WANTED - TPG ARTICLES
Instructions to Authors

The TPG accepts articles of modest length for publication. Submittals should be no more than approximately 1600 words, or six typed pages, double spaced. Longer articles may be divided into parts (e.g., part I and part II), but this is not encouraged. Articles may be technical or professional in nature. General topics are listed below. Articles containing news of importance to professional geologists will also be considered. Except for news articles, or articles containing dated materials, submittals should be sent to AIPG headquarters twelve weeks in advance of expected publication. Some technical topic issues are planned up to one year before printing, therefore early submittals will be preferred.

Manuscripts should have the following section:

Title
Author(s) with CPG number and address
Text
Tables if included
Figures with captions if included
Appendix(es) if included
Acknowledgements
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One original and two copies of each manuscript should be submitted. Whenever possible, text should also be submitted on diskette. Headquarters uses WordPerfect 7 for Windows ‘95, which is preferred, but Word, ASCII, RTF, or translatable files are acceptable. The program or format of the text should be clearly marked on the diskette. Articles can also be transmitted by e-mail.

Graphics should be clear, camera-ready, line drawings whenever possible. Photographs (color or black and white) are also encouraged. Whenever possible, drawings may be submitted on diskette in .pcx, .bmp, tiff, gif, or other standard formats.

TPG wants color photographs. Photographs alone may be submitted for the cover. They should have a geologic theme and an informational caption.

General Topics:

Technical
Mining (January)
Petroleum Geology (March)
Hydrogeology (July)
Environmental Geology (September)
Geophysical/Engineering (November)

Professional (any issue)
Government and the Geologist
Ethics and Standards of Practice
Public Perception of Geology and Geologists
Definition, Certification, and Licensing
Practicing Geology Internationally

Other suggestions: Forensic Geology, History of Practice in a given field, Book Reviews, and Geology and the Military, Unusual Applications of Geology.

Authors are encouraged to communicate with Headquarters via mail, fax, or Internet. Send your article and/or photographs, or communicate questions to:

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The Professional GEOLOGIST

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Photograph by Mark A. Koestel, CPG-8307.

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Potential Home Buyers

The American Institute of Professional Geologists has prepared the "Home Buyers' Guide to Geologic Hazards" to educate potential home buyers about damages that can occur to structures due to geologic hazards. It offers tips on finding information regarding geologic hazards; obtaining professional consultations; ensuring proper siting, construction, and drainage; and understanding risks posed by expansive soils and heaving bedrock, flooding, subsidence, landslides, rockfalls, avalanches, earthquakes, coastal erosion, and radon.

It is hoped that this booklet will provide the public with insight into those geologic processes that most affect the home buyer and home builder in the United States. To the old adage "buyer beware" we wish to add another. **Buyer, be informed.**

By being informed of potential problems prior to construction of a new home or purchase of an existing one, perhaps much damage and property loss can be avoided. **The possible presence of a geological hazard does not necessarily condemn a property. It is frequently possible to adjust to or overcome these limitations.** Information on how to contact qualified geological consultants is presented at the end of this publication.

**Buyer, be informed.**

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Avoiding the Pitfalls of Accelerated Site Characterization

Charles R. Robertson, CPG-9858

A common complaint among environmental consultants is that state regulatory agencies, in their efforts to create standardized approaches and reporting for underground storage tank (UST) investigations, have taken much of the “fun” (i.e., thinking process) out of the work. Geologists in particular have experienced the consequence of these changes, given that our work is descriptive in nature with an ultimate scope that cannot always be anticipated prior to the initiation of a field investigation.

In recognition of the unpredictable nature of the site assessment, many state agencies allow latitude in assessment decision-making. Conversely, some states have created entire assessment schemes, typically making use of direct-push subsurface technology (e.g., Geoprobe, Strataprobe, etc.) to attempt to fully assess sites in a single mobilization of personnel and equipment. Direct-push assessments have several advantages, primarily their smaller size and lower profile, which allows for greater accessibility, and their ability to obtain samples (soil, water, and vapor) quickly and with a minimum of generated wastes. Implicit in such an UST assessment, which for convenience sake I will refer to as an Accelerated Site Characterization (ASC), are the following assumptions:

1. access to all known or potentially-affected properties will be obtained prior to initiation of field activities;
2. analytical results will be obtained quickly, while the people and equipment are still on site; and
3. a minimum of three permanent groundwater monitoring wells will be installed to allow for continued groundwater monitoring after the assessment.

One pitfall of ASC becomes immediately clear. Often, neighboring property owners are unwilling to provide access until they know whether the leaking USTs have actually contaminated their property or unless they are so directed by the state regulatory agency. The Catch-22 of this is, of course, no such information will be available until the investigation has been initiated. (The consultant should always remember that while these third parties may not have done anything to contribute to the contamination of their properties, as owners of the land, they may be required to clean-up their property. The irony is that, if they refuse access to their neighbor, they deprive themselves of the opportunity to allow needed cleanup, but this dilemma could fill a whole article.)

In addition, many responsible parties may not wish to alert their neighbors of potential problems prior to at least an initial determination of site contamination, particularly of groundwater, which has a much greater chance of migrating off-site. Finally, a particular property owner may be unwilling to give access. If the consultant delays the initial investigation of the site while attempting to get access, crucial time can be lost and the assessment may reveal that such access was not even necessary.

Second, unless an on-site mobile laboratory is used, the geologist will ultimately have to conduct the drilling and sampling as two distinct phases. The first phase would use direct-push sampling points to delineate the areal extent of contamination. Upon receipt of analytical results (and assuming that the area was successfully delineated; if not, step one must be repeated), the second drilling phase would be conducted with permanent well installation to confirm the delineation and allow for future monitoring. The down side to using mobile labs is their high cost, as most mobile laboratories charge a minimum daily rate. Therefore, unless a great number of samples are analyzed, the per-sample cost is quite high, especially for small sites. The budget can take quite a beating when rig breakdown, inclement weather, or lack of access delays the projects. Usually, the geologist ends up submitting practically everything to the lab for analysis, something rarely done in a conventional drilling and sampling investigation, in an effort to see that the client “gets his money’s worth” from the lab. While the acquisition of these excess data can be helpful, it is not commonly crucial to the investigation.
The third pitfall is that most direct push rigs do not have the capability of installing permanent wells. In fact, fewer than half of the drilling companies that I have worked with have both types of drilling rigs, and even those that do will charge separately for their mobilization to a site. As permanent wells will be needed for almost all state-mandated UST investigations, it becomes clear that completing the ASC in a “single” mobilization requires a great deal of coordination between multiple subcontractors, good weather, no delays, and a lot of luck.

Finally, and perhaps most importantly, is the problem caused from a lack of available data prior to the initial investigation. The following case illustrates this point and shows how, with careful consideration of site-specific factors, we were able to avoid the preceding pitfalls.

In 1996, a client contracted with us to perform a site assessment of his retail gasoline and service station located near the Gulf Coast of Texas. The client had discovered contamination when he removed two USTs at the site; two USTs remained active. The only analytical data available prior to the site assessment phase were the results of soil samples obtained from the UST excavation during their removal; no groundwater had been encountered. Though the property was actually quite large, the location of the leaking USTs was near a property boundary. However, the fairly flat topography of the site made it uncertain which direction groundwater flowed and in which direction(s), if any, off-site access would be needed.

We therefore determined that an ASC using temporary sampling points would not be advantageous for the initial assessment. Rather, we proceeded with the installation of permanent groundwater monitoring wells in locations as close as feasible to the known and potential sources of contamination (i.e., the former and active tank holds and the active dispenser islands). A total of five wells were installed, each to a depth of 30 feet, with groundwater encountered at 18-20 feet below ground. Well screen was installed from the bottom of each well to five feet below ground to allow for maximum groundwater fluctuations.

After the wells were installed, they were surveyed to a local datum point and the groundwater elevations measured. As suspected, the groundwater exhibited almost no elevation difference across the site. Furthermore, the groundwater elevation in the monitoring well nearest the former UST hold appeared anomalously “high.” Our hypothesis was that the former excavation, which had been backfilled with the removed materials when the USTs were removed, and not covered with an impermeable surface cover, was acting as a conduit for increased rainfall infiltration, thus providing a false indication of regional groundwater flow. Additional well gauging confirmed this theory and yielded the surprising finding that the direction of groundwater movement was actually 180 from the direction of surface water flow indicated by a slight topographic gradient, which was toward a nearby lake.

Sampling of the groundwater from the wells confirmed that the hydrocarbon contaminant levels in several of the wells were above state-mandated levels, thus causing the state to direct that additional assessment be conducted. We determined that we now had enough information to successfully apply the techniques of the ASC. We were able to approach the neighboring property owners with analytical data to help them better evaluate the risk (or lack thereof) of allowing us access to their property. Furthermore, we were able to eliminate certain properties from assessment based on the direction of groundwater movement.

We subcontracted a firm to provide both the direct-push sampling and mobile laboratory services. With a firm plan for sampling locations, were able to complete the installation of 17 direct-push borings to 23 feet in a day and a half, thus realizing cost-effective usage of the laboratory. Groundwater samples were obtained from the borings using dedicated disposable tubing and a syringe. Real-time results provided by the mobile laboratory confirmed that we successfully delineated the extent of dissolved hydrocarbons to the state-required levels. The following day, the drilling rig for the installation of the permanent groundwater monitoring wells arrived at the site. This allowed the field geologist to confidently locate the three off-site wells needed to delineate the extent of groundwater contamination to levels below state requirements. The geologist conducted gauging and sampling of these wells and the previously-existing five on-site monitoring wells, surveyed the new wells, and left the site that evening.

The groundwater samples were submitted to a stationary laboratory at a much smaller cost than a third day of using the mobile laboratory. When analytical results and survey and gauging data were reviewed, we determined that we had successfully delineated the extent of groundwater contamination and had analytical results that showed the locations of the areas of maximum contaminant concentration to allow for preparation of a risk assessment.

I hope that this information will provide assistance to those geologists in areas where the ASC is being introduced as a new assessment approach. While there is much to gain from its correct use, the pitfalls, if not avoided, can certainly leave you with a bad case of “20-20 hindsight.”

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Acknowledgments: DeLaine L. Fletcher, CPG-9468; Robert H. Fakundiny, CPG-4977; Edward M. Baltzer, CPG-8861.
SHAKE, RATTLE AND ROLL

Predicting Earthquakes — Nature’s Seismic Dance

R. Alan Welch, CPG-8546

Earthquakes are among the deadliest of natural catastrophes, with an average death toll in the 20th century of 20,000 people each year. Of more than 6,000 earthquakes detected annually throughout the world, 5,500 are either too small or too far from populated areas to be felt. Another 450 are felt but cause no damage, and 35 cause only minor damage. The remaining 15, however, wreak disaster, death, destruction and damage.

Most deaths from earthquakes occur when homes, buildings, bridges and other structures — many of which may be far from the fault — are toppled by the shaking earth. During the few seconds that the earthquake lasts, the force of this shaking approaches the force of gravity. The seismic waves generated by the rupture continue to propagate after movement on the fault has stopped, spanning the globe in 20 minutes. Indirect damage is caused through the accompanying landslides, avalanches, fires and the collapse of dams, although the latter is a rare occurrence. The result often leads to the disruption of food and water supplies and sanitation systems, causing starvation and the spread of disease. Earthquakes that occur under or near the ocean can help to generate tidal waves (tsunamis or seismic sea waves) with heights up to 50 feet near shore. These waves can cross an ocean in several hours, inflicting damage upon shores far from the earthquake itself.

To help minimize the enormous potential for disaster, man has long sought a reliable method for earthquake prediction. The forces comprising an earthquake are often accompanied by tell-tale signs, or warning phenomena. Different areas of the world may exhibit different characteristics; these may be variations in seismic wave velocities, resistivity, dilatancy, tilt, and strain. These characteristics, when carefully studied, can contribute to the prediction of earthquakes which may often mean the difference between life and death to people living in high seismic risk areas.

Seismic Gap

Certain parts of some faults have what are called seismic gaps, because there have been no earthquake tremors along the fault for the past 25-30 years. Some geologists believe that along a seismic gap the Earth’s plates press on each other so hard that they lock together. Tremendous pressure builds up, eventually to be released by a major earthquake.

Historically, the aftershock sequences of the great earthquakes are sharply bounded spatially, defining distinct tectonic plates with little overlap of activity in adjacent plates. In each case the activity within the zone of a major event was relatively low beforehand. During the event, however, strong activity registered, returning to a scattered activity afterwards. There appears to be no simple, generally accepted reason to explain why certain sections of some seismic zones have periods of low activity. This manner of prediction is the most effective for island arc systems of the Pacific plate. Major earthquakes are often preceded by relatively low activity. When this low period is being recorded, it can be assumed that energy is building up in the area. Fault creep and small earthquakes do not substantially release much energy during this time.

Warning Phenomena (Precursors)

The accumulation of stress and the weakening of rock that precede an earthquake have measurable consequences. If detected early enough, these consequences can signal an alert. Sudden lowering of groundwater levels, tilts and bulges in the Earth’s surface, changes in the velocity of propagation of the P (Vp) and S (Vs) waves, changes in the Earth’s magnetic field, and increased concentration of rare gases in well water have been observed prior to some, but not all, earthquakes. Certain changes in animal behavior have also been observed.

Earthquake prediction requires the discovery of localized warnings — one or more observable qualities
that occur just prior to the event. Prediction research focuses on the relationship between the size and duration of the anomaly to the magnitude of the impending earthquake and the length of time before its occurrence. Several methods provide insight to the prediction of some large earthquakes.

**Strain and Tilt**

The energy released at the time of an earthquake was present just before the event in the form of elastic “strain” energy in the rocks. The energy is then released by slippage along a fault when the shear stresses exceed the strength of the rocks. The rock body has been slowly accumulating this strain from the result of deformations. For prediction purposes, it is important to know that the strain has built up to the point that the system of rocks is approaching failure by sudden slip.

Evidence that a volume of rock is in a highly strained state is observed by 1) changes in the relative positions of points on the Earth’s surface, either from geodetic measurements or from point measurements of strain and tilt, and 2) the determination of strain — dependent physical properties of the rocks in situ, either by direct measurement or by local values of force fields that depend on these properties. These properties include elastic wave velocities, seismic wave velocities, duration, dilatation, and temporal changes in the concentration of a geochemical tracer such as radon gas in well water.

**Changes in Geodetic Measurements**

Numerous stations must be set up using strain and tilt meters in an effort to detect strain accumulation by measurements at discrete points. Both strain and tilt rates have been monitored, with episodes of rapid change recorded prior to earthquakes recorded.

One type of instrument consists of a pool of mercury which establishes an equipotential or level surface. Suspended above this surface are two capacitor plates attached through the mercury to the Earth. If the earth tilts a small amount, the capacitor plates are displaced relative to the mercury and the capacitance between the plates and mercury is changed. The relative capacitance of these two sensors is continuously monitored and recorded.

A newer, more promising meter used to measure strain is a geodolite. The geodolite uses a laser beam to determine the distance between it and a reflector. This instrument is capable of resolving distances as small as one millimeter at ranges of thirty kilometers or more. The main limitation to its precision is the determination of the refractivity of the surrounding atmosphere. To compensate for this, atmospheric pressure must be measured very carefully at both the geodolite and the reflector.

There are two major difficulties with measurements of this kind: 1) the large diurnal and annual variation caused by thermal strains, the elimination of which requires perfect stability of the strain meter; and 2) determining the relation of near-surface strains and tilts to the processes at greater depth where the earthquakes originate. Surface measurements in or near an active fault zone may be modified by deformation of material that is not part of the source volume.

The Laser Geodynamic Satellite, or LAGEOS, placed in orbit in 1976, permits measurements of the movements of the earth’s crust to an accuracy of 2 cm thereby providing information useful to earthquake prediction research.

**Changes in Physical Properties**

The coefficient, “b”, in the Gutenberg and Richter equation, \( \log N = a + bM \), represents the relation between frequency of earthquake occurrence and magnitude, and is an important factor of the study of seismicity. Both the slope and the intercept at a selected magnitude of the curve are characteristic of the activity of a region. Detailed investigations have shown that the slope and intercept are not stationary in time and their variations may indicate an impending event.

Studies suggest that the “b” values during the period of foreshocks of a major event are abnormally low, as low as -0.35 to -0.5, compared to normal values of -0.8 to -1.2 determined for background activity and aftershocks of the main event.

The rates of frequency of foreshocks and aftershocks varies with magnitude. The frequency of foreshocks and aftershocks is almost the same for larger earthquakes, but for smaller earthquakes, much higher frequency of aftershocks is seen.

**Seismic Wave Velocities**

The elastic constants and therefore the elastic wave velocities of solids are known to be stress-dependent. A great deal of research has been devoted to the stress dependence within the area of elastic deformation of rock materials. More significant for predictions are the observations of the behavior under loads high enough to cause failure. Before the earthquake, the ratio drops to a minimum and then returns to its normal value around 1.75 with perhaps a small increase just about the time that the large event occurs.

**Duration of the Anomaly**

Observable anomalies can precede major earthquakes for months, and sometimes even years. The use of the Vp/Vs ratio yields the appropriate time (to within about 10 percent of the total precursor time), the location, and magnitude of the impending earthquake. The onset of the preceding anomaly could be recorded over a span of time, and as the values begin to return to normal, an estimate of the time of occurrence and magnitude could be made. The estimates would be revised as the Vp/Vs ratio returns to normal.
Physical Basis of Prediction (Dilatancy)

Dilatancy is an inelastic volume increase caused by the formation of microcracks parallel to the axis of maximal compression and opening in the direction of least compression (Brace, Paulding and Scholz, 1966). The axial load at which dilatancy begins depends on the confining pressure and the material, but it is somewhat in excess of 50 percent of the load to produce failure.

The behavior of the seismic wave velocities prior to earthquakes can be explained on the basis of dilatancy in low-porosity rocks that are initially saturated with water (Nur, 1972). As new cracks and additional porosity develop, the rock becomes less than totally saturated. Because the compressional wave velocity is more sensitive than the shear velocity to the degree of saturation, the ratio of Vp/Vs will drop. The rock would then resaturate, allowing an earthquake. The resistance of a fault to slip depends strongly on the pressure of the fluids in the pores, especially when that pressure is near the confining pressure, the resaturation of the medium will weaken it and result in an earthquake about the time of the return to the fully saturated state.

Another result of dilatancy can be observed in the appearance of radon in water wells shortly before earthquakes, which happened in the 1966 Tashkent (capital of Uzbekistan) earthquake. Analysis of water from a deep well in the hypocentral region showed a variation in the radon content prior to the earthquake. Several years preceding the earthquake, the radon content increased very rapidly, doubling its normal value. The radon content was maintained at this high level until the earthquake, at which time it returned to its normal value. The same pattern was repeated prior to the large aftershocks, but on a shorter time scale.

Radon has a half-life of only 3.8 days, and its average lifetime diffusion distances in groundwater is only several centimeters. Thus its increased concentration in the Tashkent well prior to the event could have been caused by only two means: 1) an increase in the surface area of rock at depth due to cracking, or 2) an increase in the flow rate of pore water.

According to the dilatancy model, there should be a significant reduction of the electrical resistivity prior to an earthquake as a result of the influx of water into the dilatant region. A strong correlation exists between minima in electrical resistivity and the occurrence of earthquakes, the same results that come from the model. Laboratory studies of the electrical resistivity of rocks show that it would be very difficult to explain these drops in resistivity in any way other than as an increase in the pore water content of the rocks.

Fluid Studies

Knowledge of the effect of fluids on earthquakes has been obtained from the Rocky Mountain Arsenal deep-disposal well. Between 1961 and 1966, periods of increased injection pressure showed increased earthquake activity. Cohesive strength of the rocks in the reservoir was estimated to be about 150 bars. Earthquake-induced fracturing decreased the cohesive strength, and thus the resistance of the reservoir rock to additional fracturing and sliding. The injection pressure varied from 269 to 379 bars. A variation in the ratio of injection rate to pressure was observed, and parallel cases where oil-bearing reservoirs have been hydraulically fractured to increase their permeability.

From the theory of hydraulic fracturing, the fluid pressure, (Pc), required to hold fractures in the formation open to rapid injection, is equal to the magnitude of the least principal stress, (S3). In the reservoir rock at the Denver well, Pc was approximately 362 bars, 93 bars greater than the initial fluid pressure (269 bars) in the reservoir. Before seismic faulting can be inhibited, the pressure would have to fall to 214 bars or lower; for the pressure to fall this low, fluid would have to be pumped out of the reservoir rock.

Conclusion

The previous models presented show great promise for predicting earthquakes. As equipment improves and more recording stations are established, new information can be processed and utilized to further refine the process.

Accurately predicting the time and place of an earthquake can obviously have great economic and social benefits. Through a combination of modern geological exploration, compilation of records of historical seismicity, and growth in the science of seismology, the ability to accurately predict an earthquake cannot be far away.

References


R. Alan Welch is a Licensed Professional Geologist with the State of Florida and a Certified Professional Geologist with the American Institute of Professional Geologists. A member of The Society of Mining Engineers, Welch concentrates his practice in the fields of environmental, marine and mining geology. He also consults as an environmental contamination professional. Welch is currently the principal geologist and vice president for Environmental Land Services, Inc. (E. L. S.) located in Fort Myers, Florida.

Valuation geology is one of those specialized areas of geology that is relatively unknown except by government agencies, mineral property owners, and business enterprises where a value is required for state and/or county tax assessment, condemnation, or estate and gift tax. Other, more common occasions when the value of a mining property is called for are: 1) regulatory requirement associated with estimating the value of federally-controlled mineral lands; 2) the sale/purchase of a mining/mineral property; 3) royalty interest; 4) or for appraising the value of shares on the market. For the purpose of this article only solid mineral properties are considered.

Mine valuation is the estimating or assigning of worth to a mine or an undeveloped mineral property. In 1877, H.D. Hoskold, a British mining engineer, was the first to publish a mine valuation text. The basis of the Hoskold method is the present value of annual earnings consisting of two parts: (1) an interest payment to the investor; and (2) a return of part of the capital, which might then be reinvested at compound interest to build up a "redemption fund". The methodology declined in importance because a basic premise, the sinking fund, is no longer consistent with modern corporate financing practices. Present methodology, as noted by Robert H. Paschall, is that the capitalization of income, or discounted net income, is the only method applicable to appraising the total mine property. The preferred income to be considered is present-worth, or discounted, is net operating income (N.O.I.), sometimes called net operating profit. Paschall lists rock reserves, future rates of production, product prices, operating expenses, future capital costs, and discount rate as the key elements in a total property appraisal.

In this paper the value of the mine/mineral property is the fair market value, which the courts have interpreted as the price a willing buyer would pay and a willing seller would accept for the property, neither being under any compulsion to buy or sell and both having reasonable knowledge of the relevant facts. In many cases the market value of a mineral deposit is expressed as an estimated market value based on the time and conditions existing as of a specific date.

Overall, the key to correctly valuing a property, a purely factual matter, lies in using a qualified valuation geologist who has supported his/her opinion with credible evidence. Courts may accept or reject part or all of an expert's opinion, or they may accept the opinion of one expert in its entirety. They may also determine a value by combining points from different appraisals of the same property, even if the resulting value falls outside the range of the opposing parties' expert opinions.

Courts generally do not like to deal with valuation cases because they regard them as factual disputes best resolved by the parties. When these cases do not settle, it cannot be assumed the court will simply split the difference. Instead, it may come down hard on the side it perceives as having the weaker valuation. Generally, this means the valuation geologist should have superior credentials and methodology, the best knowledge of local conditions, comparable sales, and other evidence supporting the valuation opinion. John Gustavson noted that a fundamental area of activity for professional minerals appraisers is the courtroom, where an appraiser's knowledge and ability to communicate are put to the most demanding test.

To estimate the market value of any asset, most valuation geologists initially consider three generally accepted approaches to value: (1) the Cost Approach, (2) the Market or Comparable Sales Approach, and (3) the Income or Earnings Approach. These approaches are based on the appraisal principle of substitution, which holds that when several commodities or services with substantially the same utility are available, the one with the lowest price attracts the greatest demand and widest distribution.

Cost Approach

The cost approach is an attempt to determine the depreciated replacement cost for the asset in question. In other words, what would it cost to reproduce the asset with another of identical quality and state of repair? Underlying this approach is the idea that a purchaser would not be justified in paying more for a property than it would cost to acquire land and timely construct improvements having comparable utility.

The approach is rarely applied in mining because the correlation between construction costs and value of property is very imperfect and depends upon the char-
characteristics of the mineral deposit. In other words it may cost the same to build the identical infrastructure on two separate properties, however, the economics of processing or transporting the ores may vary widely depending upon grade of the ore. Another drawback is the fact that a newly discovered ore body without any infrastructure or equipment on the property will have only exploration costs associated with the property. Exploration costs have little utility in estimating the value of the orebody. Cost approach is usually the least reliable method of valuation.

Market or Comparable Sales Approach

The market or comparable sales approach is the best evidence of fair market value since it reflects the balance of supply and demand in the market. Underlying this approach is the fact that a purchaser would not be justified in paying more for a property than it would cost to acquire an equally desirable substitute property. It consists of studying the sales and purchases of similar assets in an open market, exposure for a reasonable time, knowledgeable buyers and sellers, absence of pressure on either party, and a sufficient number of transactions to create a stable market.

There is great difficulty in applying this approach to mining transactions because: (1) There are very few sales of mining properties, and (2) each mineral deposit is unique in quality, size, geographical location, degree of development, geological setting, and a number of other ways. Much of this information is proprietary and is not divulged to the public.

It is extremely difficult to learn the actual value of the property in question due to stipulations pertaining to production commitments, deferred stock exchanges, production payments, royalty overrides, and other factors having an impact on the value.

Income or Earnings Approach

The income or earnings approach is estimated by calculating future annual net earnings generated from the producing property or asset and then discounting this earnings stream to the present time using an appropriate interest rate. The approach assumes that a purchaser would not be justified in paying more to acquire income-producing property than the present value of the income stream to be derived from the property. Thomas A. Loucks stated that the income method has generally become the most satisfactory method of valuing a depleting asset such as a mine of finite life. In addition, he adds that the income method is commonly accepted by the courts when "comparable sales" are deemed not to be comparable or are non-existent.

Essentially the approach consists of estimating the value of a mine by treating the expected annual net profit after taxes as an annuity for the life of the mine, and discounting the annual annuity payments by a capitalization process. The interest rate used reflects the hazards of the mining business.

D.W. Gentry and T.J. O'Neil commented that it is possible to arrive at a value estimate by combining the selling price of the commodity produced with the costs of producing the commodity from the property in question. By properly incorporating this data into a discounted cash flow analysis, it is possible to arrive at an estimate of property value even in the absence of actual production; however, it is important to remember this is an estimate of potential income generated from mining the commodity and selling the product. They continue that capitalized future income is a unit valuation method in that a single value is assigned to the ore deposit, surface and subsurface improvements, and all real and personal property used in the production process. This is usually the case for hard rock mines in remote locations where the real property has value only because of the presence of ore; however, a worked-out sand/gravel pit or a crushed stone quarry in an urban area might have utility as a reservoir, recreation area, housing development, public park, landfill, or similar private or public use. In such an instance the mineral appraiser should estimate the residual value of the property after mining has ended. Paschall presents a sample appraisal of total property, and the residual value of land and minerals in Appraisal of Construction Rocks.

References


Earl G. Hoover, CPG-2739, 1855 Powell Place, Jacksonville, FL 32205.

Summary of the Virtual Meeting of the Executive Committee of AIPG

Robert G. Font, CPG-3953, Advisory Board Representative

The AIPG Executive Committee conducted its first ever “virtual meeting” from July 1 through July 14, 1997. Led by President Jon Price, various topics were discussed via electronic mail. The meeting culminated with several items being voted on by the participants. The vote was conducted through a “fax ballot” sent directly to the National Headquarters office in Arvada, Colorado. Participants in the meeting included:

- Jonathan G. Price, President - Nevada
- Stephen M. Testa, President-Elect - California
- Dennis Pennington, Vice President - Pennsylvania
- Robert H. Fakundiny, Secretary - New York
- Robert M. Colpitte, Jr., Treasurer - Nevada
- J. Dale Nations, Editor - Arizona
- Ronald E. Alexander, Advisory Board Representative - Kentucky
- Robert G. Font, Advisory Board Representative - Texas
- Frank W. Harrison, Jr., Advisory Board Representative - Louisiana
- John T. Howard, Advisory Board Representative - Missouri
- William V. Knight, Executive Director

Several items were approved unanimously as a result of the voting. These are summarized below:

- A request from the Missouri Section to change its bylaws relative to meeting dates.
- A motion to request (but not require) that AIPG Sections make either the AIPG Executive Director or the National Treasurer a signatory on all Section accounts. The rationale for this request is to help prevent Sections’ accounts from being tied up or lost should the Section leadership be unavailable, etc.
- A move to adopt the draft Policy on “Relationship Between Professionals”, as published in the May, 1997 issue of the TPG.
- The approval of the fee and dues schedule summarized below, for 1998 and beyond, until further modified by the Executive Committee:

  CPG Application Fee: $50.00 (unchanged)
  CPG Annual Dues: $85.00 plus Section dues (unchanged)

Member Application Fee: $30.00
Member Annual Dues: $60.00 plus Section dues
Registered Member Application Fee: $30.00
Registered Member Annual Dues: $60.00 plus Section dues
AIPG Student Application Fee: $5.00
AIPG Student Annual Dues: $15.00 (No Section dues)
AIPG Associate Application Fee: $5.00
AIPG Associate Annual Dues: $50.00 plus Section dues.

- A move to form a task force to work with Headquarters with the purpose of developing a brochure on why to join AIPG.
- A move to charge the Membership Services Committee with the formation of a task force or subcommittee to develop a regular TPG column on licensing exams. In particular, to pursue Committee Chair Barbara Murphy’s following recommendations:

  To have an article in TPG about ASBOG exams and the types of questions and fields covered by the exam.
  To have a problem-solving type question each month in the TPG with the solution provided either that month or the following month.
  To invite comments from people who have recently taken the exam.

- A move that AIPG, in principle, add its name to a joint press release with SME and other mining-related organizations concerning violations of professional codes of conduct, and that the Executive Director and President approve the final language before AIPG’s name is actually added.

- A move to charge the National and International Affairs Committee (NIAC) to establish task forces or subcommittees to deal with key issues of the day. As a start, the NIAC should pursue the review of the USGS strategic plans for its geological programs. These task forces should prepare draft policies and position statements to be reviewed by the NIAC. In turn, the NIAC will submit recommendations to the Executive Committee for adoption.

Several other issues were considered and voted on. Those that were not approved unanimously were tabled until the executive committee meets in October at the annual meeting in Houston.

The virtual meeting was very successful proving to be an effective way to conduct AIPG business. Undoubtedly, there will be many more of these to come.

NOTE: The Executive Committee Summary for the April meeting that was printed in the May issue of TPG was written by John Howard. Our apologies for not including this information at the time of printing.
Stephen M. Testa, CPG-6464

As a Member Society of the American Geological Institute (AGI), AIPG participates in AGI’s Government Affairs Program (GAP). GAP was established in 1992 to increase communications between the federal government and the member societies, and provide a mechanism through workshops, congressional testimony, written correspondence and meetings for the member societies voices to be heard on Capitol Hill and in the Executive Branch. AIPG’s involvement in GAP consists of periodic meetings held throughout the year among the member societies either at AGI’s headquarters or concurrently with certain annual geological meetings such as the American Association of Petroleum Geologists (AAPG) and the Geological Society of America (GSA). AIPG supports and contributes funding for GAP. Through the AIPG Foundation, AIPG also contributes to AGI’s summer internship program. Further information regarding the specific policy issues discussed below and others can be found on the AGI web-site under “Government Affairs” at <http://www.agiweb.org>.

National Geologic Mapping Reauthorization Act of 1997

The National Geologic Mapping Reauthorization Act (NGMRA) of 1997 was signed by President Clinton on August 5, and is now Public Law 105-36. The bill authorizes spending for geologic mapping projects conducted by the United States Geological Survey (USGS), state geological surveys and universities. The bill authorizes $26 million in fiscal year 1998 for the USGS’s National Cooperative Geologic Mapping Program; however, the House and Senate Appropriations Committees have voted a $21.5 million funding level, the same as in fiscal year 1997, but $1.7 million more than the President requested. Supporters of the bill, led by the Association of American State Geologists, hope that reauthorization of this bill will encourage the administration and congressional appropriators to increase support for the program in the years to come.

National Earthquake Hazards Reduction Program

The National Earthquake Hazards Reduction Program (NEHRP) was reauthorized resulting in Senate Bill 910 which provides $103.2 million for fiscal year 1998 and $106.3 million for fiscal year 1999. The House Science Committee passed a companion bill (H. R. 2249) a few days earlier providing $105.5 million for fiscal year 1998 and $108.7 million for fiscal year 1999. The two bills have similar provisions although the Senate bill provides for the Federal Emergency Management Agency (FEMA); whereas, the House bill provides more for the United States Geological Survey (USGS), National Science Foundation (NSF) and the National Institute of Standards and Technology (NIST).

Tax Cut Legislation

Section 117(d) of the tax code which addresses tax exemption on tuition for graduate students and remains intact. In addition, Section 127 of the tax code was reauthorized for undergraduates for three years. Section 127 provides for tax exemptions to be extended up to $5,250 for employer-provided educational assistance to be given to an employee for undergraduate-level training. The bill does however phase out some tax exemptions for the TIAA-CREF retirement plans, which is the principal retirement system for most of the colleges and universities throughout the United States whether private or public. Limited effect is anticipated for most account holders.

Decade of Investment

Nearly 50 scientific societies, including AIPG, signed a joint statement last spring calling on Congress and President Clinton to increase federal research spending by 7 percent in fiscal year 1998. One AGI society president referred to this effort as the “million and a half scientist’s march” referring to the

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number of scientists belonging to the societies represented in the letter. A strong economy has made it possible for much of that increase to materialize in the spending bills currently making their way through Congress. As follow up, American Chemical Society president Paul Anderson has written other society presidents asking them to sign on to a joint statement calling for a doubling of federal research spending in the next decade. Senator Phil Gramm of Texas introduced legislation last January calling for a doubling in specific science agencies. His bill, however, raised some concern within the geoscience community since it omitted the Department of the Interior. The Gramm bill has made little progress to date, although Senator Joe Lieberman of Connecticut is expected to join Senator Gramm in a bipartisan effort to get this bill moving.

**AIPG NATIONAL OFFICER ELECTION RESULTS**

**1998 President-Elect**
(1999 President)
Thomas G. Fails, CPG-3174, Colorado

**1998 Vice President**
William J. Sick, CPG-4773, New Hampshire

**1998-99 Secretary**
John L. Bognar, CPG-8341, Missouri

**1998 Editor-Elect**
(1999-2000 Editor)
Myrna M. Killey, CPG-6033, Illinois

**Incumbent officers**

**1998 President**
Stephen M. Testa, CPG-6464, California

**1997-98 Treasurer**
Robert M. Colpitts, Jr., CPG-7702, Nevada

**1997-98 Editor**
J. Dale Nations, CPG-6364, Arizona

For convention information and registration visit our web site: http://www.awg.org. Or contact Sandy Eldredge (801) 537-325, fax (801) 537-3400, e-mail: nrugs.seldredg@state.ut.us

**Featured Speakers:**
* Keynote: Mary Cleave, Ph.D., former astronaut, now Project Manager for the Sea-viewing Wide Field-of-View Sensor, Goddard Space Flight Center Laboratory for Hydropheric Processes,
* Tanya Atwater, Ph.D., Professor of Tectonics and Marine Geophysics, University of California, Santa Barbara,* Vicki Cowart, M.S., State Geologist and Director, Colorado Geological Survey,* Priscilla Grew, Ph.D., Vice Chancellor for Research, University of Nebraska, Lincoln,* Allison Macfarlane, Ph.D., Assistant Professor, Women in Geological Sciences Research, George Mason University,* Dianne Nielson, Ph.D., Executive Director, Utah Department of Environmental Quality,* Marilyn Suter, M.S., Director, Education and Human Resources, American Geological Institute.

Three exciting field trips

October 16, 17, 18, 19, 1997 at Snowbird, Utah

**Association for Women Geoscientists**
PROFESSIONAL ETHICS & PRACTICES - Column 22

Compiled by David M. Abbott, Jr., CPG-4570, Ethics Committee Chair, 624 South Vine St., Denver, CO 80209-4615, 303-715-1350, DMAgeok@aol.com

Ethics in the Geosciences Conference

The Ethics in the Geosciences conference was a GSA Presidential Conference with co-sponsorship by AAPG, AIPG, the NSF, and the USGS. I attended this July conference as one of AIPG’s official participants. The others were President Jon Price and Executive Director Bill Knight. Many of the other participants were also AIPG members.

The official summary of the conference hasn’t been distributed as I write this, so I expect it shortly. That summary will be directed at the Earth science community in general. It will be made available to the AIPG membership as soon as possible.

Some of the topics raised at the conference are ones I believe AIPG should consider for itself. These topics include a review of other codes of ethics to determine whether there are topics we could be more precise about or if there are topics currently not addressed but which should be. I will be inserting summaries of various topics discussed at the conference into this column, starting with this edition. The first topic calls for recognition of those who have acted in an ethically commendable way and whose acts warrant recognition.

Good Ethical Examples Needed!

One of the points brought out at the Ethics in the Geosciences conference in July was the general dearth of case histories of someone demonstrating notable ethical behavior. Most of the case histories seem to focus on situations where either someone has really done something bad, or explore a problematic area. We should recognize those who have taken the notable ethical action. Sometimes these examples will point out the short-term negative consequences like job loss—and these should be recognized. But not all examples involve negative consequences. Sometimes, everyone comes out a winner, but still what happened is notable. Achieving the highest ethical standards is something we aspire to, not something we inherently have. Please send in your examples of strivings towards the aspiration.

I am also recommending to the Executive Committee at their meeting in Houston that a new award be instituted, the President’s Award for Ethical Merit—if you’ve got a better name, I’ll use it. The award would allow for AIPG recognition of notable ethical behavior. Like the Presidential Certificate of Merit, there would be no fixed number that could be awarded in any one year, and there would be no requirement that the award be given in a year. The award would be available when needed. Suggestions as to requirements, nomination procedures, a better name, etc. are welcomed.

Registration as a Vehicle to Restrict Practice and Multistate Practice: More Discussion

(see columns 17 & 20, April & July '97)

Bruce Darling, CPG-9636, wrote, “I really enjoyed your column in the July edition of TPG, especially your comments on “Registration and Multistate Geologic Practice”. I hope that this column stimulates a lot more discussion of this topic, as a great deal more is needed.

“With regard to Ronald Wallace’s comments, I am pleased to know that he passed the exam on his first effort. I think, however, that he missed my point about my perception of bias in the testing program. If fewer than 40 percent of examinees pass a test on basic skills (actually, the number in Georgia has been as low as 32 percent, according to statistics that were shown to me by associates who are registered in Georgia), then I suspect that the exam somehow does not adequately measure one’s understanding of basic principles, as much as one’s ability to assimilate through study sessions, etc., what the people who design the exam think are the important points.

“I have not taken the Georgia exam, even though I lived in Atlanta for 2 years. (95 percent of my work was out of state,) I know more than a few geologists who have had to sit for the old Georgia exam several times. In all cases, these geologists had to retake the basic skills test, but had already passed Part II! I think this

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suggests that there was very definitely something out of kilter with the examination. I would be very interested in evaluating the distribution of test scores to ascertain whether the scores are normally distributed or skewed."

Darling also summarized an article from a while ago on testing results for North Carolina. Reportedly, questions relating specifically to the geology of North Carolina have been eliminated for two reasons. The first was to encourage reciprocity and the second was to increase the pass rate on Part I of the exam. Further elaboration on the specifics would be welcome, particularly on the issue of reciprocity.

Darling also provided me with a long account of the engineers opposition to the bills to register geologists in Texas in 1995 and 1997. That account is too long to include here. If someone wants a copy, I'll send one.

Darling concludes, "As you know, I am not pleased with the program of registration for anyone anywhere, although I am not naive enough to ignore the necessity of being registered/certified. In my opinion, if there is an argument for passing a registration bill, it lies in the interests of geologists and the public preventing engineers from controlling everything they can get their hands on, while limiting the ability of other highly qualified professionals to make a living in their respective fields."

R. E. Whittemore, CPG 9077, wrote, "I took the ASBOG exam for Georgia registration in April 1996. About a year later, I was discussing my experience with some friends and discovered that one of them is on the committee that reviews the exam questions for ASBOG. I asked him what the failure rate was, and he said that it was 55% at that time. I doubt that this is privileged information, and I feel that ASBOG should furnish it for any legitimate purpose.

"Concerning reciprocity and multi-state registration, I am employed by a corporation that has mining operations in seven states. Under the corporate umbrella, I am not required to be certified. But, knowing how quickly downsizing can close that umbrella, I decided to acquire certification/licensure/registration in all seven states. It makes for a better looking resume, and my employer picks up most of the expense. If I were on my own, this would be a pain in the neck. The stamps alone cost over $200.

"I agree that AIPG could (and should) be of service in this area. Moreover, why shouldn't AIPG seize the initiative by administering the exam and furnishing continuing education courses? Alabama now requires professional development hours to maintain licensure. I've been to several for engineers. A typical CEU course lasts two days, gives you 1.5 CEU's, has about 40 participants, and costs $400. Run the numbers. It should not take an astrophysicist to see that the economics are there."

In response to Whittemore's comment about AIPG-sponsored short courses, AIPG, both nationally and by section, has offered a variety of short courses over the years. Nine short courses are being offered in conjunction with the Annual Meeting this year in Houston. These courses vary from a half day to two days in length and $25 to $360 (member, advance registration) in cost. Short courses have been a part of annual meetings for many years. As requirements for continuing education increase, more of these courses will be accredited, although just what counts and who does the counting is another question.

Regarding the point that AIPG can be of more service to members in the area of registration, the current issue of the AIPG Membership Directory contains on page 15 the names and addresses of those states requiring registration along with ASBOG's name and address. This list is an initial step towards providing the types of service for members requested in the preceding comments in this and last month's column.

Is "Geobasket Weaving" Contributing to the Falling Pass Rate?

Part of the discussions in this and previous columns under "Registration as a Vehicle to Restrict Practice" and "Registration and Multistate Geologic Practice" involved the pass rate on the examinations given as part of the registration process in several states. I'm initiating a separate discussion of pass rates and the reasons for trends therein because of apparent interest in the topic.

Seena Hoose of the California Board of Registration for Geologists & Geophysicists presented a poster at the Ethics in the Geosciences conference documenting the declining pass rate on California's exam over the years. Hoose attributed the decline to lack of basic training in geology on the basis of examination of the transcripts submitted with applications. She described an increasing number of "geobasket weaving" degrees whose hold-
ers lacked basic field, structure, mineralogy, stratigraphy, and similar training. Such courses are so fundamental to all fields of geologic practice. I'll also note that recent issues of *Geotimes* have contained letters lamenting the decline of field camps for geologists.

**Bruce Darling**, CPG-9636, agrees 'that the proliferation of 'geobasket' degrees in recent years might be a factor in the low numbers reported for California and elsewhere. However, my skepticism is based on comments offered by a friend of mine who participated in developing the examination for Florida several years ago. He told me that the Florida exam had been designed to make sure that someone who had not practiced in the state (i.e. outsiders) for five or more years would not perform well. I have known too many geologists who graduated from 'good' departments who failed examinations because they were unprepared for the off-the-wall state-specific questions on obscure index fossils, local stratigraphy, mineral deposits, etc. In addition, nearly all of these geologists have been working for five or more years, and have not been concerned with many of the fine points of petrology, mineralogy, etc. that might show up on the examinations. Most of those I have kept in touch with over the years report having passed the examinations on the second or third go-round after having participated in study groups that focused not on basic principles but—guess what? I understand that the ASBOG examinations have been designed to address these concerns.'

Clearly, as Darling points out, there are several potential problems, one relating to basic knowledge, a second relating to state-specific minutia, and a third relating to the fact that our familiarity with a lot of the "academic" details of petrology, mineralogy, paleontology, or whatever dull with the passage of time and our concentration on specific sub-specialties of a particular geologic specialty. If we need the details of something, we know where to look it up. Each of these contributes to a greater or lesser degree to pass rates on exams. This is also clearly a topic generating a good deal of interest. Please share your ideas and send in your contributions.

**In organizations, a review process is common, though its implementation may be irregular. The peer review process for technical papers provides a similar function. Sole practitioners have no logical reviewer, yet their work can benefit from such review. What do those of you who practice alone do for such review?**

Let's take this column as an example of neither the best nor the worst (I hope) of a quality control process. I compile and edit a draft, which includes reformatting, spelling, grammar, and style corrections to submitted material. I then send the draft in to headquarters, and sometimes to others as well. A proof copy is prepared and sent to me for correction. The proof copy is also read by various people like Wendy Davidson, Bill Knight, the Editor, and Karen Spaulding, who catch various errors prior to publication. While these reviewers catch most of the spelling and grammatical errors (some always seem to slip through) and periodically call my attention to other problems as well, this column is not peer reviewed prior to publication. Such review comes in form of the comments and discussion of points made by later contributions. Yet even these comments are not quite the same as classic peer review. So far, the foregoing system is working well. But is it good enough? Let me know.

I would like comments on the general idea of quality control review and particularly comments on how it occurs in your working environment. I'm particularly curious about the experiences of sole practitioners. What do you do? Has the lack of quality control review resulted in major embarrassment? Do the procedures in larger organizations really work? While this is clearly a professional practice issue, is it also an ethical one relating to competence? Should there be more formal discussions of the need for quality control, for example as an AIPG policy statement? Please send me your thoughts.

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**Ohio Preparing Statewide Karst Map**

The Ohio Low-Level Radioactive Waste Facility Development Authority and the Ohio Department of Natural Resources, Division of Geological Survey have jointly announced the commissioning of Ohio's first edition Karst Map. Prompting the project was the Authority's need to satisfy a specific siting criterion under Ohio law for a regional disposal facility. Specifically stated, "The disposal site shall not be located in areas of known or probable karst."
AIPG ANNUAL MEETING UPDATE

SHORT COURSE #1 - CONTINUING EDUCATION:
Management Development for Geologists and Related Professionals -
Management of Organization
Monday, October 6 and Tuesday, October 7, 8:00 am - 5:00 pm (16 hours)
Course Fee: Members $300.00, Non-Members $400.00
Continuing Education Units (CEUs) from Colorado School of Mines: $50 additional

AIPG offers a continuing education program in business and management training for geologists and other scientists
and engineers. Management of Organization, one of five self-contained two-day continuing education sessions, will be
offered at the AIPG 1997 Annual Meeting in Houston, Texas. Who should attend? All professionals who want to become
more effective in managing their projects and their business. Topics covered in this two-day course include: knowledge
requirements; business organizations; managerial and communications styles; human relations; communication; perform-
ance appraisal and discipline; managing technology and management change; inter-cultural relations; and labor
relations.
Presented by: David E. Fletcher, Ph.D., Director of the Executive Program and
Professor of Mineral Economics, Colorado School of Mines, Golden, Colorado.

FIELD TRIPS

Field Trip #1 - Houston Area Superfund Sites
Saturday, October 11, 8:00 am to 7:00 pm - Departs from Double Tree-Galleria Hotel, Houston, Texas
Fee: $100.00

Field Trip #2 - East Texas Items of Geological Interest
Saturday, October 11, 8:00 am to 8:00 pm - Departs from Double Tree-Galleria Hotel, Houston, Texas
Fee: $100.00

HOTEL INFORMATION

The hotel reservation form is on page 26 and the registration form is on the back cover of this issue.

Correction - The map and picture in the June issue of TPG is incorrect.
The meeting will be held at the Doubletree Hotel at Post Oak, 2001 Post Oak Blvd., Houston, TX 77056.
(713) 961-9300, Fax (713) 961-1557, 1(800) 222-TREE.

Airport Directions - 28 Miles
Intercontinental Airport - Take I-45 South to 610 West. Continue to 610
South and exit at Post Oak Blvd. Go past three traffic lights. The hotel is
on the left after the third light.

Airport Directions - 20 Miles
Hobby Airport - Take 45 North to 610 West. Continue to 610 North and
exit at Westheimer Road. Turn left and go to Post Oak Blvd. Turn right
on Post Oak Blvd. And the hotel will be on the right.

Doubletree Hotel at Post Oak
2001 Post Oak Blvd.
Houston, TX 77056.
(713) 961-9300, Fax (713) 961-1557
1(800) 222-TREE.
**PRE-REGISTRATION FORM**

**34TH ANNUAL AIPG MEETING**

**HOUSTON, TEXAS - OCTOBER 8 - 11, 1997**


**NAME:**

**SPouse/GUEST NAME:**

**COMPANY/INSTITUTION:**

**ADDRESS:**

**TELEPHONE:** ( )

**FAX:** ( )

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**EVENTS:**

1. **Trip 1:** Golf at "Tour 18"
   - Tuesday, 6:15 am to 2:00 pm (NEW TIME)
   - Registration cost: $100.00

2. **Trip 1:** Alternative: Places of Worship and Orange Show
   - "Eye-Opener Tour"
   - Registration cost: $85.00
   - Wednesday, 9:00 am to 4:00 pm

3. **Trip 3:** Major Art Museums (Lunch)
   - Tuesday, 10:30 am to 3:30 pm
   - Registration cost: $45.00

4. **Trip 4:** Space Center Houston - N. A. S. A. (Lunch)
   - Friday, 10:30 am to 4:30 pm
   - Registration cost: $55.00

5. **Trip 5:** Theater Under the Stars Musical
   - Friday, 7:00 pm to 11:00 pm
   - Registration cost: $65.00

**MINIMUM NUMBER OF PARTICIPANTS MUST BE MET BY SEPTEMBER 5th.**

**SHORT COURSES:**

1. **Management Development Program for Geologists and Related Professionals**
   - Cost: $300.00
   - Monday and Tuesday, 8:00 am to 5:00 pm

2. **Environmental Chemistry**
   - Cost: $300.00
   - Tuesday, 8:00 am to 5:00 pm

3. **Environmental Geophysics for Oil & Gas Geologists and Geophysicists**
   - Cost: $335.00
   - Tuesday, 8:00 am to 5:00 pm

4. **Continuous Process Improvement in Professional Services**
   - Cost: $25.00
   - Wednesday, 8:00 am to 12 noon

5. **Practical Geostatistics**
   - Cost: $295.00
   - Wednesday, 8:00 am to 5:00 pm

6. **Multidisciplinary Teams**
   - How and Why They Make You Money
   - Wednesday, 8:00 am to 5:00 pm
   - Cost: $250.00

   - Thursday, 8:00 am to 5:00 pm
   - Cost: $250.00

8. **Reservoir Seismic Methods**
   - Thursday, 8:00 am to 5:00 pm
   - Cost: $295.00

9. **Introduction to Reflection Seismic Interpretation**
   - Friday, 8:00 am to 5:00 pm
   - Cost: $360.00

**Mini-Symposium:**

- Environmental Ethica, Professional Practices, and Related Issues
  - Cost: $25.00
  - Wednesday, 1:00 pm to 5:00 pm

**TOTAL AMOUNT PAID $**

For conference updates, see our Texas-AIPG website at: http://www.texas-aipg.org/AIPG/event.html

**RETURN FORM WITH PAYMENT TO:** John L. DeVault, AIPG-HOUSTON 1997, P. O. Box 218567, Houston, Texas 77218-8567 or FAX to (281) 558-5876

**VISA / MASTERCARD / AMERICAN EXPRESS / DISCOVER CARDS ACCEPTED**

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**MAKE CHECKS OR MONEY ORDERS PAYABLE TO AIPG-HOUSTON 1997**

**REFUND POLICY:**

Refunds of 100% of registration fees will be given upon written request if received by 5:00 pm on Friday, September 19, 1997. Notification and full refund for field trips or social activity fees will be given in cases of cancellations due to insufficient registration by this date also.

50% refunds will be given up to October 3, 1997.
Cancellation 4pm day of arrival.

Non-Guaranteed reservations are subject to availability and group rate.

Reservation must be received by 9/7/97.

Smoking Non-smoking

Special request

2 dbl beds King

Please circle requested room type:

1 Bedroom Suite: $220.00
Jr. Suites: $210.00
Double Rate: $150.00
Single Rate: $115.00

October 16-11, 1997

Georgics - American Institute of Professional Geologists

Accommodations may not be available until 3:00 P.M. on day of arrival. Check out time is 12:00 Noon.

Reservation Request Subject to Availability. In the event of a room type or smoking preference not available, nearest available room type will be assigned.

Please retain your cancellation number.

Deposits will be refunded only if reservation is cancelled by 4:00 PM on the day of arrival.

Visa, MasterCard, Carte Blanche or Discover.

2) Send us the entire number of your credit card with the expiration date and your signature. We accept: American Express, Diners Club.

1) Endorse a check or money order covering the first night's stay to include 15% sales tax. In making your reservation we require that you:

Doubletree Restaurant

The Doubletree Hotel at Post Oak is pleased you have selected our hotel as your Houston, Texas host. Our staff looks forward to serving you in fine hospitality.
CALENDAR

1997

Sep. 29-Oct. 3. International Oil & Gas Law, Contracts, and Negotiations, Dallas, TX. Contact: Rocky Mountain Mineral Law Foundation, 7039 E. 18th Ave., 3rd Fl., Denver, CO 80220, Ph.: (303) 321-8100, Fax (303) 321-7657, e-mail: info@mmlf.org


Oct. 6-7. Fundamentals of Petroleum Exploration, Drilling, and Production, Denver, CO. Contact: The University of Tulsa, Div. of Cont. Educ., 600 S. College Ave., Tulsa, OK 74104-3189, Ph.: (918) 631-3088, e-mail: conted_cee@utulsa.edu.

Oct. 6-9. Ecuador Mining '97 - Exploration, Geology, Mine Development, Business Opportunities Conference, Cuenc, Ecuador. Contact: George H. Roman, Conference Director, Engineering & Mining Journal, 29 N. Wacker Dr., Chicago, IL 60606, Ph.: (773) 342-1167, e-mail: groman@msn.com.

Oct. 16-17. Structuring and Selling Oil and Gas Programs for Profit, New Orleans, LA. Contact: The University of Tulsa, Div. of Cont. Educ., 600 S. College Ave., Tulsa, OK 74104, Ph.: (918) 631-2347.


Oct. 20-24. Oil and Gas Law Short Course, Breckenridge, CO. Contact: Rocky Mountain Mineral Law Foundation, 7039 E. 18th Ave., 3rd Fl., Denver, CO 80220, Ph.: (303) 321-8100, Fax (303) 321-7657, e-mail: info@mmlf.org

Oct. 20-24. Federal Oil and Gas Leasing Short Course, Breckenridge, CO. Contact: Rocky Mountain Mineral Law Foundation, 7039 E. 18th Ave., 3rd Fl., Denver, CO 80220, Ph.: (303) 321-8100, Fax (303) 321-7657, e-mail: info@mmlf.org


Nov. 3. Practical Techniques for Cost-Effective Ground-Water Sampling, Atlanta, GA. Contact: David M. Nielsen, The Nielsen Env. Field School, 4686 S. State, Rte. 605, Galena, OH 43021, Ph.: (614) 965-5026, Fax (614) 965-5027, e-mail: nielsenfieldsschool@juno.com.

Nov. 4. Micropurge Low-Flow Purging and Ground-Water Sampling, Atlanta, GA. Contact: David M. Nielsen, The Nielsen Env. Field School, 4686 S. State, Rte. 605, Galena, OH 43021, Ph.: (614) 965-5026, Fax (614) 965-5027, e-mail: nielsenfieldsschool@juno.com.

Nov. 5-7. Problems and Pitfalls in Joint Operating Agreements, Houston, TX. Contact: The University of Tulsa, Div. of Continuing Education, 600 S. College Ave., Tulsa, OK 74104, Ph.: (918) 631-3088, e-mail: conted_cee@utulsa.edu.

Nov. 16-19. International Conference on Advances in Ground-Water Hydrology — A decade of Progress, Tampa, FL. Contact: American Institute of Hydrology, 2499 Rice St., #135, St. Paul, MN 55113-3724, Ph.: (612) 484-8169, Fax (612) 484-8357, e-mail: ahhydro@aol.com.

AIPG ANNUAL MEETINGS
October 8-11, 1997
Houston, Texas
October 3-8, 1998
Baton Rouge, Louisiana
October 5-8, 1999
Anchorage, Alaska
October 11-15, 2000
Milwaukee, Wisconsin

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APPLICATIONS RECEIVED - (July 25, 1997 - August 30, 1997)

Applicants for certification must meet AIPG's standards as set forth in its Bylaws on education, experience, competence, and personal integrity. If any Member or board has any factual information as to any applicant's qualifications in regard to these standards, whether that information might be positive or negative, please mail that information to Headquarters within thirty (30) days. This information will be circulated only as far as necessary to process and make decisions on the applications. Negative information regarding an applicant's qualifications must be specific and supportable, persons who provide information that leads to an application's rejection may be called as a witness in any resulting appeal action.

Applicants for
Certified Professional Geologist

TX-Bastian, Janet B.

CO-Beach, Karen G.
2148 W. Centennial Dr., Louisville CO 80027. Sponsors: Matthew Rhoades, Joseph Seracuse, David Bernal.

NJ-Box, Gordon
88 Summit Ave. 228, Summit NJ 07901. Sponsors: Larry Rhodes, Frank Dickson, Charles Callis.

MI-Breung, Vincent E.

CA-Burridge, Mark
9900 Washington St., 104, San Francisco CA 94108. Sponsors: Russ Slayback, A. Mayer, Dennis Martin.

UK-Camm, Godfrey S.

OH-Carey, Duane A.
542 Gahanna Highlands Dr., Gahanna OH 43230. Sponsors: Ernest Williams, Linda Aller, Duane Braun.

Hi-Chenot, Robert
92-117 Hona Place, Kapolei HI 96707. Sponsors: Kevin Snyder, Ron Soroco, Dan Lau.

CO-Coppage, Curt L.
7137 S. Elm St., Littleton CO 80122. Sponsors: Ted Mullin, Bobby Timmons, Ron Prichett.

TX-Crump, Timothy E.
1502 Enclave Pkwy. 216, Houston TX 77077. Sponsors: Dan Gerhardt, Edward James, Tony Flores.

NH-Devine, Christopher P.

MI-Dew, John W.
245 Portico Drive, Chesterfield MO 63017. Sponsors: Tom Tveten, Lee Nichols, Emmet Horne.

CO-Ferguson, Randall H.

MI-Ferrillo, James J. Jr.
9227 Ponderosa, South Lyon MI 48178. Sponsors: Bill Davidson, Jim Bradley, Mark Vincent.

NH-Francis, Robert A.
4 Gulf Road, Derry NH 03038. Sponsors: Norman Gardner, Joseph Cerutti, Helen Mango.

MA-Goldsmith, Wendi
7 Mall St., Salem MA 01970. Sponsors: Jutta Hager, David Patrick, Brian Balikinas.

NY-Gulumoglu, Allan R.

NM-Hallier, Timothy M.
7201 Joyce Dr. NE, Albuquerque NM 87109. Sponsors: Clyde Yancey, Jane Cramer, Stan Halenfeld.

PA-Harrison, David
1339 Middle Road Ext., Gibsonia PA 15044. Sponsors: James Gould, Edward J. Walter, David Miller.

VT-Hayes, Joseph J.
RR 3, Box 3316, Middlesex VT 05602. Sponsors: Donald Podsen, Charles Mytte, John Karp.

OH-Higgins, Patrick M.
129 S. Grove Ave., Cincinnati OH 45215. Sponsors: Andrew McCorkle, Kurt Etter, Bill Reid.

MA-Ingle, Darryl S.
103 Thurston St., Sommerville MA 02145. Sponsors: Kevin McCarthy, James Young, Barbara Lemus.

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4750 Pearl Ridge Dr., 11108, Dallas TX 75287. Sponsors: Al Schmidt, Tom Lentzen, John Karp.

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261 Cedar Crest, Tuscaloosa AL 35401. Sponsors: Thomas Joiner, Minda Paxton, Dorothy Malair.

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6109 Rockdale Lane, Sylvania OH 43560. Sponsors: Peggy Carpenter, Bob Beckwith, Dave Greene.

MN-Lehr, James D.
8521 243rd St., Forest Lake MN 55025. Sponsors: Scott Wolter, Terry Swor, Tudy Hoagberg.

WI-LeRoy, B. J.

OH-Leung-Wolf, Allen J.

PA-Lock, Matthew J.

NJ-Lombardo, Christopher P.

NJ-Lovett, Richard P.
110 Donald Dr., Trenton NJ 08619. Sponsors: Robert Cunniff, Paul Lindell, William Winkley.

NM-McCam, Dan W. II

WA-McMorrow, Gregory A.
22121 NE 10th Pl., Redmond WA 98053. Sponsors: Doug Romer, Dave Mayes, Jerome Kraus.

MI-Nolen-Hoeckema, Richard C.

NJ-Nyhan, Mark V.
269-1/2 Eighth St., Jersey City NJ 07302. Sponsors: Daniel Toder, Roy Redmond, Anthony Beese.

NJ-Pappalardo, Vincent C.
87 Front St., Belvidere NJ 07823. Sponsors: Daniel Toder, Robert Cuniff, Gary Parent.

OH-Parish, Gordon K.

MI-Peterson, Mark R.
815 Spring St., Howell MI 48484. Sponsors: Andrew Foeg, Randy Glass, Jim Finetti.

NJ-Pharo, Steffi A.

NV-Ristorcelli, Steven J.
393 Fricke Ct., Gardnerville NV 89410. Sponsors: Dave Fitch, David Griffith, Paul Hartley.

LA-Robert, Ray J. Jr.

VA-Rothman, Robert M.
201 Overlook Ct., Fairfax VA 22045. Sponsors: Kenneth Clayman, Vasily Rusu, Jim Johnson.

RI-Russell, F. Daniel Jr.
4772 Old Post Road, Charlestown RI 02813. Sponsors: Margaret Bradley, David Sheldon, John Lavio.

NY-Rykin, Mark

ON-Shriner, Patrick

LA-Sierra, Amy L.
4915 Millwood Dr., Baton Rouge LA 70817. Sponsors: John Hebert, Mike Simms, Steve Doss.

MA-Skiba, Catherine V.

IA-Stanley, Scott R.
7020 Brookview Dr., Urbandale IA 50322-8005.

AIPG Membership Totals
As of 8/30/96
As of 9/4/97

CGP - Active: 4,514
CGP - Retired: 496
CFC: 49
AP: 49
SA: 60
Honorary: 11
TOTALS: 5,134

As of 9/4/97

CGP - Active: 4,438
CGP - Retired: 492
CFC: 51
AP: 4
SA: 42
Honorary: 13
TOTALS: 5,092
Applicants for
Candidate for Certification

MI-Blinkiewicz, Gary T.
2507 Leamington, Farmington Hills MI 48334.
Sponsors: Michael Barcelona, Robert Ferrer.

TN-Crowder, John L. Jr.
201 Windsor Park Lane, Hendersonville TN 37075.

NJ-Blinkiewicz, Gary T.
1 North High St. Colonia NJ 07067-2212.
Sponsors: Charles Hamilton, Gary Gilliland.

MI-Houla, Patrick R.
3642 Partridge Path, Arden Arbor MI 48108.
Sponsors: Gary Catalano, James Finetti.

OH-Justice, J. Matthew
114 E Whitney Ave., Fairborn OH 45324.

MI-Kaczor, Peter J.
31108 Morlock, 604, Livonia MI 48152.
Sponsors: Michael Wilczynski, Donald Walsh.

OK-Kreher, David J.
4455 East 31st St 201, Tulsa OK 74135.
Sponsors: John Ravenscroft, Collin Barker.

MI-Loew, Phillip J.
7100 N. Long Lake Rd., Apt. 10, Traverse City MI 49684.
Sponsors: Kurt Koalla, Alfred Judson.

AL-O’Hearn, Stephen M.
6429 Trent Lane, Mobile AL 36696.

MI-Pierson, Rodney
1169 Windham, Westland MI 48186.
Sponsors: Sandy Pelowski-Bresson, Greg Flamondon.

MI-Roth, Christopher M.
7252 Nightingale, Dearborn Heights MI 48127.
Sponsors: Thomas Strand, Thomas Kamin.

CO-Roth, Matthew A.
1300 30th St., B4-15, Boulder CO 80303.
Sponsors: Gary Van Der Sluis, Danielle Joneja.

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1 Old Lane Highwood, Somerset NJ 08873.
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3151 E 64th Ave., Anchorage AK 99507.
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32 Park St., Kings Park NY 11754.

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6220 S 328th Pl, Apt AA-104, Kent WA 98032.
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1816 Cumberland, Lansing MI 48806.
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91-238 Hanapouli Circle 1, Ewa Beach HI 96706.
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1920 W. Tarrant Rd., 630, Grand Prairie TX 75003.

TX-Whitaker, Timothy R.
16823 Scenic Gardens Dr., Spring TX 77379.
Sponsors: Kyle Landreneau, Michael Barne, Denise Lant.

NY-Wolterding, Dennis J.
16 Barkwood Lane, Cliffon Park NY 12065.

HK-Wong, Francis Chilk-Hal
Flat A, 22/F, Block 2, Avon Park, 15 Yat Ming Road, Fanling, New Territories, Hong Kong.

NV-Zampiro, Danny
P.O.Box 1736, Round Mountain NV 89045-1739.

NY-Graberski, Justin R., CPG-10137
81 Old Orchard Lane, Orchard Park NY 14127.

CT-Gardner, Jeffrey D., CPG-10145
34 Old Chester Rd., Haddam CT 06438, (860) 398-4631.

MN-Green, Jeffrey A., CPG-10128
10137 Girard Avenue South, Bloomington MN 55434, (612) 355-2470.

IL-Horvath, Daniel J., CPG-10139
Resource Consulting, P.O. Box 123, Geneva IL 60154, (630) 232-9820.

MN-Jablinski, Joseph D., CPG-10140
7199 Columbus Ave. S., Richfield MN 55423, (612) 683-6700.

NY-Jacobs, David T. Jr., CPG-10156
60 Hamlet Road, Levittown NY 11756, (516) 349-4600.

NY-Milangan, John C., Jr., CPG-10158
16720 Red Maple Court, Southfield MI 48076, (313) 462-0207.

MN-Moulzolf, Gerad., CPG-10142
8045 Chassoway Parkway, #204, Minnetonka MN 55343, (612) 659-1349.

CA-Nicholson, Lynda, CPG-10169
P.O. Box 475, Moffett Field CA 94035-0475, (415) 904-0923.

MI-Penniman, Donald E., CPG-10147
2332 Paris Avenue SE, Grand Rapids MI 49507, (616) 649-2373.

NJ-Ruhl, John H., CPG-10148
1511 Longley Court, Somerville NJ 08876-7201, (973) 627-1995.

IL-Shainon, Jan B., CPG-10143
2336 Virginia Lane, Glenview IL 60025, (312) 981-6242.

FL-Simmons, Curt A., CPG-10136
1400 Strawberry Place, Apt. 54, Plant City FL 33566, (941) 857-2522.

NY-Wheatcroft, Suzanne B., CPG-10144
182 Edgewood Ave., Rochester NY 14618, (716) 262-2640.

NM-Williams, John L., CPG-10161
2345 48th Street, Los Alamos NM 87544, (505) 662-1332.

Executive Committee and Headquarters Activity

Members of the Executive Committee and/or of the Headquarters staff will participate in the following meetings, which provide opportunities for AIPG Members to exchange ideas with the Executive Committee and staff. We also welcome invitations from AIPG Sections to discuss AIPG programs and goals. If your Section would like to meet with members of the Executive Committee or Headquarters staff, please contact Headquarters to schedule a convenient time.

Thank you.

October 8-11
Houston, TX, AIPG Annual Meeting, including Executive Comm. meetings October 8 and 10th.

October 18-23
Salt Lake City, UT, GSA Annual Meeting, including meetings of the Govt. Affairs Program Adv. Comm. and the Member Soc. Council of AGI.

October 25
Madison, WI, National Assoc. of State Boards of Geology annual meeting.

November 2-7
Dallas, TX, Society of Exploration Geophysicists annual convention.

November 17

November 20-22
Denver, CO, National Science Teachers Assn. Regional Meeting.

December 18
Reno, AIPG NV Section annual meeting on mineral exploration outlook.
AIPG National Meeting
HOUSTON, TEXAS
October 8 - 11, 1997

The TEXAS Section of the American Institute of Professional Geologists is pleased to announce that the 34th ANNUAL MEETING will be held at the DOUBLETREE HOTEL POST OAK.

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