by saying the following:

“If you may encounter wildlife, prepare accordingly and act responsibly. Bears may try to eat you if you smell like food. Don’t wear the same clothes you cook in. Make noise all the time if running into a bear is a concern. Deer and elk can kill you too. Bulls may attack you for no reason. Male deer, elk, and cattle may become aggressive to women if they are experiencing their monthly cycle. Get away from animals. Don’t play with snakes, etc. Common sense.”

To me, and probably to most geologists these things are common sense, but what about those students who want to be geologists but have absolutely no experience in the outdoors or with animals? If you grow up in a big city, like New York City, you have no reason to know outdoor survival techniques. You will learn how to use the subway and where not to go at night, but you probably won’t need to know how to keep warm in sub-freezing temperatures or that during the monsoon season flash floods are a possible hazard in the arid canyon lands of the west. Last time I checked, having outdoor experience isn’t a prerequisite for becoming a geologist. It is reasonable to expect students to learn survival skills over their career as a student, but we cannot assume that people come equipped with the knowledge of things that the more experienced outdoorsman thinks is common sense. There are students out there that need to be taught how to be safe prior to going out into the field.

Another common theme in many of the e-mail responses I received referred to the human threat to our safety. If you remember from the previous article, the geology graduate student, Alyssa Heberton-Morimoto, was murdered by a man camping alone within her field area. How worried should we be about the threat from our fellow humans, particularly given such a murder? John W. Pearson (CPG-10012) shared the following:

“I have happened upon people in the middle of nowhere and have had them happen upon me. Most of the time, they are regular, friendly, hard-working ranchers, prospectors, hikers, and people like that. Sometimes you come across a lone person and it is not clear what they are up to. If you enter this profession, it is part of the package. Out in the middle of nowhere, some people lose their sense of social conscience and accountability. Evidence of that are bullet holes in water tanks, broken windows in abandoned buildings, piles of trash, etc. Some people move to the middle of nowhere because they are social outcasts. If you work in the middle of nowhere, expect to run into them.”

Others mirrored John’s views that sometimes the people that you encounter in the woods can pose just as great a threat to your safety as a mugger on the most dangerous city street. It is important not to be pacified into thinking that everyone out in the woods is a kind-hearted nature lover. In some situations, it may be prudent to not make your presence known, to have an escape plan ready, and to remove yourself from the area as quickly as possible, as John advises. If it is necessary to approach someone, be sure to approach people with an appropriate level of caution and respect because you never know what type of personality you are going to run into, either good or bad.

To what degree should you be prepared to defend yourself if you are faced with an encounter with a stranger in the field? In the previous article I presented
the option of carrying a handgun and proposed the question that “if the option of carrying a weapon were available to students, would they be safer?” The e-mail exchange that I had with Danny and Susan Zampirro (CPG-10258 & CA-PG 7898) really expanded my view on this issue. If properly trained on the use of a handgun, then having a handgun can be an asset because simply carrying one can be a deterrent. Given a choice of potential victims, can you imagine that a would-be assailant would choose to attack the person with a gun? A properly defended victim is not an easy victim. In that way, a weapon can make a person safer. However, as Danny and Susan point out that “if they know they may not be able to use a firearm against a person in self defense then they should not carry one because it could be used against them.” If a handgun is a serious personal safety option, then the person carrying one should know how to use it, feel comfortable using it, and practice using it. What happens if you don’t feel comfortable? Well, Danny and Susan recommend carrying mace or even consider using your rock hammer as a safety weapon. The key is to be prepared for an attack and to think and act defensively when in compromising or threatening situations.

When discussing field safety in my previous article, I was careful to avoid discussion of gender. Alyssa Habeiton-Morimoto was a female and her field partner/advisor was also female. I would like to think that gender doesn’t matter when it comes to academic pursuits, such as fieldwork, because higher education should be blind to differences associated with gender. Unfortunately, the rest of society does not function in this world of idealism. As Danny Zampirro put it, “It sure is different for a fellow to work in the field, or even just to wander around town, versus a woman,” or as John Pearson more pointedly said, “If you are a woman, realize that being alone in the field, or anywhere, can put you in more danger than if you were a man. It is a sad fact of life.” Women, myself included, should not ignore this reality even if we really want it not to be true. What special safety preparations should we make because of our gender? Not working alone is a good start, but, more importantly, we should recognize that we are at this disadvantage because of our gender by learning personal defense techniques. The more I think about it, the more I think Rape Aggression Defense (RAD) training or self-defense courses should be mandatory for females, or anyone worried about personal safety, before they start fieldwork alone or in a small group. Beyond learning defensive moves, self-defense training will help you think defensively, which can be more important for helping someone decide what to do in a compromising situation than just knowing how to fight back when attacked.

With all the good advice and comments filling my inbox, it is hard to know how to synthesize it all together to best guide a new fieldworker. As I mentioned previously, “I would love to see a universal safety policy for students in the field that has been adopted by all accredited colleges and universities with an earth science, environmental science, or geology program.” This is where the advice from Gretchen Gillis (CPG-09693) was most helpful. Gretchen told me about the book Field Safety in Uncontrolled Environments: A Process-Based Guidebook by Stephan R. Oliveri and Kevin Bohacs and written in conjunction with the AAPG, the Division of Environmental Geosciences (Tulsa, Oklahoma), and ExxonMobil. This guidebook isn’t an exhaustive list of all the things you need to do, have, and know before you start a field season. Instead, the authors outline a detailed framework for developing your own safety policy, complete with risk assessment, pre-field safety preparations, mindfulness in the field, and a post-field safety assessment. The structure and completeness of their framework is a little intimidating for a lone geologist in the field, but there is much that students and university policy makers can take away from it.

The role of risk assessment is key to the implementation of a good safety strategy and can often be overlooked. The best way to be overwhelmed in a situation is to be unprepared and the best way to be unprepared in a situation is to fail to identify the risks or to not take them seriously. It is important for an advisor to sit down with his or her student and discuss the types of terrain, weather, animals, plants, and even people that they will encounter in the field area. They should discuss problems that the advisor might have had that he or she is always sure to bring. Failure at this level is to assume that the student is capable of identifying the risks and can prepare properly for them without any guidance. I reiterate my earlier statement that many if not most students may not be capable of doing such a risk assessment on their own if they have never had any similar experiences to draw on. It is also important for the advisor to stress the relative severity of the risk so that the student is aware of how likely and how often they are to encounter such a hazard and how much of a threat that hazard will pose to their safety. Perhaps a student is more than equipped to handle him or herself in the field. In such a case, the risk assessment will simply be a short, but necessary review of what that person already knows.

Pre-safety preparations are the next step and the step that this article and the previous one focused on the most. Field partners, two-way radios, a first-aid kit, and weapons such as handguns or mace are all examples of preparations. or mace are good preparations. Remember, cell phones do not work everywhere. Having a safety plan is also a good preparation. John W. Pearson (CPG-10012) provided a good type of safety plan when he said, “Let people who care and who will act know where you are going and when you expect to return. Leave a map with an X on it with someone who can read maps. When you leave the field, call that person and let them know. You know you picked the right person if when you don’t call, they go looking for you.” Yet, just as important as those preparations are, I think that personal training is just as important. First-aid training, self-defense training, and outdoor safety training are vital ways of giving a person the knowledge and confidence to face problems and deal with them in a safe and intelligent manner. It is not possible to avoid all hazardous situations in the field, so it is as important to teach safe behaviors as it is to have the tangible tools for safety. We should never assume that students have this knowledge and can take care of themselves in a bad situation. These types of courses should be available and encouraged for new geology students before they spend any time out in the field unsupervised. Once students know what they are getting into, they will be better able to handle themselves in a sticky situation and, in effect, be safer because of it.

As a final thought, I wanted to say thank you to the membership for all the feedback and support. I was highly honored and grateful to receive the Presidential Certificate of Merit, especially after only three years of writing this column. Many times ideas for
article topics come from discussions with my geology colleagues and E-mail exchanges with the AIPG membership. I only have one life to draw experiences from and one point of view from which to consider the world. When people share their ideas and stories with me, it makes this column that much richer and more valuable. The ideas in this second field safety article stand as testament to that very fact, and I am grateful for it. Keep up the feedback and involvement. I look forward to hearing what you have to say. 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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Making Truth Convenient: A Goal for Geoscience Students

Joseph J. Fiore, Jr., SA-1164

Global climate change has gone from a fringe scientific theory to an accepted pandemic catastrophe within the past 10 years. It’s one of those rare topics that have gained the full attention of the international community, like nuclear proliferation or the “Macarena”. As frequently happens with big sociopolitical issues, climate change has become the cause du jour for countless members of my generation. College campuses across the country are holding rallies and demonstrations for climate change awareness. Many consider this to be the calling of our generation. Forget “Generation Y”, we’re a TIME cover away from being “Generation Green”.

Economists, sociologists, film students, and engineers are all studying their own pieces of the global climate change puzzle. At my school we even have a student group, the Husky Energy Action Team, or HEAT (the Husky being my school mascot), focused solely on promoting the use of renewable energy to combat climate change. While this is all great, there is a tremendous quantity of misinformation out there. Very few people have the big picture in mind, or even the facts to do so. Unfortunately, this situation seriously impairs all of the efforts to effectively address this issue.

It’s basically a foregone conclusion (unthinking conclusion?) for most young people that climate change is anthropogenically linked. The fact that so many of our peers believe this isn’t at all what bothers me, but why they believe it is. When climate change is constantly presented as a finished misinformation package that details selected cause and effect, such as evil American energy companies and innocent drowning polar bears, respectively, like commercials that lead people to poor conclusions about the situation. We, the students of geoscience, are among the few still engaged in the conversation about how great anthropogenic influence is on the climate. Most of the buzz at this point is about the effects climate change will have on everything from global health to relations with China.

In many ways such discussion is good, because whether we like it or not our haste to jump onto the anthropogenic bandwagon has made this into a self-fulfilling prophecy in terms of many secondary effects, if not the actual warming. If we think we are going to need completely energy efficient homes, then we will build them. Effectively, we will have them regardless of whether or not we needed them, but why not if we do it the right way. To have everyone doing things the right way, though will require getting to the root of these myths and changing impressions.

A lot of the misinformation started with An Inconvenient Truth, which was the main medium through which climate change was spread so extensively to the general public. On one hand, Al Gore did a tremendous job at opening peoples’ eyes to the possible effects of and some of the science behind climate change. Almost overnight, it went from being a scientific debate to talk in America’s living rooms. To do so, Gore took a very melodramatic, sensational approach, leaving millions with the impression that climate change is dire enough to strike down civilization at any moment. While that’s not really the case, many believe it to be so.

On one hand, now climate change is a real problem; people know about it and take it seriously. On the other, to say Clint Eastwood has never played a cowboy and then show Dirty Harry as proof is clearly going to give people the wrong impression. Even so, it is happening all over. On campus, climate change is hardly discussed in terms of how much humans are contributing. The discussion rather is just how bad it is going to be, and when. That segways into how to stop it, and that is where having only a part of the picture hurts.

Knowing what makes hydraulic conductivity high or low is vitally important to knowing where to put a well, and climate change is no different. People need to know more of the bigger picture and what is really happening so they can appropriately cope. The push to fight climate change has evolved into a broader environmental movement, considering virtually everything affects carbon output in a fossil fuel based economy. That in itself is not bad at all, but some of the measures being taken to fight CO\textsuperscript{2} on campuses are ineffective or even counter-productive. Without sight of the bigger picture, people have such an urgent view of issue they are pulling out all the stops to fight it.

For instance, it makes sense to switch cars to cleaner burning forms of energy, but it doesn’t make sense to do before an efficient cost effective alternative is available. If you live in Maine and citrus fruits are not produced near you
that doesn’t mean you should let scurvy set in. My friend Justin would probably tell you that towels made of recycled clothes are not quite necessary yet. He purchased one thinking he was being environmentally conscious before a trip to the Keys last spring. For the next two weeks, he had to dry himself with what felt like a strip of fiberglass insulation, as he replaced dripping with itching every time we left the water.

There is something we can do about this though. As the ones who are studying and understand this whole thing, we can share the wealth! So much effort is being put into “greening” our planet by students from every discipline, a whole mass of energy is aimed at putting Gaia back on top. We can help focus this energy to do so in the most productive ways. My fellow geoscience students, this is our calling.

Take the time to educate the environmental leaders on your campus to the most effective ways to fight carbon emissions, and try to help steer student movements in the right direction. Educate with a holistic view of climate change and allow people to see the big picture, so we don’t get caught up in the trifles and forget the winnable battles. Keep yourselves up on the issue and the debates and do your best to be the reliable source for your social circles on the facts and fiction regarding climate change.

While we don’t really know yet how much we are influencing climate change, we do know that taking steps to become more sustainable and to damage the environment less will result in a cleaner planet; and if done correctly, a stronger economy. As a geoscience student you can be a positive force in seeing this happen simply by sharing the material you learn in class every day, with a little common sense mixed in. And that could turn out to be a world of difference.

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The recent article by Corbett and Dannemiller in the December 2007 issue of the *TPG* dealt with the uncertainty factor in the causes of Global Warming. The various responses indicate a strong dichotomy in opinions on the subject.

Most scientists agree that the average temperature of the earth has increased since the end of the last major ice advance about 18,000 years Before Present (BP). Figure 1 by Mann, *et al.*, (2001) illustrates his interpretation of a record showing global temperature fluctuations over the last 1000 years. Figure 2, from the first IPCC report (1990) provides a different perspective of climate change.

Although most scientists agree that a long-term warming trend began approximately 18,000 years BP at the end of the last major glacial advance, a major controversy has developed over why the warming has occurred. Two major hypotheses are advanced to explain the warming trend:

1. Increasing atmospheric concentration of carbon dioxide (CO₂) by man’s industrial activities traps long-wave radiation reflected from the earth surface with increasing heat accumulation in the atmosphere (Anthropogenic Global Warming), or

2. The warming trend is part of a recurring natural cycle of climate change caused by interaction of solar radiation, earth motion synergies and other potential natural mechanisms with minor influence by man’s activities (Natural Cycle).

The present debate primarily concentrates on relatively short-term (in a geological sense) data and trends with a 0.6° Centigrade (C) increase since about 1850 AD, the beginning of the modern industrial age. Discussions in the fields of atmospheric physics, isotope chemistry and interpretations of climate proxies over the past 1000 years dominate the debate on each side. The most dynamic and interactive medium of the debate is, no surprise, the Internet. Within the context of the Internet, data and analyses can be promulgated, critiqued and discussed without the one to two year delay normally associated with peer-reviewed journals, as long as the data sources are valid, e.g. NASA, NOAA or published databases from various research organizations.

Although the various blogs should be approached with care, selective review can be useful in assessing the validity of many of the arguments presented by both sides of the debate. Numerous universities and science publication web sites in the United States are now using this approach. The European Union is actively pursuing this trend (see website [http://www.infoworld.com/article/07/02/15/HNeuonlinescience_1.html](http://www.infoworld.com/article/07/02/15/HNeuonlinescience_1.html)).

Review of various reports of the International Panel on Climate Change (IPCC) (1990, 2001, and 2007) indicates that the reports generally exclude input from the geologic profession and commonly emphasize data acquired since 1850. Even the graphs supposedly citing data back to approximately 1000 B.P. minimize the effects of events such as the Little Ice Age and the latter stages of the

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**Figure 1**. The “Hockey Stick” used to demonstrate Global Warming showing an apparent abrupt change in rate of global temperature rise using a combination of thermometer and proxy data (Mann, *et al.*, 1999, Second Report, Intergovernmental Panel on Climate Change (IPCC), 2001).

**Figure 2** - Average near-surface temperatures of the past 1000 years (Intergovernmental Panel on Climate Change Scientific Assessment, 1990). Note that the Medieval Warm Period is shown as warmer than present temperatures and is not reflected in the Mann “Hockey Stick”.

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A GEOLOGIC PERSPECTIVE ON ANTHROPOGENIC GLOBAL WARMING

Medieval Warming Period, on the basis that they probably represent events of regional, not global extent. Singer and Avery (2007) and Loehle (2007) use data from various disciplines to assess the validity of that assumption.

For those interested in some of the non-geological aspect of the debate, I would recommend the following web sites:

1. One of the more objective sites I have found is <http://climatemesci.org/> operated by Dr. Roger Pielke, Sr. Professor and State Climatologist Emeritus, Colorado State University Department of Atmospheric Sciences.

2. A somewhat less objective web site but one that deals fairly competently with the discussion on location of monitoring stations, urban thermal effects, data reliability and the esoteric aspects of climate modeling is <http://www.climateaudit.org/> operated by Steve McIntyre, a mathematician whose career has also concentrated on mineral exploration and development.

3. Another web site which deals primarily with technical aspects of the physics and chemistry of the debate is operated by Doug Hoyt, <http://www.warwickhughes.com/hoyt/climate-change.htm/>. Hoyt is a research physicist with numerous publications in the field. His discussions deal mostly with the theoretical basis for the global warming hypothesis.

4. A good, overall summary of the arguments against Anthropogenic Global Warming is on the web site operated by the Canadian group “Friends of Science”. This summary was last updated in February 2008 and can be accessed at <http://members.shaw.ca/sch25/FOS/Climate_Change_Science.html#Global_Cooling>.

5. A site which is definitely not objective, but which serves as a sentinel screening system for the Anti-Global Warming side of the debate is <http://www.junkscience.com/> operated by Steven Milloy. Mr. Milloy holds degrees in Natural Science, Health Science and a Doctor of Jurisprudence. This site should be used for links to actual articles, databases and media coverage, not necessarily for his commentary.

Perspective of Geologic Time

Geologists have been generally ignored in the Global Warming discussion and IPCC deliberations, even though our profession specializes in study of the long-term history of the Earth’s climate behavior through time. Geologists feel that comparing modern scope and rate of change of climate with similar events in the geologic record should provide context for the present warming trend. Since that is a key missing ingredient in the ongoing debate, this discussion will emphasize the geologic perspective based upon the history of climate change and fluctuation in the geologic record.

A basic tenet of geology is “the Present is the Key to the Past.” A direct corollary to that tenet is “the Past is the Key to the Future.” To geologists, therefore, an understanding of the geologic history of climate change and the controls impacting that change should be essential to identifying the mechanisms causing supposed Global Warming.

A major advantage of using geologic perspective in studying Global Warming is that we view time in a different context than non-geologists. The time frame in which we operate (approximately 4.5 Billion Years, the age of the earth) covers significantly more climate change events than the Holocene that only began about 10,000 years BP. We tend to emphasize past geological events and integrate geologic field evidence into the development and critique of our theories. In addition, we accept the fact that the earth is a constantly changing, interactive system with both short-term and long-term episodic/periodic/cyclic events. Conversely, most proponents of the Anthropogenic Global Warming hypothesis depend primarily on databases emphasizing from 30 to 150 years with a maximum time frame of 1000 years.

Pre-Quaternary Temperature and Carbon Dioxide (CO₂) Fluctuation

Atmospheric CO₂ concentration has varied dramatically through geologic time. During the late Precambrian, much of the earth was covered by thousands of feet of ice during a so-called “Snowball Earth” event. Shortly after this event, fossils became abundant (the Cambrian Explosion) providing tools to help interpret geologic history.

Several models simulating the distribution of CO₂ throughout the Phanerozoic have been developed e.g., Berner, R.A. and Kothvala, Z. (2001); Rothman, D. H. (2002); and Bergman, N.M., Lenton, T.M. and Watson, A.J. (2004). The following discussion is based primarily on the Berner and Kothvala model with paleotemperature values from C. R. Cortese (2002), using generally accepted paleoclimatologic reconstruction criteria described by Parrish, (1999).

According to the Geocarb III model by Berner and Kothvala (2001), early Cambrian atmospheric CO₂ concentrations approximated 7,000 parts per million (ppm), ~20 times the present 380 ppm concentration. Estimated average global temperature during the early Cambrian was approximately 22°C, ~10°C higher than the present estimated average global surface temperature.

The same simulations indicate CO₂ declined generally from late Cambrian until mid-Devonian, although temperature remained generally stable. Two relatively short (geologically) cooling events occurred in late Ordovician and late Carboniferous when global temperatures declined to levels equivalent to modern temperatures. CO₂ concentrations remained elevated during the late Ordovician temperature drop, declining to approximate modern levels by early Carboniferous. Temperatures remained high through the early and middle Paleozoic, only declining to modern levels during the late Carboniferous. Glaciation events similar to those of today were associated with both temperature minima. Apparent decoupling of CO₂ and global temperature in the geologic record occurred in late Ordovician as well as the late Jurassic and middle Miocene, Veizer, J., Godderis, Y. and Francois, L. M. (2000); Francois, L.M. (2006) and Donnadieu, Y. et. al (2006).

Values for both parameters remained low until late Permian or early Triassic time. CO₂ and temperature levels both then began to rise, possibly in response to a combination of 1) massive volcanism in the Siberian Traps, 2) a mass extinction event resulting in the loss of 95% of all life on earth (including photosynthesizing plants), and 3) a possible methane surge of deep-sea methane hydrate volatilized due to ocean temperature rise.

The range of CO₂ concentrations apparently fluctuated between 1000 ppm and 3000 ppm during the Triassic and early Jurassic although temperature remained fairly stable at about 10°C.
C above modern levels. A steady decline in CO₂ began in mid-Jurassic, continuing until the present time. Global temperatures, however, remained about 10° C higher than modern temperatures until the early Eocene, except for a short-lived decline in the late Jurassic.

Zachos (2001) reports gradual declining temperatures from the early Eocene to the early Oligocene. A sharp decline in global temperature then began, finally resulting in Antarctic glaciation. This abrupt temperature decline appears to coincide generally with 1) elevation of several mountain ranges (the Himalayas and the Alps), 2) closure of the Tethys Sea between Africa and Europe, 3) positive reduction of atmospheric CO₂ due to weathering of siliceous rocks in the uplifted mountains, and 4) modification of global atmospheric and oceanic circulation patterns by oceanic isolation of Antarctica.

Glaciation began in the Antarctic mountain ranges during early Oligocene and reached continental size during the Miocene. The northern hemisphere was apparently ice-poor (cold, but with insufficient moisture for snow accumulation) until the end of the Pliocene when closure of the Isthmus of Panama allowed introduction of the Gulf Stream into the north Atlantic, more atmospheric moisture into the Arctic polar region and consequent ice accumulation producing northern hemisphere Pleistocene glaciation.

**Pleistocene/Holocene CO₂/ Temperature History**

Numerous Pleistocene ice advances and retreats followed, with warm interglacial events similar to the present time separating each advance. Muhls (2005), in the U. S. Geological Survey Last Interglacial Timing and Environment (LITE) website indicates that in the most recent (Eemian or Sangamon) interglacial warming interval (about 125,000 BP) global temperatures were approximately 5° C higher than present, although CO₂ levels were about 15% lower. Sea levels during the Eemian were up to six meters higher than at present, possibly reflecting greater ice melting than so far observed in this interglacial warming interval.

Episodic warming and cooling since the end of the last major ice advance has resulted in an average global temperature that is -10° to 12° (C) higher than the global temperature 20,000 years ago, when glacial melting began. The Holocene Epoch, which began approximately 10,000 years ago, represents a relatively stable temperature interval with relatively minor (2° to 4° C) fluctuations during which man evolved from a hunter-gatherer culture to our present industrial culture. It should be emphasized that these minor natural cycle fluctuations are much greater than the 0.60° C temperature rise in the last 150 years cited as proof of Anthropogenic Global Warming.

Fagan (2000); Petit, J. R., et al., (2000) and Alley, R. (2000) use data from ice cores to describe global temperature fluctuations during the latter part of the Pleistocene. The data indicate that temperatures fluctuated very rapidly between glacial advances and intervening warming intervals, with amplitudes ranging from 10° to 12° C, sometimes occurring within fifty years or less, similar to the earlier Ordovician, Jurassic and Miocene decoupling discussed above.

Recent data by Stott, Timmermann, and Thunell (2007, Science Daily) indicate that a 2° C deep-sea warming event in the southern hemisphere about 19,000 years ago preceded CO₂ rise by approximately 1000 years. They conclude that an increase in CO₂ did not cause the melting of the last glacial advance that began approximately 18,000 BP. Detailed analysis of data from ice cores taken in Antarctica and Greenland indicates that this temperature/CO₂ decoupling is common in Pleistocene cooling/warming cycles with temperature rise commonly preceding atmospheric CO₂ rise by 800 to 2,000 years, at least over the record of the last 300,000 years (Moffin, Eric, et al., 2001; Caillon, N, et al., 2003).

My own personal favorite climate proxy in the debate on Anthropogenic Global Warming involves the rate of sea level rise. It is acknowledged widely that major sea level declines occurred during the Pleistocene, primarily related to removal of water from the oceans during the formation of glaciers. Alternatively, sea levels rose when the ice melted during the episodic interglacial warming events.

Data from different areas of the world indicate that during the time interval from 18,000 to 6,000 years BP, the earth warmed sufficiently to melt over 50,000,000 km³ (70%) of the ice cover at the last glacial maximum. This melting caused a sea level rise of 400+ feet (120+ meters). As shown in Figure 3, the rate of sea level rise during this melting phase ranged from 0.183 meters per century (the present rate) to 1.768 meters per century, with the highest rates of sea level rise occurring from 13,000 to 6,000 BP, prior to significant human impact. The 0.6 feet per century modern average rate of sea level rise has remained relatively stable for the last 6,000 years, with minor fluctuations during the warming/cooling episodes shown in Figure 2.

Available data are insufficient to accurately predict the length of the present warming cycle. Predictions range from a century (IPCC projections, 2007) to less than 5 years (Abdusamatov, et al., Russian Academy of Sciences, 2006) dependent upon the control mechanism and conditions favored by the predictor.

In my opinion, several conclusions can be drawn from the geologic data available:

1. The controls on climate change are extremely complex. Climate change cannot be accurately predicted using a single controlling variable;
2. Cyclic climate changes involving both warming and cooling are common in geologic history. The present rate of climate change is not exceptional compared to either Pleistocene or Holocene climate change history;
3. The amount of temperature rise over the last 150 years (0.6° C) is within the reported range of variation (3° to 4° C) over the past 2000 years;
4. Numerous examples of temperature/CO₂ decoupling have been identified.
in the past (Ordovician, Jurassic, Cretaceous and Miocene) suggesting that CO2 is not the major controlling factor in climate change:

5. Data on climate change during multiple Termination events in the Pleistocene all indicate that global temperature rises commonly pre-date CO2 increase suggesting that the postulated CO2 stimulus for the present temperature increase relationship may be reversed:

6. Climate change will continue, no matter what efforts are implemented by man. We should therefore, not waste our resources in trying to control climate change but use them to adapt our culture and prepare equally for global cooling and/or warming effects on energy availability, food supplies, sea level fluctuation, atmospheric degradation and other threats.

References:

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Dr. James F. Howard, CPG-02536, graduated from the University of Dayton in 1961 with a B/S in Geology, the University of Houston in 1963 with an M/S in Geology and Indiana University in 1966 with a Ph/D in Geology and has additional training in Marine Ecology at Duke University and Ocean Springs Marine Laboratory. He retired to Owensboro in 1998, where he is active in consulting as an expert witness in Environmental Litigation. He teaches a class in Global Change at Kentucky Wesleyan University.
The first sentence of the American Geological Institute’s 1992 book, *Planning for Field Safety*, states, “Safe fieldwork is no accident.” In the world of safety professionals, there are no such things as accidents, just unsafe acts and unsafe conditions or a combination of the two. In the November/December issue of *The Professional Geologist* (TPG), Nancy Price’s article, “How Safe is Fieldwork?” discussed the tragic death of Alyssa H eberton-Morimoto at the hands of a now-convicted murderer; he was sentenced to life in prison. Price’s article presented well thought-out safety-focused suggestions for improving safety while conducting geologic field work. Those suggestions are truly applicable for any type of field work whether it is geologic, environmental, archeological, biological, etc. The January/February issue of TPG (David Abbott’s Column 113 column, “How Safe Is Fieldwork?”) asked the question, “Should AIPG’s Code of Ethics be modified to add a new Standard that explicitly addresses the need for complying with safe working practices both personally and for those who employ or direct them?” Finally, at the GSA Annual Meeting & Exposition in Denver, a session entitled, “A Dialogue on Field Safety in Memory of Alyssa H eberton-Morimoto” addressed field safety issues. This session was supported by various geological agencies from four states, and the USGS Central Region Safety Office. What happened to references to Occupational Safety and Health Administration (OSHA) regulations in these discussions and articles?

Alyssa was working as an intern under the supervision of a State employee who is not regulated by OSHA, as State employees are exempt from meeting the regulatory requirements of this Federal agency. State-run universities and colleges are exempt from implementing safe work practices and ensuring that such practices are part of students’ activities as specified by OSHA regulations. There are only four State-run occupational safety and health agencies (New York, New Jersey, Connecticut and the Virgin Islands) that cover state and local employees. Twenty-two states have implemented their own occupational safety and health agencies to provide oversight to ensure that safe work practices in the private sector are implemented within their states. Colorado employers are regulated by Federal OSHA Region VIII.

Many of us can tell stories about our summer field camp experience or laboratory work while in undergraduate or graduate school that describe less than safe work environments, practices or processes that were not accompanied with documented safety training. For example, consider the hazards associated with the little bottle of HCl used to identify limestones or dolomites in the field or in the laboratory? What are proper gloves to wear while collecting samples of volcanic glasses or what are the proper type of shoes to wear when working around old abandoned mines and their tailing dumps? During my summer field camp, conducted by a State-run college, none of us in my five-person mapping team received training in first aid, or had a first aid kit, or were made aware of the various signs of heat stress before conducting field mapping exercises in a remote section of the Injo Range of California during the summer.

The private sector is regulated by either State or Federal OSHA guidelines and must meet safety-related requirements. State run OSH agencies must meet or exceed the requirements of Federal OSHA regulations, and Federal OSHA regulations are referenced by those State agencies. For those situations where an exact requirement is not identified to address a specific work-related hazard, OSHA has a very clear and enforceable tool, the General Duty Clause, 5(a)(1) of the 1970 OSHA act. This clause states, “Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.” The General Duty Clause also addresses the requirement of employees to follow safe work practices by 5(b), “Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.”

The most significant regulatory requirement regarding work in the field addresses medical and first aid issues set forth in the Code of Federal Regulation (CFR) Title 29, Part 1910, Section 151 - Medical and First Aid (commonly cited as 29 CFR 1910.151). The requirements of this regulation as well as the numerous OSHA interpretations associated with this regulation’s implementation sets the framework for preparing for field work. Many times, field work is conducted away from cities and towns where medical attention is not readily available or as OSHA states within “near proximity.” Paragraph 1910.151(b) of OSHA’s general industry standard on medical services and first aid states, “In the absence of an infirmary, clinic, or hospital in near proximity to the workplace which is used for the treatment of all injured employees, a person or persons shall be adequately trained to render first aid. Adequate first aid supplies shall be readily available.” From a March 3, 2007 interpretation of this regulation OSHA stated, “OSHA has long interpreted the term ‘near proximity’ to mean that emergency care must be available within no more than 3-4 minutes from the workplace. Medical literature establishes that, for serious injuries such as those involving stopped breathing, cardiac arrest, or uncontrolled bleeding, first aid treatment must be provided within the first few minutes to avoid permanent medical impairment or death. Accordingly, in workplaces where serious accidents such as those involving falls, suffocation, electrocution, or amputation are possible, emergency medical services must be available within 3-4 minutes, if there is no employee on the site who is trained to render first aid.” Depending on the location of the field work to be done, the hazards that could result in

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serious injury are many and within the realm of reason. For example:

- Insect or Snake bite
- Fall from an unstable or high out crop
- Heat stress such as heat exhaustion, cramps, stroke, etc.
- Drowning while fording rivers and streams
- Hypothermia during winter work
- Lacerations due to vegetation, nails, etc.
- Encounters with dangerous wildlife (i.e., bear, moose, elk, etc.)
- Injury associated with carrying samples out of the field
- Crashing field vehicle

To meet the 29 CFR 1910.151 requirements, a specific process should be established before anyone heads out with rock hammer, GPS unit, etc. into the field. A common safety tool used within general industry to establish work tasks and identify hazards is called a Job Hazard Analysis (JHA). It is also known as a Job Safety Analysis (JSA), Activity Hazard Analysis (AHA), Work Plan, etc. Regardless of the name, this written document establishes the work activities, the known or potential hazards associated with the defined work and how those hazards will be mitigated. As a Best Practice, it is prepared with the involvement of the field supervisor, field personnel and supported by someone knowledgeable with safety and health issues. It is completed only after the senior person responsible for the field work has ensured that all applicable aspects of safety regulations as well as established best practices have been reviewed and included in the analysis. Upon its completion, all field personnel are trained to the requirements of the document’s content and requirements.

Some of the applicable OSHA regulations associated with geologic field work can be found within 29 CFR:

- 1910 Subpart I – Personal Protective Equipment [addresses use of hard hats, gloves, eye protection, foot ware, etc.]
- 1910 Subpart J – General Environmental Controls [addresses requirements for sanitation]
- 1910 Subpart P – Hand and Portable Powered Tools and Other Hand-held Equipment
- 1910SubpartZ–Toxic and Hazardous Substances [addresses addressing blood-borne pathogen training for first aid providers and hazardous communication requirements]

These and other sections of OSHA’s regulations are reasonable and appropriate to review and consider in planning field work. Encountering a human generated hazard or a spontaneous natural event is not something that a reasonable person or employer can possibly mitigate prior to beginning field work. Establishing a means to communicate with the field party, provide medical or first aid, ensure a detailed JHA has been prepared and if appropriate, an emergency evacuation plan established and understood by field personnel, are steps needed to be taken to allow for safe and productive field work.

Conclusion

It is the employer, regardless of whether it is in the private or public sector, who must ensure all reasonable and appropriate planning and training has been done prior to allowing anyone to conduct field work. At the least, for agencies and elements of State governments not regulated by OSHA, OSHA regulations would reflect Best Practices for field work.

Should AIPG modify its Code of Ethics to address a topic that is already addressed by State and Federal regulations? I would suggest that is not AIPG’s role. Can we anticipate and prevent senseless acts of violence within and outside the work environment? Based on the terrible situation that occurred in Fairplay and those that have occurred over the past few years within Colorado and our nation, I would have to say no. Can we learn from these unfortunate events and err on the side of caution in terms of awareness and safety in field operations? I would say definitely, yes!

References


Occupational Safety and Health Administration – WWW.OSHA.gov


Howard J. Gordon Along with Howard’s CPG, he is a registered professional geologist in Wyoming, Utah and Tennessee. He currently is responsible for implementing policies, programs and procedures related to safety and provides safety oversight and guidance to over a thousand geologists, drillers, biologists, anthropologists, environmentalists, engineers, surveyors, and other professionals conducting field work including an additional 2,100 employees associated with other areas of work. He has extensive experience with ES&H (environment, safety & health) management systems. Along with these duties, he also provides consulting and internal support related to geology.
We have grown accustomed to reading the status of the AIPG Foundation through the words of Ernie Lehmann. In March of 2007, Ernie submitted his resignation as Chairman of the Board of Trustees of the Foundation effective October 2007. His resignation marks the end to his twenty year tenure as the Chairman of the Board of Trustees of the Foundation. Because of Ernie’s deep passion for the Foundation he wants “…to continue to serve on the Board and will, in any event, continue my financial support of the Foundation.” We acknowledge his service and commitment to the Foundation and look forward to Ernie continuing as a member of the Board of Trustees for many more years.

I have not known any other Chairman of the Foundation since I became a CPG. He will be a tough act to follow! During the twenty years Ernie has directed the Foundation, we have gone from a dream to an endowment approaching $300,000. In 2007, the Foundation received $14,295 in donations and $5,139 in investment income for a total income of $19,434. Our expenses for 2007 were $29,090 which included $24,090 in grants and $5,632 in operating expenses. Foundation grants in 2007 were to AIPG for $12,000 for a number of programs, $6,750 to AGI to fund three interns in Washington, D.C., $2,500 to the Geological Society of America for their USFS intern program, $2,000 to the Nevada Section for K-12 for educational programs, and $810 to the Minnesota Section for the purchase of mineral kits. We are hoping to fund grants at a similar level in 2008, but need your support to maintain this level grant support.

Thus, the Foundation has a broad set of guidelines from which to work, with the overall emphasis on supporting efforts that provide information, data, and research on geologic issues that affect mankind. This is what we as geoscientists do in our everyday life. As shown above, the Foundation expense to income ratio was 2:1. In order to ensure that the Foundation’s has the ability to continue funding grants, we need your financial support. Check the box on your yearly AIPG renewal form and send in a contribution to the Foundation or contact me at rtalkington@geospherenh.com if you would like to explore other contribution avenues.

The face of the Foundation has changed in 2008 as well as the size of the Foundation. We are increasing the number of Foundation Board Members from nine to nineteen. There are currently ten Foundation Board Members. They are as follows:

Ray Talkington, Chairman;
Rick Powers, Vice Chairman;
Bob Merrill, Secretary;
Kel Buchanan, Treasurer;
Ad Honkala, Ernie Lehman, P.K. (Rana) Medhi, Barb Murphy, Russ Slayback, and Jane Willard.

There are nine open positions on the Foundation Board. Please contact me or any of the Board Members if you are motivated and want to help the Foundation grow.

Thank you for taking time to read this article and I hope that you will contribute to the Foundation each year financially, in any amount possible, so that we can support all of the grant applications. We can only do this with your support!
Although it may be of interest to others, this article has been particularly prepared for students who may have interests in careers in the exploration and extractive industries. The process of finding and bringing a mine into production employs a number of earth science and engineering professions working together to inject new wealth into national economies by providing the mineral products upon which modern industrial and post-industrial societies are based.

The process begins with large areas of the earth's surface being progressively evaluated, and winnowed down to a few naturally occurring mineral deposits which might be economically mined. The exploration and mine development process is shown in the diagram below. It is based on the modern scientific method (observation-hypothesis-tests-discovery-commercialization) comprised of twelve steps that smoothly merge into each other.

These steps in the scientific process can be grouped into two familiar action phases. First is the exploration phase staffed by scientists who develop creative concepts of where and how to find the mineral deposits and who then must effectively scour the earth to find them. This is followed by an engineering and business phase (distribution phase) concerned with producing and distributing the mineral products efficiently and economically. The exploration phase is a high-technology business, generally run by entrepreneurs. It mainly employs economic geologists, who are specialists in various types of mineral deposits, assisted along the way by geochemists, geophysicists, and remote sensing (satellite data) specialists. The development and operational phase is commonly run by professional business people. It mainly employs mining, metallurgical and environmental engineers who ascertain the economic viability of a discovery and who design and supervise construction and operation of the mine and the ancillary facilities that separate and beneficiate the mineral commodities into the useful fuels, metals, chemicals, and minerals, including gems, needed by society.

Since most valuable mineral concentrations exposed at the surface have already been found and mined, new reserves or resources are most likely to be found beneath the earth’s surface under a cover of younger formations, overburden, and/or vegetation or water.

The exploration process to find these hidden deposits is premised on the scientific method. It begins by assembling all available information about historical mining, the regional geology, the particulars of earlier geological, geochemical, or geophysical surveys, and any data available from special satellites designed to map certain portions of the visible and non-visible electromagnetic spectrum reflected from the earth’s surface.
characterize different types of mineral deposits. Information from the above
geotechnical surveys is integrated, com-
monly via complex computer programs,
and specific targets worthy of more
intense exploration are defined.

The principal way that these targets
are evaluated is by drilling. An initial
stage confirms the geological environ-
ment and samples are taken to be ana-
lyzed for valuable minerals or metals.
If this drilling demonstrates the pres-
ence of interesting mineralization more
detailed drilling is undertaken to define
the resource by ascertaining mineral
distributions and dimensions, tonnages
and grades (tenor), metallurgical char-
acteristics, and general makeup of the
deposit. If all work and studies to this
point continue to be encouraging, the
project is considered a discovery, and it
advances to the engineering phase.

A mineral deposit cannot be consid-
ered an ore body unless it can be mined at
a profit. Qualified engineers and mineral
economists make a preliminary deter-
mination of project feasibility, based on
their experience and judgment. On the
basis of this, the mining, metallurgical
and environmental characteristics of
the deposit are carefully researched,
as are its economic characteristics, and
the potential markets. The deposit is
then drilled in more detail to define a
mineral reserve (the word reserve
implies that the deposit is an ore body
that can be profitably mined), and final
plans to put the mine into production
are drawn up. Mining, metallurgical and
environmental engineers as well as law-
yers, economists, and business people
plus officials from various governmental
agencies with jurisdiction over the oper-
ation, work together on these plans. The
objective of all these studies is to maxi-
mize profits to investors and to optimize
sustainable benefits to the public while
preventing or minimizing degradation
of the environment. If all of these inter-
ests are aligned, the mine is put into
production and the mineral products
are sold to national and international
manufacturing firms that make the
vehicles, household items, and all of the
physical components of the transporta-
tion and communication infrastructure
upon which modern life depends.

Environmental concerns are a major
consideration of all modern mines, and
government agencies have stringent
policies with regard to enforcement. Any
lands disturbed during the exploration
phase are immediately rehabilitated by
re-contouring and reseeding the land.
Once a mine is exhausted, waste piles
are reclaimed, any effluent is remedi-
ted and diggings rehabilitated or converted
to other beneficial uses. For example, in
the Wyoming coal basins, as fast as the
land is excavated, the waste piles are
reshaped and replanted and the land
is returned to its original uses for wild
animal habitat and/or for cattle graz-
ing. In a different way, rock quarries
in the Front Range near Denver are
being mined such that the quarry pits
can serve as important water reservoirs
for the metropolitan area, once mining
is completed. Similarly, the famous, but
mined-out, Homestake Gold Mine in
South Dakota, is now being rehabilitated
to a depth of more than two miles as a
major federal research laboratory, to
study cosmic rays and neutrinos.

The exploration for and development
of a mine is a costly process that takes
large investments over long periods
of time. The vast majority of deposits
explored never become mines. Industry
studies show that out of every 1,000
targets and prospects defined, about 200
may be drilled, 20 enter the feasibility
study stage, and only 2 ever go into pro-
duction. It is a tough, risky business and
the few mines that do go into production
must pay for their own costs as well as for
expenditures on unsuccessful projects.

Moreover, mines must be developed
where reserves are found. In heavily pop-
lulated and developed areas, mine projects
must compete with other land uses and
other value systems, so it is becoming
increasingly difficult to develop mines
in these areas. Accordingly, exploration
and mining activities are increasingly
moving into remote areas with difficult
terrain, or into foreign countries where
mining is still considered an engine for
national economic growth, with sustain-
able benefits accruing to the local popula-
tions. Because of these trends, the USA
is becoming increasingly dependent on
foreign sources of mineral products.

Despite all the advances in technol-
ogy and the complexities of modern life,
agriculture and the extractive industries
(mining and petroleum) are still the
fundamental industries which support
our lives and all other aspects upon
which modern society is built. This is
all the more reason why the application
of the scientific method remains essen-
tial to resource exploration, discovery,
extraction, processing, utilization, and
reclamation. Oh yes, there are at least
two other components in all stages of
the process……imagination and perse-
verance.

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Digital Mineral Resource Modeling: An Overview

Abani R. Samal, CPG-11143

Abstract

Mineral resource estimation requires a pre-assessment of resources based on interpretation of the surface and underground data acquired during different stages of mineral exploration. Currently, digital (computerized) data analyses and processing is the commonly used tool to create a virtual mineral deposit model with information on commodities that can possibly be extracted at an economically more favorable economic time. This article provides a general overview of the processes of computerized mineral resource modeling.

The digital geological data sources include; including soil geochemistry, drill-hole log data (collar, survey, assay, lithology, alteration etc), topography, and other geological attributes of the samples are accessed using advanced geological/mining and GIS software tools for analyses and processing. A digital deposit model based on this data provides information that can be used for assessment of quality and quantity of the resources projected to be present.

Introduction

A variety of data are used at different stages of mineral resource modeling and estimation. In some cases, raster data sets (including remote-sensing data) are also included to illustrate geological features on the surface. Data collected from the field are saved in digital format to be incorporated in the resource models. The digital data are used to create a model that provides reasonably accurate three-dimensional views and synthesis of the mineralized lithological units and other geological features such as faults, dikes, etc. Traditionally, the geologist interprets drill-hole logs and other data, laying-out maps and cross-sections to create such models. However, a digital three dimensional block model can now be created and manipulated to more easily visualize, classify, and report the quality mineral resources.

The variety of data used in a digitally generated three-dimensional resource model provides opportunities to illustrate many aspects of the resource under investigation. Often more than one software tool is used to build a more comprehensive geological and resource model of the deposit.

The flow of data from the site under investigation to the computer and from software to software is complex and must be handled carefully in mineral resource modeling and estimation to minimize the potential for error. The following sections provide a review of the data analyses and processing that are required to develop a digital mineral deposit model using geological/mining software systems. The figures, their captions, and numerical data presented here are modified from the original data in order to protect the rights of the owner of the data.

Data types

The data are collected from the field (topographic surveying, surface sampling, drill-hole logging and surveying etc.) and are recorded digitally for analysis and interpretation. Remotely sensed data in digital format can provide information on the topography, lithological units and variations in geochemical parameters that can be used to define/map important geological features such as hydrothermal alteration patterns. Remotely sensed data used in conjunction with the topographic mapping data (point survey information) can be used to create a surface map illustrating topographic modification that occurred after the topographic map was published. The interpreted geological features are correlated in three-dimensional (3-D) space to build a digital geological model (Figure 1). Similarly, grade models are made from assay/composite data. The geological model and assay model are essentially three-dimensional envelopes representing interpreted geology and spatial distribution of the grade.

Block modeling

The geological continuity of mineralization is provided by 3-D geological models as discussed above. In order to quantify the resources inside the geological model, a block model is designed, which is later populated with alpha numeric values by interpolating the drill-hole data. In order to choose an interpolation technique and get the interpolation parameters, the underly-
ing spatial structure of the elemental concentrations and lithology are modeled using industry standard techniques. The popular standard models are known as variograms, cokrigograms and correlograms, etc. Model parameters are often used in the interpolation process to estimate the values at the unsampled locations in the virtual digital model of the deposit. These unsampled locations are defined as the centers of 3-D cubic/rectangular solids known as “blocks”. The block model is an array of all blocks with information such as lithology, density, grade etc.

The information in the block-model is estimated from interpolation of the drill-hole data or transfer of information from other sources of data such as attributes of the geological solid model envelopes. Different industry standard interpolation techniques are used to populate the block models. The popular interpolation techniques used in mineral resource modeling include inverse-distance-power (IDP), nearest-neighbor and ordinary-kriging. When the power in the IDP technique is two, the technique is known as inverse-distance-square (IDS). The block model is used to estimate the mineral resources at different cutoff grades (Figure 2).

Resource Classification and reporting

The block model enclosed within the 3D-solid envelope is considered as a resource model representing the mineral deposit under consideration. The mineral resource estimation and reporting are done as per international standards/codes, such as Society of Mining Metallurgy and Exploration (SME) standard, the Australasian Joint Ore Reserves Committee (JORC), Canadian National Instrument 43-101 and the South African Code for Reporting of Mineral Resources and Mineral Reserves (the SAMREC code) which provide standards suitable for different geographical regions in the world for reporting mineral resources. The blocks constituting the resource model are further classified as measured, indicated or inferred category resources following industry standard procedures. Mineral resources are generally reported at different cutoff grades on different lithologic units. Often the confidence levels on the blocks are assessed based on the proximity of the block-centers to the input point data and the number of samples used to estimate a block.

The measured and indicated category resources can be converted into proven and probable type reserves if the economics are feasible. Discussion of the reserve categorization are beyond the scope of this paper, but can be found in any standard text book or in the public domain and from the above mentioned documents (standards/codes).

Discussions

Prior to the advent of computerized modeling, prediction of mineralization was largely done by manually drawn cross-sections and simple mathematical techniques such as applying the mean of the adjacent elemental concentrations to the un-sampled areas. Such approaches suffered from high error factors. With the improved computing power, sophisticated mathematical techniques were developed for development of computerized mineral-deposit models with minimized error.

The data derived from the mineral exploration operations are input into the computer to develop digital model(s) of the geology and mineral resource contents. Such a digital modeling becomes extremely useful in planning for resource extraction in the future. The models can be extremely powerful in providing quality and quantity information of the material (grade and tonnage) and also economics of the deposit. The complexity of a deposit-model depends on the geology of the deposit or, extraction and/or, processing information.

The preliminary data sets initially used to make the geological model and later used to populate a block-model can be/ are updated at higher stages of exploration and mineral resource development. With increasing density of data of higher resolution and enhanced quality, the confidence level of models (geologic, grade and block model) increases. As a result of this modeling resource categories can be more effectively upgraded at advanced stages of resource development.

Acknowledgement

The author thanks Pincock Allen and Holt for their support in making this manuscript for the TPG. The help of Mr. Bart Stone in reviewing this article is highly appreciated.

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A GEOPHYSICAL INVESTIGATION FOR THE PANAMA CANAL EXPANSION

Ronald D. Kaufmann, Derek Irving, Lynn Yuhr, MEM-1249, and Daniel Casto

ABSTRACT

The Panama Canal is one of the most important shipping routes in the world, handling an estimated 5% of total world trade. Since its opening in 1914, the canal has provided a swift passage for Post-Panamax vessels. This project is a monumental geotechnical investigation and new engineered structures. As part of the geologic setting for the project, a reconnaissance geophysical survey was carried out by Technos in conjunction with ACP. The last important geologic event was the collision of eastern Panama with Colombia, ending with the complete separation of the Atlantic and Pacific Oceans at 3.1 Ma (Jackson, Budd and Coates 1996). Bedrock includes intrusive and extrusive volcanic rocks, pyroclastic rocks, and sedimentary rocks. The Panama Canal was cut into a low section between mountain ranges and is conformed to a small Miocene sedimentary basin disrupted by Late Miocene and Pliocene tectonic faulting and volcanic activity. The survey areas in this investigation are located along the northern (Atlantic) and southern (Pacific) portions of the Panama Canal (Figure 1), each with unique stratigraphy and structure.

GEOLOGIC SETTING

The Isthmus of Panama is part of a volcanic arc that started developing in the Cretaceous Period, with deformation and faulting shaping the landforms through present time. It is wedged in a complex tectonic setting surrounded by four plate boundaries with relative motions of 10 to 90 mm/yr (Trencamp et al., 2002; Adamek et al., 1988). The last important geologic event was the collision of eastern Panama with Colombia, ending with the complete separation of the Atlantic and Pacific Oceans at 3.1 Ma (Jackson, Budd and Coates 1996). Bedrock includes intrusive and extrusive volcanic rocks, pyroclastic rocks, and sedimentary rocks. The Panama Canal was cut into a low section between mountain ranges and is conformed to a small Miocene sedimentary basin disrupted by Late Miocene and Pliocene tectonic faulting and volcanic activity. The survey areas in this investigation are located along the northern (Atlantic) and southern (Pacific) portions of the Panama Canal (Figure 1), each with unique stratigraphy and structure.

Northern Canal Region (Atlantic Survey Area)

The northern canal region is composed of Miocene to Holocene sedimentary sequences deposited on eroded pre-Tertiary volcanic rocks. (Stewart et al., 1980; Jones, 1950). The primary stratigraphic formations in the region are the Miocene to Holocene Gatun Formation and the Late Miocene Chagres Formation. The Gatun Formation consists of clayey sandstones and siltstones with interlayered tuff and conglomerates (Irving and Santamaria, 2005). The Chagres Formation also consists of clayey sandstones and siltstones, but no tuff and conglomerate. The Pleistocene and Holocene Atlantic Muck unconformably overlies these formations, consisting of unconsolidated clays, sandy silts, organic matter, and marine shells. The Atlantic Muck is over 60 m thick in some areas and is uniformly soft and weak (Franceschi, 2001).

Numerous faults transect the north-ern canal region with a predominantly north and northeast strike (Jones, 1950; Stewart et al., 1980). In Limon Bay, located just north of Gatun Lake, Pratt et al. (2003) identified 13 distinct faults or fault zones along a single 3.3-km long sub-bottom seismic reflection profile. The most prominent fault in the area is the Rio Gatun fault, which is evident as a 30-km long topographic feature trending northeast from Gatun Lake. Substantial Late Miocene and younger displacement has occurred along the Rio Gatun fault.

Southern Canal Region (Pacific Survey Area)

The southern canal region is composed of Miocene-age sedimentary and volcanic rocks covered by residuum overburden or fill from recent excavations of the canal (Figure 2). Sedimentary formations in the Pacific survey area include the Cucaracha Formation and the La Boca Formation. The Early Miocene Cucaracha Formation primarily consists of soft clay shale. The Early Miocene La Boca Formation is composed of sandstones, siltstones, limestones, shales, agglomerates, and tuffs (ACP internal document, 1984). The Early Miocene Pedro Miguel Formation interfingers with the La Boca Formation and is composed of pyroclastic agglomerate and tuff. Late Miocene basalt occurs as sills, dikes, plugs, and flows with a...
hard, fine to medium-grained texture (ACP internal document, 1984).

Fault zones and shear zones have been identified by lineament analysis and from geologic logs in the area. The two most prominent faults are the Rio Pedro Miguel and Miraflores faults, which strike northwest and north respectively, from Miraflores Lake (Stewart et al., 1980). However, the locations of the faults within or south of the lake have not been well-defined.

THIRD SET OF LOCKS PROJECT

The Panama Canal is 77 kilometers long and extends southeast from the Atlantic Ocean, through a system of locks, to the Pacific Ocean. The locks raise ships to an elevation of approximately 26 meters (85 feet) above sea level. In October 2006, the people of Panama approved the Third Set of Locks Project, which will make the Panama Canal an economically viable transportation route through the 21st Century.

The Third Set of Locks Project consists of eight project areas to expand the canal capacity (ACP, 2006; Figure 3). A previous version of the project was started in 1939, but halted due to WWII. Competition from the Suez Canal and trans-continental railways and highways has now made the project a necessity. The project will add new locks on the Pacific and Atlantic sides of the canal capable of handling longer and wider ships. The new locks will require new navigational channels that will join into the existing canal and utilize water recycling basins to minimize fresh water loss through the lock cycle. The existing locks will continue to be used in conjunction with the new locks. The navigable depth of the canal will also be increased to allow for deeper draft ships.

GEOPHYSICAL INVESTIGATION

In 2006 and 2007, a geophysical investigation was carried out along critical portions of the expansion route. The investigation included over 81 km of sub-bottom seismic reflection data within the canal to map stratigraphy and to identify faults. In addition to the marine data, over 15 km of seismic refraction and multi-channel analysis of surface waves (MASW) data were acquired on land. The main objective of the land-based geophysical survey was to determine the physical properties of subsurface strata and how they relate to stratigraphy, structure, and anomalous conditions. The investigation provided an integral set of data for the geologic characterization of the Third Set of Locks Project.

Marine Seismic Data

Marine seismic reflection (sub-bottom profiling) is a method that uses acoustic energy to penetrate the water and reflect back from underlying geologic strata. Reflections may occur at stratigraphic interfaces (changes in porosity and/or lithology) as well as at structural features such as faults and fractures. The reflected signals produce a continuous cross-sectional image of subsurface conditions.

The sub-bottom seismic reflection survey covered 81 km of survey lines within Miraflores and Gatun Lakes. ACP provided a modern survey vessel equipped with a differential GPS navigation system and an experienced boat crew. Two seismic reflection methodologies were employed for the survey, which included single-channel Boomer and multi-channel airgun data.

The processed marine seismic records contain good quality data to depths of up to 250 meters that show reflections due
Two seismic methods were used: seismic refraction and multi-channel analysis of surface waves (MASW).

Seismic refraction is a method used to determine the seismic compressional wave (P-wave) velocity structure of the subsurface. Seismic P-waves are generated on the surface, propagate through the soil and rock, and are recorded by geophones at known distances from the source. When the seismic waves encounter interfaces separating material of different seismic velocities, the waves are refracted according to Snell’s Law. Since P-waves are the fastest portion of the seismic wave, they represent the first arriving energy at each geophone (either direct or refracted). A seismograph is used to record the travel-times of these first arrivals, after which seismic velocities can be derived. A 2D cross-section of P-wave velocity is then developed from the data using a least-squares inversion process.

Multi-channel Analysis of Surface Waves (MASW) is a seismic method that uses the dispersive characteristics of surface waves to determine the variation of shear-wave (S-wave) velocity with depth. S-wave velocity values are calculated by analyzing seismic surface waves generated by an impulsive source and recorded with an array of geophones. The resulting shear-wave profiles from multiple locations along a survey line are combined and contoured into a 2-D cross-section of shear-wave velocity. Shear-wave velocity is a function of the elastic properties of the soil and rock and is directly related to the hardness (N-values) and stiffness of the materials.

In order to improve the efficiency of the survey, the array of geophones was mounted on a landstreamer and towed behind a vehicle along the survey lines consisting of hard soil or asphalt roads (Figure 5). An elastic weight drop, consisting of an 80-lb. hammer accelerated into the ground with a large elastic band, was used as the primary seismic energy source for the survey. In some areas with soft soils or areas inaccessible by vehicle, a sledgehammer was used as the energy source with geophones planted in the soil with spikes (Figure 6).

High quality refraction and MASW data were acquired along most of the survey lines, with resulting P-wave and S-wave models to depths of up to 50 m. The seismic models show variations in seismic velocity that correlate well with stratigraphy identified in nearby borings. Intrusive basalts are evident as high velocity material, while relatively
soft sedimentary rocks are evident as low velocity material. Anomalously low-velocity areas correlate with fault zones and can be spatially mapped from line to line (Figure 7). The results of the land seismic survey will be used to refine the geologic models of the project area and provide engineering parameters for the new structures.

**CONCLUSIONS**

The geophysical data obtained in this study will be used as one component in a comprehensive subsurface characterization of the Third Set of Locks Project. Stratigraphic boundaries, faults, and variations in engineering parameters have been mapped based on the data. Seismic P-wave velocities will be used as a physical parameter for the estimation of rock rippability, overburden/fill thickness and for defining fault zones. Seismic S-wave velocities will be used mainly as a physical parameter for defining the dynamic elastic parameters of soils and for the estimation of the seismic site response. The data will guide future characterization efforts as well as refine geologic models by providing much greater spatial coverage than traditional borings and excavations alone.

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Ronald Kaufmann is Vice President of Technos, Inc. in Doral, Florida and served as project manager for this study. His expertise is in characterizing the subsurface using land and marine-based geophysical methods. Derek Irving is a senior geologist at ACP and coordinated the geophysical investigation of the canal expansion. Lynn Yuhr and Dan Casto served as key personnel on the geophysical investigation.

Reviewed by AIPG Associate Editors: Edward M. Baltzer, CPG-08861, Ray W. Talkington, CPG-07935, and Scott A. Tiller, CPG-10016
Roadside Geology of Florida

Move over Mickey—North America’s most famous peninsula is a geological theme park just waiting to be explored!

Walt Disney World, the moon landing, shark attacks—these are things the average person readily associates with Florida, but geology . . . ? Not so much. Roadside Geology of Florida is fixing to changethat. From the panhandle through the Central Lakes District all the way to the Dry Tortugas, authors Bryan, Scott, and Means lead you through a world of cavernous limestone, roiling springheads, and rock strata containing the remains of some of the strangest animals that ever walked the Earth.

The latest in this one-of-a-kind series, the Roadside Geology of Florida is divided into five regions, following Florida’s roads to its geological wonders. Along the roads you’ll encounter a sinkhole that swallowed several buildings in Winter Park; sand dunes stranded high and dry with no shoreline in sight; and Titanis walleri, a 6-foot-tall, predatory flightless bird. With its concise descriptions, clearly written explanations, and voluminous color photographs and illustrations, this book will enthrall readers as they tour the Sunshine State, which, by the way, is the most recent addition to the North American continent.

Geoscientist Salaries, by years of experience

The average salaries for geoscientists in 2005 varied by years of experience. For geoscientists employed for 0-2 years, the average salary was $74,000, a 9.7% increase over 2004’s average. Geoscientists employed for 20-24 years earned an average of $139,000, which was more than a 23% increase over 2004 salaries. After 25 years of employment, average salaries dip slightly, to $138,100.

As expected, the greater the education, then generally the higher the compensation. However, given the premium on experience and small population of mid-career geoscientists in the US, even Bachelors’ degree recipients can out-earn PhD and Masters degreed scientists. Geoscientists with their highest degree as the Bachelors earned an average of $135,000 with 10-14 years of experience, compared to only $103,000 for doctoral geoscientists with the same experience. For More information visit www.agiweb.org

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