Hydrogeology - Part 2
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Environmental Geology September
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The Professional GEOLOGIST

FEATURES

Special Report... Hydrogeology - Part 2

The Use Of Borehole Geophysics In Environmental Hydrogeology
David R. Rhode, CPG-8858

History Of Karst Studies
Philip E. LaMoreaux, CPG-0880

Occurrences, Utilization And Quality Of Groundwater In And Around The City Of Calcutta; India
Timir B. Hore, CPG-8169

Articles By AIPG Officer Nominees

Some Thoughts On What We Do
Russell R. Dutcher, CPG-1644

Communication, An Essential Skill For Professional Geologists
Robert K. Merrill, CPG-4984

Get Involved! Make A Difference! Now!
Tom Fails, CPG-3174

Registration Needs Comity
Lisa C. Worthington, CPG-6298

Are We Preaching To The Choir?
Richard M. Pauers, CPG-6765

Concerning Our Profession And AIPG
Lawrence C. Weber, CPG-7120

COVER - Thinly bedded shales, tilted & locally contorted, of the Tertiary (Miocene) Monterey Formation. This photo was taken at Little Corona Del Mar beach, Southern California. Photograph Mark A. Koestel, CPG-8307.

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Photograph by Lorita Dill, Golden, Colorado.
The Use Of Borehole Geophysics In Environmental Hydrogeology

David R. Rhode, CPG-8558

Borehole geophysical techniques are often utilized to obtain geological and hydrogeological information from the subsurface environment. These techniques are routinely applied in the petroleum and mining industries, and are often used in groundwater investigations and studies. Unfortunately, however, the use of borehole geophysics in environmental investigations has been very limited to date. The two primary factors for the under-utilization of borehole geophysics in such investigations are 1) cost, and 2) a lack of knowledge among professionals in the field about borehole geophysics and the merits of integrating borehole geophysics into environmental-hydrogeological investigations. A lack of experience with borehole geophysics, however, should not be a deterrent to completing a thorough assessment of groundwater contamination, especially when the data obtained from groundwater investigations and monitoring activities is used to make key decisions regarding remediation of an aquifer. Furthermore, although cost is an issue to be considered, the resulting costs associated with failed remediation efforts due to inaccurate hydrogeological assessments can be significantly higher than the costs of a borehole geophysics program.

Environmental Hydrogeology

Groundwater is one of the principal media currently being sampled to carry out the provisions and intent of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the Resource Conservation and Recovery Act (RCRA). An accurate assessment of groundwater contamination, the proper evaluation of subsurface geological and hydrogeological conditions, and the subsequent selection of an aquifer remediation program is of particular importance because groundwater represents one of the main transport routes of hazardous constituents, and because groundwater is the primary drinking water source in many regions of the country.

The main objectives of groundwater detection and assessment monitoring programs are to determine if pollutants are present in groundwater, to determine the concentration levels, and to define the horizontal and vertical distribution of the pollutant(s). By determining these parameters and characterizing the geological and hydrogeological factors present at the site, transport routes can be identified, the eventual fate of the pollutants determined, and remedial actions proposed. In order to complete this evaluation, a number of subsurface methods are commonly utilized that yield important information about geologic and hydrogeologic conditions. These methods include:

- well cuttings and core descriptions/tests for defining geological conditions and aquifer characteristics,
- water-level measurements for determining groundwater flow directions and aquifer characteristics,
- tracer tests for determining groundwater flow directions,
- well tests or aquifer tests for determining aquifer properties, and
- groundwater sampling for water quality determination.

Although significant information on subsurface geological conditions and aquifer properties can be obtained from these methods, additional and very valuable information can be obtained from borehole geophysics. Borehole geophysics can provide accurate, consistent, and quantitative information on subsurface geologic condi-
tions, aquifer conditions, and subsurface fluids that can not be obtained through other methods. In addition, borehole geophysics can be an excellent correlation tool for mapping geologic formations and aquifer zones and can be used for calibrating core and cuttings data. Borehole geophysics data can be utilized in well construction and development, groundwater sampling activities, and in pump test analyses. Surface geophysics can also be combined with borehole geophysics to yield a three-dimensional view of subsurface conditions.

Borehole Geophysics

Borehole geophysics encompasses all methods or techniques in which a sensing device is lowered into a borehole in order to make a record or log that can be interpreted in terms of the characteristics of the geologic formations and their contained fluids. These geophysical logging units are either portable or truck mounted and generally consist of a set of logging devices, a winch and conductor cable, and a monitoring console to record data. A logging device is activated downhole and measurements are sent as electronic signals to the surface where they are recorded and stored as analog or digitized data. The data are then displayed graphically on what is commonly called a log.

Borehole geophysics provides subsurface information on rock and unconsolidated sediment properties, fluid properties, and fluid movement. Information that can be obtained from a geologic formation or aquifer includes lithology, structure, geometry, resistivity, bulk density, acoustic properties, vertical changes in porosity, relative vertical changes in permeability, and moisture content or fluid saturation. The source, movement, and chemical and physical characteristics of groundwater can also be obtained.

Borehole geophysical log types can be subdivided into three main logging categories: formation logs, fluid logs, and structural logs. Formation logging refers to techniques that allow for the characterization of geologic formations in the subsurface. Formation logs are valuable in identifying lithologies, determining porosity, detecting formation boundaries, determining shale content, measuring formation density, identifying fractures, and measuring groundwater salinity and resistivity. Fluid logging allows for the characterization of formation fluid properties such as temperature, conductivity and flow velocity. Structural logging refers to techniques that can be used to check on the physical status of open boreholes or cased holes. In addition, structural logs can be useful in formation evaluation. A description of some log types and their primary uses is given below.

### BOREHOLE GEOPHYSICAL TECHNIQUES FOR ENVIRONMENTAL HYDROGEOLOGY

<table>
<thead>
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<th>Formation Logs</th>
<th>Primary Use</th>
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<tr>
<td>Resistivity</td>
<td>Lithology, formation resistivity, fluid type, fluid salinity, fluid resistivity, fluid saturation, and fluid flow direction/rate</td>
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<tr>
<td>Spontaneous Potential (SP)</td>
<td>Lithology, clay/shale content, permeability, fluid resistivity, and fluid flow direction/rate</td>
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<tr>
<td>Gamma Ray</td>
<td>Lithology, clay/shale content, and geologic correlation</td>
</tr>
<tr>
<td>Density</td>
<td>Porosity, formation density, lithology, and geologic correlation</td>
</tr>
<tr>
<td>Neutron</td>
<td>Porosity, moisture content, specific yield, lithology, and geologic correlation</td>
</tr>
<tr>
<td>Acoustic</td>
<td>Porosity, fractures, lithology, and geologic correlation</td>
</tr>
</tbody>
</table>

**Fluid Logs**

- **Temperature**
  - Temperature gradients, fluid movement, dispersion, and dilution

- **Fluid Conductivity**
  - Fluid conductivity and/or resistivity, fluid movement, dispersion, dilution, and water quality

- **Flow Meter**
  - Fluid movement from multiple aquifers, and casing leaks

**Structural Logs**

- **Caliper**
  - Borehole diameter, fractures, cavities, well cementing, and casing corrosion or breakage

- **Casing Collar Log**
  - Locating casing collars, perforations, well screens, and detecting faults in casing

- **Borehole Camera**
  - Locating fractures, cavities, or Televiewer and inspecting well casing and screen debris

A more-detailed description of these geophysical log types can be found in the publications listed under the "Selected References" of this paper.

**Planning a Borehole Geophysics Program**

Study objectives must be clearly defined in order to plan an effective logging program, and to determine the appropriate logs to run. An evaluation of geophysical methods applied to the geologic and hydrogeologic pa-
rameters of interest and data collection objectives should be completed. Program objectives and data quality objectives should also be established. In addition, a general understanding of the surface and subsurface geology is helpful in the planning process. Site-specific conditions must be known to determine if truck-mounted or portable devices will be needed. There are also several factors related to drilling methods that limit the use of various log types. These include drilling fluids, casing type, borehole or casing diameter, perforation types, and gravel pack material.

There is not a "standard suite" of logs that should be run at all sites as programs will vary based on site-specific conditions and other factors. In addition to preparing a drilling and geologic log, a fairly standard geophysical log suite recommended for groundwater investigations should include the following logs:

1) Resistivity Log
2) Spontaneous Potential (SP) Log
3) Gamma Ray Log
4) Density, Neutron, or Acoustic Log
5) Caliper Log
6) Temperature Log
7) Fluid Conductivity Log

Running this recommended log suite in every borehole or monitoring well may not be necessary. Factors such as study objectives, number of planned wells, well spacing, cost considerations, and other prohibitive conditions should be evaluated.

Summary

U.S. Environmental Protection Agency (EPA) guidance documents developed under RCRA and CERCLA describe various borehole geophysical techniques. However, borehole geophysics have not been routinely used in past EPA remedial investigations and groundwater monitoring programs. Groundwater professionals in the environmental field who have not had the opportunity to use geophysical logs in their groundwa-
relation (e.g., comparing geophysical properties or log curves with lithologic descriptions from cuttings and/or core, and comparing log curves between wells), and 3) provide aquifer property values for calibration with core data and aquifer test data (e.g., comparing porosity or other aquifer property values, and using calibrated log-derived values to provide data coverage where core data or aquifer test data is missing or of poor quality).

Ultimately, errors and mistakes caused by incomplete data sets and misinterpretations increase costs and cleanup times observed at hazardous waste sites. Promoting the routine use of borehole geophysics in environmental investigations should be a responsibility of all groundwater professionals.

**Selected References**


David R. Rhode, CPG-8558, Senior Geologist, ICF Kaiser Engineers, Lakewood, CO 80228.

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History Of Karst Studies

Philip E. LaMoreaux, CPG-0880

The term "karst" has been used only since the 19th Century. It is a German term applied to an earlier Serbo-Croatian term "krs". Descriptions of karst phenomena, caves, sinkholes, swallow holes, and underground rivers date back to antiquity. They were an integral part of Greek mythology.

Cuneiform tablets provide the first records of karst hydrogeological research known and describes an expedition in 852 B.C. by the Assyrian King Salmanassar III to the headwaters of the Tigris. The source of the Tigris is a karst spring. Inscriptions on the cave state that the source of water to the Tigris immortalize Salmanassar III and is the first known representation of stalagmites.

In 650 B.C., there were two novel explanations of the hydrologic cycle. One group, including the philosophers Thales, Plato, and Pliny believed that water is forced from the sea into the rocks in which it is driven upwards, and its salts extracted, until it reaches the surface of the ground. The other group, including Aristotle, believed that springs originated from condensation in subterranean caves and caverns.

The early Greek philosophers theorized on the movement of ground water in karst areas as related to the water cycle—some examples, Empedocles (490-430 B.C.) and Aristotle (384-322 B.C.). Eratosthenes (276-194 B.C., as reported by Strabo in Book 8) described the hydrologic connection between Katavothra (Ponors) in Pheneos polje and Ladon Spring in the Peloponnese of Greece—spring rains and discharge; Poseidonios (135-50 B.C.) reported on the springs of Timavo and described the River Timavus where it disappears in a cave underground. Strabo (60 B.C.-28 A.D.) devoted his eighth book of 17 volumes, Geographica to the Karst Phenomena of the Poljes (underground streams), as well as other karst phenomena.

Jewish historian Josephus Flavius (37 A.D.) recorded in the History of the Jewish War the probable source of the Jordan and that Tetrarch of Trachonitis used a tracer (chaff) to trace an underground stream. Lucius Annaeus Seneca (4 B.C.-65 A.D.) was perhaps the most important Roman philosopher and writer regarding karst. In his book III, Naturales Quaestiones, he describes solution processes, the development of large underground caves, and explains the disappearance and reappearance of streams.

In the evolution of karst studies we should not overlook parallel work in China. A book on caves was written about 221 B.C. for North China that contains description of caves and hydrography. The Hongshan Karst Spring, discharging $3 \text{m}^3/s$ in Jixian County, Shaanxi Province has been in use since the Sung Dynasty (1000 A.D.), and in 1040 A.D. the spring's discharge was separated into three channels and used to irrigate nearly 100,000 acres. Chinese karst scientist Fan Chengda (1175 A.D.—Sung Dynasty) gave an explanation of speleothems, saying that the milky water dripping continuously in the cave, through the process of condensation, created stalactites. Xu Xiake (1586-1641 A.D.—Ming Dynasty) made extensive field trips into South China karst—Guilin area—for the study of the geomorphology of caves. He described tropical karst features, including fenglin, or peak forest karsts. He is known as "the father of karst studies in China".

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AUGUST 1994 • The Professional Geologist 9
During the 18th Century in Europe studies began with observation and description, for example, Melchior Goldast from Germany described the Blautopf, one of Germany's largest springs. A. Kirchner (1665) correctly interpreted fluctuations of water in a polje to the seasons, and theorized on the connection of underground streams; and Johannes Antonius Nagel (1748), a mathematician, was assigned by the Hapsburgs to study poljes and caves—the objective was the development of agriculture as the poljes remained flooded into the planting season.

Between 1778 and 1789, Hackuet, in a four-volume work, described many karst—hydrologic phenomena: the solution of limestone, dripstone, carbonate incrustation, joints filed with clay, the relationship between streams in a karst area, and poljes. Professor Josef Zotl (1980) states "Hackuet is 'the father of karst hydrology' in Europe", as he anticipated problems that would be the subject of controversy in the coming century.

By the 19th Century, there began natural scientific thought. Earlier work described the karst phenomena, theorized on the hydrologic cycle and, as in the case of Hackuet, identified some serious questions and problems that would need to be studied. It is not possible to identify all of the karst scientists that made contributions in the 1800s; however, in a paper, Bibliography of the History of Karst Research, by Josef G. Zotl, published in the Annotated Bibliography of Limestone Terrane as Volume IV (1989), he provides us with the identity of many important scientists for this period. In 1834, in France, J. Virlet (1834) explained the development of dolines earlier than Cvijic, however, most of the karst work in France was related to speleology.

Toward the end of the 19th Century, J. Cvijic cooperated closely with Albrecht Penck at the University of Vienna. Penck published the journal, Geographical Proceedings. In volume 3, 1893, Cvijic's monograph on karst was published. This work provided the first systematic treatment of karren, dolines, karst rivers, karst valleys, poljes, and distribution of karst phenomena along the Adriatic Coast.

In the 20th Century karst research has received great attention by a diversity of scientists. New methods employ sequential satellite imagery, air photography, remote sensing, computers, results from sophisticated chemical laboratories, new techniques of isotope hydrology and model analysis. During the same period there have been many textbooks published, thousands of technical papers written and over 150 symposia and congresses directed to the subject of karst.

Man was intrigued with karst, particularly cave development, long before the word "karst" came into use. In pre-historic times caves provided humans with a living space, water supply, and protection. In the cave area of southern France, in the Pyrenees and in northern Spain that were outside the influence of the massive Continental Pleistocene Glaciers, the Paleolithic Period of man's evolution was a scene of remarkable cave drawings illustrating an amazing capability of early man to duplicate pictures of animals and hunting activities. He had chosen these caves as living areas, and his exploratory drive led him deep underground to sources of water. These were man's first attempts to explore and understand karst and use this natural phenomenon to enhance his living conditions and safety.

How important is karst to man's environment? In Yugoslavia, the home of the term "karst", 33 percent of the surface is karst terrain (Milanovic, 1981). In the USSR, 40 percent of the land area consists of carbonate and other soluble rocks, and in the United States about 25 percent is underlain by carbonate rocks. Approximately one-fifth of the earth's surface is underlain by carbonate rocks of a complex physical character that produced a diverse topographic expression by weathering under varied climatic conditions. Carbonate terranes in some areas are underlain by broad, rolling plains, whereas in others they are characterized by steep bluffs, canyons, sinks, and valleys. Owing to the variability of the solubility of limestone under different climatic and geologic conditions, man's inhabitation and development of limestone areas has often been difficult. In some areas the limestone is covered by fertile soils; in others soils are missing. In the midwest of the USA, a large area is underlain by limestone covered by a very

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Carbonate rocks are a source of abundant water supplies, minerals, and oil and gas. Even though there are many blessings associated with carbonate terranes, there are also many problems related to developing an adequate water supply, assuring proper drainage, providing stable foundation conditions, and preventing serious pollution problems. Because of this complexity, the evolution of concepts related to the movement and occurrence of ground water in karst, methods of exploration and development of water, safe engineering practices in construction of all kinds, and adequate environmental safety precautions cannot be based on one uniform set of rules.

The impact of karst terranes is great on man and of substantial interest financially. This is recognized by a few select references from recent publications: John Newton (1986), Development of Sinkholes Resulting from Man's Activities in the Eastern United States, (19 States) reports that since 1950 there have been more than 6,500 sinkholes or related features that have occurred. Newton further states that the total cost of damage and associated protective measures resulting from these induced sinkholes is unknown, however, at 5 dam sites alone repair costs were in excess of $140 million. In a report presented by Dallas Peck, Director of the U.S. Geological Survey, in October 1988, in a paper, Karst Hydrogeology in the United States of America, at an International Karst meeting in Guilin China, he makes the statement, "karst aquifers are a major source of drinking water in the USA that provided 25 million cubic meters of water per day in 1985". Finally, a Panel on Land Subsidence, U.S. National Research Council, in a report dated 1991, Mitigating Losses from Land Subsidence in the United States, states that 6 states have individually sustained $10 million or more from damages resulting from sinkholes, and an additional 4 states sustained from $1 to 10 million in damages from the same cause. As a result, in the USA there has been developed "awareness programs" for catastrophic subsidence areas and an insurance programs applicable to sinkhole problems.

Finally, karst areas are dynamic and environmentally sensitive. The geologic structure, solubility of the rocks involved, and the climatic conditions determine to a great degree how rapid these changes can take place. Therefore, karst investigations must consider the dynamic nature of karst. It is necessary to recognize the Synergistic relation between circulation of water and solution of the rock, that the greater the solution--leads to changes in or progressive lowering of water tables--base levels, progressive cave enlargement, and changes in karst topography all can take place within relatively a brief period of time. Rapid dynamic change can impact the hydrogeologic history of an area, and brings about major environmental problems.

References

Philip E. LaMoreaux, CPG-0880, Senior Hydrogeologist, P.E. LaMoreaux and Associates, Inc., P.O. Box 2310, Tuscaloosa, AL 35403.

Travelers Over Bighorns Now Have Geology Road Signs

June 8, 1994

The completion of a geologic road sign project in the Bighorn Mountains was dedicated on Wednesday, May 25th. The Wyoming Geological Association Highway Signs Committee and the Geologic Mapping Section of the Wyoming State Geological Survey collaborated on the location of geologic formation signs along portions of U.S. Highway 16 between Buffalo and Tensleep and on U.S. Highway 14 between Sheridan and Shell. The signs are located adjacent to representative outcrops of key formations, listing the formation name and geologic age, with an approximate time range in millions of years. The identified formations range in age from Precambrian to Lower Cretaceous. The Wyoming Department of Transportation constructed and installed the signs.
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In And Around
The City Of Calcutta; India

Timir B. Hore, CPG-8169

Calcutta is probably one of the largest cities in the world which has developed on the fringe of an active lower deltaic plain. The north-east to south-west parts of the city are flanked by low-lying brackish marshy wetlands and the western side of the city is bounded by the river Hugli (Figure 1). Due to this geomorphologic situation, the city has inherent problems for water supply.

The city of Calcutta has dual sources of water supply. The water of the Hugli River forms the main source. Near Calcutta the water of the Hugli River is highly brackish due to tidal influence; therefore, surface water is being pumped from the Hugli River about 25 miles upgradient of the city, away from the tidal influence. In addition, large quantities of groundwater are being utilized for the city water supply. The groundwater utilization has been increased considerably due to the tremendous human growth and industrial development.

The city of Calcutta forms a part of the Bengal basin which is underlain by a considerable thickness of predominantly deltaic alluvial material of Quaternary formation. The deltaic alluvium contains several horizons of water-bearing granular materials, most of which are capable of yielding large quantities of groundwater.

The near-surface groundwater exists in unconfined conditions; i.e., under water table conditions, while water in the deeper zones occurs in the confined state, as it is overlain by an impervious confining clay layer. Although both clay and sand strata are saturated, only the latter can be economically utilized for extraction of groundwater.

The confined aquifer consists of fine-to-coarse grained sand occasionally mixed with gravel. This aquifer occurs between the depth span of 46 to greater than 150 meters below the land surface over most of the localities. In certain localities, this aquifer has been found to extend much deeper, over 300 meters below ground level. No geological log was available for study older than Pleistocene. Hence, it is very difficult to predict if any potential aquifer exists below the Pleistocene deposits.

Analysis of aquifer distribution reveals that a thin silty to fine silty sand bed occurs all along the levee of the Hugli River. Below this layer a thick clay bed occurs. The thickness of this clay bed varies from 20 to 45 meters. This clay bed is absent in some locations. Some sand layers also do not extend laterally for any great distance. This indicates localized deposits of different sedimentary facies. Field study and interpretation of aerial photographs indicated that the thick clay layer is absent in the channel fill deposits of a paleo-distributary of the Hugli River. The thickness of the top clay bed varies from 15 to 50 meters. The main waterbearing granular horizon occurs below this clay bed.

Besides confined aquifers, groundwater also occurs under water table conditions (unconfined condition) in

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some localities, mainly along the levees of the Hugli River, the palaeo-levees, and within the palaeo-courses. The thickness of this unconfined aquifer varies from 3 to 10 meters. The aquifer materials are mainly fine sand to fine silty sand and the depth to water table varies from 1.5 to 3.0 meters below ground level. Utilization of groundwater from this aquifer is very limited; in most cases, the water of this aquifer is not being utilized for drinking purposes.

A mechanical analysis of the aquifer materials shows that there is a variation in the mechanical composition and sorting of the confined aquifer materials. In most cases, the uniformity coefficient values are less than 2.0. Thus, the grading of the aquifer materials is generally good. The grain size distribution indicates that the aquifer materials have high porosities.

The average hydraulic conductivity for the finer and coarser fractions of the confined aquifer materials has been calculated on the basis of grain size distribution and degree of sorting, and accordingly transmissivity values have been determined. There appears to be no definite trend of transmissivity values in different localities. Sometimes there may be a variation within short distances and sometimes no variation for a long distance. Generally, the values range from 5000 to 6500 m/day.

In general, specific capacity of wells in the area varies from 675 m3/day/m to 1500 m3/day/m. In most of the wells the specific capacity has been reduced up to 40 percent over the last decade. There are several reasons for reduction of specific capacity of wells in the area, such as: choking of the slots of the strainers, sand pumping, reduction of strainer length due to deposition of sediments, iron encrustation, lime deposits and also the influence of surrounding wells (interference of the cone of depression from one well to another).

The average potentiometric surfaces (water levels) have declined considerably during the last 25 years. The analysis of potentiometric surfaces in different years indicate that the average decline per year during the first 15 years is much less than the later period. There are many reasons for this decline in potentiometric surface. Primarily, it is because parts of the strainers have become choked, and almost all screened wells have undergone some loss in specific capacity over time. Some of this loss is attributable to the slow movement of fine particles into the area around the screen. Many of these formation materials plugged the screen. The invasion of small particles reduces the yield, hence increasing the drawdown. Secondly, due to increases of population and industrial growth, the demand for water has been increased considerably, hence the withdrawal
from the underground aquifer has also been increased, resulting in a decline of potentiometric surfaces. Finally, the decline is caused by the interference of the cones of depression of different, closely-spaced tube-wells, (unplanned utilization of groundwater) which is very common in industrial and densely populated areas. In 1956 potentiometric surface (water level) varied from 4.5 m to 8.5 m below ground level. In 1972 this level had been reduced to 9.0 m to 11.5 m below ground level, and in 1984 further decline to 11.5 m to 16.0 m below ground level.

The predominance of an impervious clay capping over the city area signifies that not much local recharge to a deeper aquifer in the Calcutta area is possible. Some local recharge through paleo-courses to the upper unconfined and shallow confined aquifer is possible. It has been observed that there is an increase in water levels in the upper unconfined and shallow confined aquifers due to local rainfall. The major recharge into the deeper aquifer is from the north and northwest of the city area. The main supply of groundwater for the city supply is from the confined aquifer between the depths of 70 m and 250 m.

The chemical characteristics of groundwater in the area are varied and complex. The chemical constituents vary both laterally and vertically. There is an amazing variation of chemical quality within very short distances in some places; in others, considerable uniformity of character is maintained for great distances. There is a change of water quality from north to south and from east to west, and also from upper to lower aquifers.

The chemical quality of groundwater of the upper confined aquifer between the depths of 25 and 50 meters is generally potable; i.e., within the standard drinking water permissible limit, except in a few localities where concentration of iron and total hardness have exceeded the permissible limit. But most of the chemical constituents, such as: total dissolved solids, sodium, chloride and iron concentration of deeper aquifers occur at levels much above the permissible drinking water standard. Bacteriological contamination is very common in the groundwater of the upper shallow unconfined aquifer. In general, the groundwater is hard (mainly temporary hardness) and both carbonate and non-carbonate types are found.

In addition to health hazards, high concentration of chemical constituents has a great impact on the structures of the tubewells. The yield of many tubewells has been reduced considerably due to encrustation and chemical corrosion. Particularly, the concentration of iron in most of the localities containing 0.1 to 6.0 mg/l, is conducive to the growth of iron bacteria around the tubewells. Some wells have become defunct completely due to growth of iron bacteria.

Timir B. Hore, Ph.D, CPG-8169, Middlesex, New Jersey.

Rattlesnake Hills Similar To South Pass Gold District

Geological mapping by the Wyoming State Geological Survey in the Rattlesnake Hills of Natrona County in central Wyoming indicates the region may be similar to the South Pass gold district in the southern Wind River Mountains. W. Dan Hausel, senior economic geologist with the State Survey in Laramie, believes that like South Pass, rocks of the Rattlesnake Hills are good hosts for metal deposits, in particular gold. Several mineralized rock samples collected to date have assayed from 0.009 to 0.15 ounce per ton gold, 0.006 to 0.02 ounce per ton silver, 38 ppm to 0.14% copper, 25 ppm to 1.65% arsenic, 11 ppm to 0.13% lead, and less than 0.01 to 0.21 ppm mercury. The geology of the Rattlesnake Hills may be favorable for widespread, low-grade, gold mineralization.

Much of the Rattlesnake Hills is formed of rocks that were originally deposited as sediments and lava flows under the ocean more than 2.5 billion years ago. Sometime later, the sediments and lavas were squeezed together, lithified, tilted on end, and deeply buried. About 43 to 44 million years ago, several volcanoes erupted in the Rattlesnake Hills. A period of uplift and erosion then exposed both the very old rocks as well as the cores of the younger volcanoes. All that remains of the volcanoes today are volcanic necks that now form some prominent peaks and buttes in the hills, including Garfield Peak, the highest point in Natrona County (elevation 8,244 feet).

Apparently more than one episode of mineralization has occurred in the Rattlesnake Hills. Gold, copper, and silver were deposited more than 2.5 billion years ago, and again about 44 million years ago. Some of the metals in the older rocks were redistributed into the younger volcanic breccias during the most recent volcanic activity. The later episode of mineralization produced several features similar to some gold deposits that are currently being mined in Nevada.

The Wyoming State Geological Survey is currently mapping the Rattlesnake Hills as part of a program to map all of the State’s historic mining districts and mineralized terranes.
Some Thoughts on What We Do

Russell R. Dutcher, CPG-1644

Great strides have been made in the last twenty years in educating the public with respect to the role of geology in our everyday lives. Much credit belongs to AAPG members for these advances, and much remains to be done.

This "educating" can be accomplished in subtle and low key fashion, at many appropriate times, in almost any setting. The formal lecture approach may not be as effective as the conversation over lunch or the casual talk at receptions and parties. It may however be accomplished in a formal lecture, look for these opportunities.

I am sure that most of us have been hailed at an outcrop or highway exposure by the generally well-meaning words, "What are you doing--looking for gold?" Sometimes this becomes a bit tiresome, but if people will hang around five minutes, take the opportunity to let folks know why you would sit in the dust or rain, take notes, and describe various rock features. You may not convert anyone, but more than likely they will repeat the experience to friends--hopefully in a favorable light.

For many years, geologists tended to view their work as either so good or so important that they assumed folks would automatically see what great things they were doing. It was that, or they felt their work was so confidential that they could not talk about it. The matter of confidentiality is easy to understand, but it is still possible to talk about what type of work you do and its importance.

In the last twenty-five or thirty years geologists have learned that they have to let folks know what they do and what the results of some of their findings have been. This has gone a long way to increase the level of geologic understanding in the lay community. More still needs to be done. Many years ago I was talking with a gentleman who was in charge of a large biological sciences group. We were bemoaning some of the shortcomings of scientific knowledge in the voting public. We worried about the impact on programs that were of significant importance to our general well-being. This person pointed out to me that we were really in pretty good shape in our respective disciplines because of the fact that "everyone who lives on this earth is dependent upon materials or items that were either extracted from the earth or grown upon it." Since that time, I have had many opportunities to use this comment on several occasions with non-scientific, or certainly nongeologic, folks around. It has never failed to cause people to stop and think and to try to come up with exceptions.

Some time ago I was in a group that was planning an environmental studies program. One of the biological types asked me why geology should be involved in environmental studies. I remained relatively calm and said a few words designed to reassure him of the facts of the matter. I am not really sure that at that time and in that setting I convinced him of much of anything. I think that he was looking at some concerns over turf, which are very unfortunate but can muddy waters. However, the thing that his comment revealed to me was the dismal, indeed abysmal, ignorance that some people have of other disciplines.

Geologists, far more than most scientists, are familiar with a wide variety of disciplines. Indeed, we have to be to adequately pursue our specialties. We do have significant opportunities to inform others, and we should take advantage of these at any time we can.

Several years ago I was meeting with a group of high school mathematics teachers. In the course of a rather lengthy discussion with five or six of these people, I finally asked why their students, that is high school students in general, were generally afraid of science courses. In unison and with no hesitation, they replied that "it is the other teachers." This took me back somewhat, but what they were saying is that teachers who advise students many times themselves are afraid of science, thinking that it is too difficult. As a result, they advise students out of and away from courses such as math, chemistry, and physics. In the process, the students really are advised out of science. This is not a universal statement. It is however, a common feeling, and one which I have since substantiated on many occasions.

All of this opens to us other great opportunities for educating the public, starting at a lower level than the legislators and policy makers whom we all have grown to tolerate to some degree. Anytime you can talk to students about your work, you have an opportunity to create enlightened citizens. This will be time well spent, it can be productive. Many teachers in the primary and middle school grades - and probably in high school - are happy to have guest speakers available. I encourage you to utilize this fantastic opportunity to become actively involved in the future of your profession.
Communication, An Essential Skill For Professional Geologists

Robert K. Merrill, CPG-4984

Widespread ignorance of geology prevails in this country. Citizens associate geology with the study of dinosaurs, finding pretty rocks, or prospecting. They do not think of consulting a geologist when they purchase property, make land-use decisions, consider environmental legislation, or draft building codes. Yet these are areas of life in which an understanding of geology can prevent significant losses. As outlined in The Citizen’s Guide to Geologic Hazards, the costs of ignoring geological hazards are staggering in terms of dollars as well as lives. For informed decisions to be made, citizens and decision makers must understand what a geologist is and what a geologist’s knowledge can do for the public welfare.

Geologists can contribute to these informed decisions and become consensus builders. We can do this through communication. As scientists we put the highest priority on observing, monitoring, and interpreting the natural world. A lower priority is generally placed on explaining our findings to the members of the public. Communication is a two-way street. People respond to information through a series of steps: hearing, understanding, believing, personalizing and taking action. Hearing and understanding makes people fully informed. For information to be personalized it must be presented within a framework of individual knowledge, so it can be believed. With this frame of reference, people can take action if they are so inclined. Without two-way communication misconceived actions produce controversy and misunderstanding.

As geologists we quantify the nature and timing of natural events and their inherent uncertainties. When explaining geologic risk, we must be aware of the steps people take in dealing with problems. We must make our listeners aware of probability. There is always a chance that an event will occur in which a client must decide what constitutes acceptable risk and how risk can be mitigated. We must be capable of translating solutions into terms that can be understood by the responsible and non-technical parties so that they can act responsibly. However, we do not act in a vacuum and the complexity of issues requires a multidisciplinary approach to provide appropriate solutions.

To provide information for effective solutions, geologists must train themselves technically, but just as importantly, in communication skills. Students must be trained in the basics of geology. Geological studies should not be disguised as other disciplines such as environmental science. Likewise, professional geologists should be recognized as geologists first, not as practitioners of other disciplines. Practicing professionals must keep abreast of technical developments through on-the-job training, courses and workshops, professional publications, technical societies, and peer interaction. It is dismaying to try to correlate the number of “practicing geologists” with the number of professional society members. Many practicing geologists do not keep up. As professionals we have an obligation to keep university faculty informed of new technologies and needs that might necessitate changes in curricula, yet maintain a strong curriculum in the principles of geology.

Finally, as professionals we must all work to improve our communication skills to create more accurate, more reliable, and more understandable reports, so we can communicate effectively with decision makers. Most of us are occupied in keeping up with the discipline-specific part of our chosen field. We need to place as much emphasis on explaining our scientific observations and conclusions as we do observing, monitoring, and interpreting. As scientists, we have an obligation to advise the public so priorities can be established and informed and effective decisions can be made when earth science is involved.

References Cited
Get Involved! Make A Difference! Now!

Tom Fails, CPG-3174

Specific professions and personality types seem to go together. For instance, paleontologists and litigators have little in common. Most geologists prefer to spend their time at the drafting table or work station or looking at rocks up in the hills rather than talking to politicians. We prefer to leave that to the lawyers, landmen and similar types. For a long time this seemed to work. Things deteriorated for geologists in the mid-80’s and haven’t improved. Our profession, the industries in which we work and our economic livelihoods are increasingly circumscribed and sometimes under attack. Despite the apathy of our profession regarding governmental affairs, some geologists now realize that we must start defending ourselves and our industries. However, most geologists have been puzzled as to how this can be done effectively.

The need for action has increased involvement in governmental/political relations by several Sections. State legislators are generally responsible and accessible, so involvement of Section members in political activities can be relatively easy. Further, Section members can fill seats on State Boards, Commissions and Committees dealing with resource and environmental issues.

Colorado is a resource state, and geologic hazards are widespread. Geology plays a larger role than in some states. For instance, an effective, efficient State Geological Survey is a must. Things heated up for our Section in 1991, when a bill damaging to our Geological Survey was introduced. Colorado Section members, including the writer, worked with others in the geologic community in opposing this bill in committee and through contact with individual legislators. It was modified to an acceptable form. As AIPG represented the only organized opposition our efforts were successful to some degree. Since then, our Section has been involved in additional bills and other legislative activities affecting the resource industries and the health, safety and welfare of Colorado’s citizens. This is increasingly at the invitation of legislative friends, as “the geologists” are seen as neutral, informed experts interested in better government. We sometimes are counted among the “good guys” in an environmentally conscious state.

Most of our Section members appear to approve. Attendance at Section luncheon meetings has doubled. Participation in Section elections has increased ten-fold. Section members “know what they are getting for their $100.”

AIPG members have learned a great deal about governmental relations. The principles are applicable at all levels. Colorado Section’s able political advisor and lobbyist, Lynn Graf, deserves much of the credit for our achievements in this area. Lynn has been retained as a Political Advisor by AIPG National; her series of articles on governmental relations debuted in the July issue. A half-day symposium on Section governmental/political activism at the 1995 AIPG Convention in Denver will share the experiences of our and other politically active Sections with interested members.

Educational activities are an important part of governmental relations. Geologists, the things we do, and the value of our services to the public are generally little-known or appreciated. But people, including legislators and bureaucrats, usually will listen and often appreciate what geologists and AIPG have to offer.

Please review the AIPG Policy on Advocacy, Code of Ethics Canon 2, By-laws Section 1.2 and the Executive Summary of AIPG’s Long Range Planning Committee Report. All advocate Officer, Executive Board and Member involvement in educational and governmental activities. Thus governmental/political activism is endorsed and encouraged at both Section and National AIPG levels. The need to identify, train and activate members willing to undertake these activities is great. As a candidate for Vice-President, I see four goals for AIPG in 1995:

- Increased involvement in governmental/political relations at national, state and local levels. Registration, legislation and regulations affecting resource, water and environmental issues are concerns.
- Enhanced educational/public relations activities to promote awareness of how geologists can protect the public’s health, safety and economic welfare.
- Increased involvement of younger AIPG members in Section activities and management. Officer recruitment and training programs for all members are needed, but especially for those under 40.
- Reorientation toward important emerging issues as certification versus registration concerns decline might help rejuvenate AIPG as premier advocate in the governmental/political arena.
Registration Needs Comity

Lisa C. Worthington, CPG-6298

Geologists should not look at this registration process as protecting ones turf but as creating an environment where we raise the standard of our profession. I believe facilitating this as an appropriate role for the Institute.

In my professional life I have lived in three states, and have worked in at least six others. With AIPG certification, moving to a new state still meant that you were a geologist and a professional and most importantly you could move state to state and still practice your profession. AIPG also afforded me a network and connections in the geologic community in whatever state I moved to. When I moved to a new state I started getting the section newsletter and was welcome to attend section meetings, field trips, and to make contact and friends in the new geological community. This helped me establish myself in a new state.

With the coming of registration the welcome mat may no longer be out. The state registration movement is coming and we may be unable to prevent it, but we are able to have our input into this process to insure that it protects geologists' rights and is controlled by or at least has representation in the geological community. The movement toward individual state registration creates problems for our profession. However I believe the Institute can still play a critical role in mitigating these problems.

The following are real-life examples of AIPG members that have had problems with state registration. The first is a geologist who had practiced geology for 25 years in State A (no state registration) retired and moved to state B (has state registration) and wants to do some consulting. Under State B law he can not obtain registration nor practice geology. The second geologist lives and works in State Y but his area of work covers both State Y (no registration) and State Z (registration). Under State Z law, he must get registered in State Z. In addition under State Z law, he can not become registered without working under a registered geologist (Catch 22).

If state registration continues on this path, you will be able to practice geology in London or in Spain due to our reciprocity with The Geological Society and The European Federation of Geologists, but not be able to practice in your neighboring states. The Institute has done an excellent job getting international reciprocity set up and is continuing to do so. We need to take an even more aggressive stance with our intrastate policy.

It is my hope that through AIPG we can help insure geologists would be free to practice their profession in all states and be free to move between states and ply their trade. In the current state of the economy it is hard enough making a living in this profession; we should not be protecting our borders, but ensure that the borders are open so we can all make a living. We should not be focusing on making legislation that is so restrictive and confining that we can not practice our profession. It is important that AIPG keeps actively involved in this registration issue to insure our right to work in our profession is protected in all 50 states.

One of the Institute's most important tasks is to increase involvement in the political arena. This should include a well-defined legislative program both for national affairs and state affairs. The Institute should support and help direct sections in the development of state legislative programs. Since state registration is a big issue in some states the Institute can offer guidance for states seeking registration to draft bills that are in the best interest of the geologic profession. The institute should take a firm stand on insuring a maximum degree of reciprocity (or preferably comity) between the states. It is tempting for each state to set its own rules excluding movement of geologists between states and restraining trade by creating "closed shops". Geologists should be able to cross state lines and still be able to call themselves geologists and earn a living. We need to represent geology as a profession and not give up our self-determination by letting government, politicians, engineers or other professions telling us how, when, and where we can practice our profession. Where registration exists the Institute should recommend such registration should be managed by boards which have professional geologists well represented.
I don’t think so. As a matter of fact I don’t think we are effectively preaching to anyone. Case in point: if you were to stop someone on the street and ask him what a geologist does, a typical answer might be, “Ah, they do something with rocks and oil and study dinosaurs.” Surely we do more than that. Why is it that our scientific discipline is less known and understood than many others? Communication.

Ask yourself this simple question, “How many times in the past year did I speak on the subject of geoscience or express my geological opinion on an issue?” Our perspective from the standpoint of time and natural processes gives us a unique understanding of our environment that other scientists may not have and it should be expressed. I give the following as an example.

Recently, I spent the day with a scientist who is very interested in environmental protection, biodiversity, and preservation. The focus of one of our discussions revolved around the premise that man has had a profound impact on the environment and that this impact is negative due to lost habitat and range, species extinction, and atmospheric and general environmental degradation. This biologist focused on the changes that have occurred over the past 100 years. I agreed that many changes have occurred.

Our discussion continued until we were sitting at a highly developed inter- section along Florida’s southeastern coast, an excellent example of complete and rapid change. As we discussed the environment at this intersection, I mentioned this development did not greatly concern me as this "environment" would not be here forever. This concept was rather foreign. I then explained that within the next several million years, the intersection will be subjected to sea level fluctuations (at a minimum) that would completely change the environmental setting. The question I then asked was, "Would this change be bad?"

Time and natural processes are not often taken into consideration when environmental "change" is debated. Who is well qualified to discuss change? -- the geologist. Is change bad? -- not necessarily. It is required due to the dynamic natural system in which we live. However, if we do not communicate to and educate our peers, political leaders and the general public concerning the geoscience viewpoint, how can we be frustrated when it is not taken into consideration?

Recently, AIPG published a book entitled, The Citizen’s Guide to Geologic Hazards. This is a tremendous publication with excellent information presented in a format for the layman. It discusses all of the natural processes that can impact property owners and the general public. How many copies of this publication have you or your AIPG section provided to your local community leaders, schools, or libraries? This is a great public awareness opportunity we all should take advantage of.

When was the last time you spoke to a third grade class about the development of natural resources? Our public education system needs professionals like us to get into the classrooms and present real life information. Do you realize that most children under 12 years of age in this country do not know where their drinking water or electricity comes from? In addition, many of our children are being exposed to incorrect information presented from a biased or uneducated position.

An example of this was an article in my son’s Weekly Reader last year. On the cover was a picture of a coal-fired power plant. When my son, second grade, showed me the picture he proudly pointed out all the "smoke and pollution" coming from the smoke stacks. The article said nothing about pollution; his teacher told him it was air pollution. I then tried to explain that the "smoke" was primarily water vapor, that the power industry is heavily regulated concerning air “pollution” and that if we want electricity, burning fossil fuels is currently the primary way to generate power. I have since made it a point to speak to primary school classes several times a year.

Where is all this going? There is a great need at this time for us as geologists/geoscientists to express our knowledge and viewpoints in the public arena. This may be at a County Commission meeting, Rotary Club, or in your child’s third grade classroom. Get involved with local issues and your community’s education system. Communicate, disseminate, and educate. You will find that your geoscience background can provide valuable input and perspective.
Concerning Our Profession And AIPG

Lawrence C. Weber, CPG-7120

Like the energy crisis of the 1970's, that saw opportunities in exploration geology, growing concerns for the environment have created manifold opportunities for professional geologists to take on new roles and responsibilities. The rapidly expanding environmental field will continue to have an increasing impact upon the way we do business. In some way, environmental concerns will impact us all.

The growing environmental emphasis is changing our profession. We are being called upon more and more to function as problem-solvers and decision-makers and to serve in roles that either compete with or complement the services of other professionals. We find an increasing amount of media exposure and a heightened sense of interest in geology by the general public. We are developing a broader client base. As we seek to find solutions to environmental problems that affect large numbers of people, we must more carefully consider our professional responsibilities to society. This new awareness of the importance of geology has caused some states to license professional geologists as a means of protecting the public from incompetent practitioners.

Not all of the changes are positive. The abundance of environmental regulations could potentially reduce our professional role to a cookbook approach to problem solving. With excessive regulation, there is little capacity for ingenuity and professional judgement. We must work to protect our profession and the public by helping to assure that policies and laws are based on good science. We must express ourselves as geologists by offering our scientific insight to policy-makers, law-makers and educators.

A ROLE FOR AIPG

In recent years, I have sensed a need for a revitalized sense of purpose within AIPG. It may be appropriate to formalize a process of strategic planning to assist the Institute in developing programs that meet the changing needs of professional geologists. In so doing, AIPG should strive to serve the interests of professional geologists on a broad front - locally, nationally and internationally. One goal should be to strengthen the state sections. Strong sections are essential for a strong Institute. Nationally, we must present a strong collective voice for all geologists, from all specialties and employment sectors. On the international scene, AIPG can facilitate networking and can assist in the transfer of technology on a global scale.

AIPG should set as a goal the protection of the profession of geology. We should exert influence where decisions are being made that affect the well-being and livelihood of professional geologists, and we should work to protect the decision-making authority of competent professionals. AIPG can help accomplish these goals by providing sound geologic data to policy-makers and by working to position geologists on panels and boards where environmental and natural resource policies are being made. AIPG should interact with elected officials and should get involved in the political process to the degree that legislators will know to seek our advice on key issues involving geology. We must let them know how current or pending laws will affect our profession, and we should help guide them toward making informed decisions.

AIPG can provide another needed service by promoting professional development. Because AIPG cuts across technical specialties, AIPG is best suited to provide for continuing education in the non-technical aspects of professional practice. Many geologists currently lack adequate training in some of the non-technical issues that are critical to a successful professional career. As pointed out by Tom Warren, CPG-7833, in the March, 1994, TPG, many geologists are unfamiliar with the management practices that are shaping the way professional organizations are being structured. Geologists need access to this type of training. AIPG could provide a great service to the profession by developing a continuing education program centered around professional development. Regardless of whether a professional person seeks a formal management position, all professionals could benefit from instruction in ethics, quality assurance, performance measurement techniques, goal setting, professional liability and loss prevention. I would encourage AIPG to work toward the establishment of a comprehensive course of professional development for geologists.

BUILDING MEMBERSHIP

It is alarming to me that an organization that proposes to represent the interests of all professional geologists has, in fact, a membership of less than 5,000. Unless we can build our membership to respectable numbers, and until we can honestly say that we represent a significant percentage of the practicing professional geologists in this county, we will always be borderline ineffectual in our pursuit of advancing the profession. This is particularly true when speaking of political influence. I am convinced that there is a need for a strong, non-technical association of professional geologists dedicated to the advancement of professional geology and capable of serving the profession through political involvement, continuing education and professional development. AIPG has the opportunity to be that organization, but we must build our membership to be successful.
UNITED STATES H 4573
AUTHOR: Rahill
SUMMARY: Provides for the full and complete disclosure of information relating to applications for mineral patents under the Mining Law of 1872.
STATUS: 09/13/94 INTRODUCED.

UNITED STATES H 4613
AUTHOR: Johnston
SUMMARY: Protects the ecologically fragile coastal resources of South Florida by prohibiting offshore oil and gas activities and by canceling Federal leases in the area of the outer Continental Shelf adjacent to the South Florida coast.
STATUS: 06/21/94 INTRODUCED.

UNITED STATES H 4532
AUTHOR: Thomas, W.
SUMMARY: Defines "sor sands" for the purposes of the credit for producing fuels from unconventional sources and repeals the minimum tax preference for intangible drilling costs.
STATUS: 05/26/94 INTRODUCED.

CALIFORNIA 7302
AGENCY: Water Resources Control Board
TOPIC: ENVIRONMENT. PROTECTION AND POLLUTION CONTROL - 8
SUMMARY: Updates the Underground Storage Tank (UST) regulations for clarification of legislative changes made pursuant to Chapter 432, Statutes of 1993 to Chapter 6.75 of the California Health and Safety Code.
AGENCY CONTACT: Dave Deener, Division of Clean Water Programs UST Cleanup Fund, P.O. Box 944212, Sacramento, CA 94244-2120, (800)913-FUND.
CITATION: 18 CCR Title 23, Division 3 Underground Storage Tank (UST) Cleanup Fund Program.
PROPOSAL DATE: 06/10/94
COMMENT DEADLINE: 07/29/94

FLORIDA 13752
AGENCY: Dept. of Health and rehabilitative Services/Program Health Office.
TOPIC: ENVIRONMENT. PROTECTION AND POLLUTION CONTROL - 8
SUMMARY: Changes certification on environmental water testing laboratories; changes Department of Health and Rehabilitative rules concerning the certification of environmental water testing laboratories under the Florida Air and Water Pollution Control Act.
AGENCY CONTACT: Carl C. Kirchner, Ph.D., Chemist Administrator, Office of Laboratory Services, P.O. Box 210, Jacksonville, FL 32231.
CITATION: FAC 10B-41.100 through .113 Certification of Environmental Water Testing Laboratories.
PROPOSAL DATE: 04/22/94
HEARING DATE: 05/19/94

FLORIDA 13939
AGENCY: Department of Environmental Regulation
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION - 18
SUMMARY: Includes a listing of Department of Environmental Regulation authorities that have been delegated by the Department to be used by the Districts to implement certain Department programs; incorporates by reference existing operating agreements between the Department and the Districts regarding the agency's responsibilities for the permitting, enforcement and compliance of management and storage of surface water program, and the wetland resource program.
AGENCY CONTACT: Diana Athnos, Environmental Specialist, Department of Environmental Protection, Bureau of Wetland Resource Management, Mail Station #2505, 2600 Blair Stone Road, Tallahassee, FL 32399-2400, (904)488-0130.
CITATION: FAC 17-101.040 Description of Organization
PROPOSAL DATE: 08/27/94

KENTUCKY 9647
AGENCY: Transportation Cabinet
TOPIC: BUSINESS AND CORPORATIONS - 2
SUMMARY: Concerns procurement of professional engineering and related services.
AGENCY CONTACT: Sandra Pullen, Staff Assistant, Transportation Cabinet, 1039 State Office Building, 501 High Street, Frankfort, KY 40622, (502)564-6680.
CITATION: 600 KAR 11:101 Procurement of Professional Engineering and Related Services
PROPOSAL DATE: 03/01/94

MASSACHUSETTS 4560
AGENCY: Division of Registration
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION - 18
SUMMARY: Amends rules for the certification of operators of drinking water supply facilities.
AGENCY CONTACT: James Holeva, Chairman, Board of Certification of Operators of Drinking Water Supply Facilities, Division of Registration, 100 Cambridge Street, 15th Floor, Boston, MA 02202, (617)727-3067.
CITATION: 236 CMR 2.00 through 5.00 Operators - Drinking Water
PROPOSAL DATE: 05/06/94

MASSACHUSETTS H 5029
AUTHOR: Committee on Government Regulation
SUMMARY: Makes an investigation and study of certain Senate and House documents concerning the issuance of licenses and registrations by the various boards of registration and related matters.
STATUS: 06/08/94 INTRODUCED.

MASSACHUSETTS H 5081
AUTHOR: Committee on Judiciary
SUMMARY: Makes an investigation and study of certain House documents limiting the liability of certain trades, organizations, volunteers and other related matters.
STATUS: 06/16/94 INTRODUCED.

MONTANA 2302
AGENCY: Department of Health and Environmental Sciences
TOPIC: ENVIRONMENT. PROTECTION AND POLLUTION CONTROL - 8
SUMMARY: Relates to underground storage tank installer and inspector licensing, tank permits, tank inspections and inspector licensing fees.
AGENCY CONTACT: John Geach, Department of Health and Environmental Sciences, Cogswell Buildings, Capitol Station, Helen, MT 59630
PROPOSAL DATE: 05/12/94
COMMENT DEADLINE: 06/09/94
HEARING DATE: 06/01/94

NORTH DAKOTA 2548
AGENCY: INDUSTRIAL COMMISSION
TOPIC: ENERGY - 7
SUMMARY: Relates to oil and gas conservation; includes U.S. Government leases, access to records, verification of certified welders, oil and gas metering systems, bond application for permit to drill and complete, drilling units-wells locations, exception location, disposal of waste, deviation tests and directional surveys, well log, completion and workover reports, liability, produced water, measurement of oil, central production facility-commingling of production, tank cleaning permits, production from gas wells to be measured and reported, valuation of flared gas, flaring exemption, reports of purchasers and transporters of crude oil, special procedures for pooling, underground injection, mineral wells to freshwater wells and central tank battery applications.
AGENCY CONTACT: Industrial Commission, Bismarck, ND 58505
CITATION: NDAC 43-02-03-07 through 43-02-03-90 Oil and Gas Conservation.
ADOPTION DATE: 03/31/94
EFFECTIVE DATE: 05/01/94

NORTH DAKOTA 2459
AGENCY: Industrial Commission
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL - 8
SUMMARY: Relates to underground injection control, includes definitions, permit requirements, plugging of injection wells, reporting and monitoring requirements and access to records.
AGENCY CONTACT: Industrial Commission, Bismarck, ND 58505.
CITATION: NDAC 43-02-05-01, 43-02-05-04, 43-02-05-08, 43-02-05-12, 43-02-05-13 Underground Injection Control
ADOPTION DATE: 03/31/94
EFFECTIVE DATE: 05/01/94

NORTH DAKOTA 2460
AGENCY: Industrial Commission
TOPIC: ENERGY - 7
SUMMARY: Relates to bond required prior to a person receiving a permit to drill, bore, excavate, or construct a geothermal energy extraction facility, includes bond requirements for shallow-well and horizontal-loop facilities and deep-well facilities.
AGENCY CONTACT: Industrial Commission, Bismarck, ND 58505.
CITATION: NDAC 43-02-07-08 Bond
ADOP DATE: 03/31/94
EFFECTIVE DATE: 05/01/94

NORTH DAKOTA 2461
AGENCY: Industrial Commission
TOPIC: ENERGY -- 7
SUMMARY: Relates to stripper well property determination; includes definitions application for stripper well property determination; purpose to classify a property for purposes of exempting production from the imposition of the oil extraction tax.  
AGENCY CONTACT: Industrial Commission, Bismarck, ND 58505
CITATION: NDAC 43-02-08-01, 43-02-08-02 Stripper Well Property Determination
ADOP DATE: 03/31/94
EFFECTIVE DATE: 05/01/94

PENNSYLVANIA S 1785
AUTHOR: Stout
SUMMARY: Amends the Engineer, Land Surveyor and Geologist Registration Law. Provides for exemptions from licensure and registration.
STATUS: 06/14/94 INTRODUCED.

SOUTH CAROLINA 1198
AGENCY: Department of Health and Environmental Control
TOPIC: HEALTH AND SOCIAL SERVICES -- 11
SUMMARY: Lowered radiation dose limits for members of the general public requires facilities to establish radiation protection programs, and includes new requirements for record-keeping; makes the dose limits for radiation exposure from x-ray machines similar to the dose limits for external radiation exposure from radioactive materials; contains definitions, and new fee schedule for the Regional Calibration Laboratory.
AGENCY CONTACT: P.O. Box 432, Charleston, SC 29402
CITATION: SCAS 86-4 X-Ray (Title B)
PROPOSAL DATE: 03/26/93
COMMENT DEADLINE: 04/26/93
HEARING DATE: 04/26/93
ADOPT DATE: 05/27/94
EFFECTIVE DATE: 05/27/94

SOUTH CAROLINA 1266
AGENCY: Board of Registration for Professional Engineers and Land Surveyors
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Provides for TAC/ABET graduates to be admitted to the Fundamentals of Engineering Examination (FE) and with 4 years of qualifying engineering experience, be certified as an Engineer-In-Training.
AGENCY CONTACT: Myra Law, Engineers and Land Surveyors Board, P.O. Box 50408, Columbia, SC 29225-0408.
CITATION: SCAS 49 Engineer-In-Training
PROPOSAL: 10/22/93
COMMENT DEADLINE: 11/12/93
HEARING DATE: 12/02/93
ADOPT DATE: 05/27/94
EFFECTIVE DATE: 05/27/94

TENNESSEE 2718
AGENCY: Department of Environment and Conservation/Division of Superfund
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL -- 8
SUMMARY: Establishes a list of those sites where hazardous substance disposal has occurred which are eligible for remedial actions including investigation, identification, containment, clean-up, monitoring and/or maintenance under the Hazardous Substance Remedia Action (Superfund) Program.
AGENCY CONTACT: Division of Superfund, Department of Environment and Conservation, Nashville, TN
CITATION: TAC 1200-11-13 Moody Road Drum Site
ADOPT DATE: 04/26/94
EFFECTIVE DATE: 04/26/94
EXPIRATION DATE: 08/26/94

TEXAS 13905
AGENCY: Board of Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Concerns educational requirements for registration for professional engineers; concerns responsibility to the engineering profession.
AGENCY CONTACT: Charles E. Nemir, PE, Executive Director, Texas State Board of Registration for Professional Engineers, P.O. Box 18329, Austin, TX 78760, (512)440-7723.
CITATION: 22 TAC 131.81, .156 Practice and Procedure
PROPOSAL DATE: 05/06/94
COMMENT DEADLINE: 06/03/94
TEXAS 13943
AGENCY: Board for Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Concerns engineers' seals; concerns complaints.
AGENCY CONTACT: Charles E. Nemir, PE, Executive Director, Texas State Board of Registration for Professional Engineers, P.O. Drawer 18329, Austin, TX 78760, (512)440-7723.
CITATION: 22 TAC 131.138, .171 Practice and Procedure
PROPOSAL DATE: 05/10/94
COMMENT DEADLINE: 06/09/94
TEXAS 13983
AGENCY: Board of Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Clarifies and supplements documents which must submitted with an application for registration to the Board for Registration for Professional Engineers. Provides for the acceptance of an incomplete application pending receipt of documents from the third-party sources over which the applicant has no control. Concerns engineering experience, education, examinations and Board of review of applications.
AGENCY CONTACT: Charles Nemir, P.C., Executive Director, Texas State Board of Registration for Professional Engineers, P.O. Drawer, 18329, Austin, TX 78760, (512)440-7723.
CITATION: 22 TAC 131.54, .81, .93, .103, .112 Practice and procedure/Application for Registration.
PROPOSAL DATE: 05/13/94
COMMENT DEADLINE: 06/13/94

VIRGINIA 2473
AGENCY: Board for Geology
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Concerns rules and regulations for the Virginia Board for Geology; allows the examination fee to be adjusted in accordance with contracts competitively negotiated under the Virginia Public Procurement Act.
AGENCY CONTACT: David E. Dick, Assistant Director, Department of Professional and Occupational Regulation, 3600 W. Broad St., Richmond, VA 23203, (804)367-5895
CITATION: VR 335-01-2 Rules and Regulations for the Virginia Board for Geology.
PROPOSAL DATE: 05/02/94
COMMENT DEADLINE: 07/01/94
HEARING DATE: 09/16/94

VIRGINIA 2476
AGENCY: Board for Waste Management Facility Operators
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL -- 8
SUMMARY: Sets standards for the certification and conduct of individuals who are responsible for the operation of waste management facilities.
AGENCY CONTACT: David E. Dick, Assistant Director, Department of Professional and Occupational Regulation, 3600 W. Broad St., Richmond, VA 23203, (804)367-5895.
CITATION: VR 674-01-02 Board for Waste Management Facility Operators Licensing Regulations.
PROPOSAL DATE: 05/02/94
COMMENT DEADLINE: 07/01/94
HEARING DATE: 09/10/94

VIRGINIA 2451
AGENCY CONTACT: Dept. of Mines, Minerals and Energy/Board of Examiners
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION -- 18
SUMMARY: Promulgates a permanent regulation for the certification and mineral miners performing specialized tasks in a mine; consolidates the certification standards for coal and mineral mining into one regulation; clarifies the general administrative and examination requirements for applicants and makes them consistent for different types of certification possible.
AGENCY CONTACT: Harry Childress, Chief, Division of Mines, P.O. Drawer 900, Big Stone Gap, VA 24219, (703)523-8100.
CITATION: VR 480-04-2 Board of Examiners Certification Regulations
PROPOSAL DATE: 03/07/94
COMMENT DEADLINE: 05/06/94
HEARING DATE: 04/05/94
ADOPT DATE: 05/11/94
EFFECTIVE DATE: 06/30/94
You should have received your ballots for the AIPG 1994 Officer election. If you have not sent them in yet, please do so. Exercise your right in the election of the officers of the Institute.

As I write this, we in the Forest Service are still mourning fourteen brave young firefighters who lost their lives fighting a forest fire near Glenwood Springs, Colorado. Others in Georgia are mourning the loss of loved ones in the horrendous flooding in that state. The press was present in droves, looking for the most sensational stories they could get, and the politicians were looking for the most sensational press they could get. Let's hope the hurricane season is a mild one this year.

According to the Public Land News, Vol. 19, No. 14, 7-7-94, the opening day of the Mining Law reform conference was a "rowdy opening day". Sen. J. Bennett Johnston (D-LA) achieved his main objective -- his draft bill will serve as the Senate position in subsequent negotiations. This was a crucial move since the Senate moved from the mild bill it approved on May 25, 1993 to Johnston's much stronger stand. This moved the action about halfway towards the very tough HR 322 introduced by Rahall in the House. This action does not bode well for industry.

Within the halls of the Administration, there are changes taking place. The Department of Interior is slimming down. The Bureau of Mines' existence remains a question, the Bureau of Land Management has virtually eliminated minerals from their organization chart, and the USBS (that is the BIOLOGICAL SURVEY) did not get the appropriations they had hoped for.

The Department of Agriculture is in trouble for some of its attempts to reorganize. Apparently some members of Congress take umbrage with decreasing services they think the changes will bring.

One item seems to reign supreme - Ecosystem Management - those are the buzzwords for any agency that even touches on land management. With that comes GIS and a whole new world of thinking, and I might add jobs.

Meanwhile, we must not forget that along without regulations. So here we go with the gleanings from the Federal Register.


These proposed rules are intended to provide for incentives for the remining and reclamation of lands eligible for expenditures under section 402(g)(4) or section 404 of SMACRA.

For further information contact: Douglas Growitz, Office of Surface Mining Reclamation and Enforcement, Room 640 NC, 1951 Constitution Ave., Washington, D.C. 20240, (202) 343-1507.


I list this document because of the following:

Part 1 - Purpose, Policy and Implementation. Section 103 - General Functions. Federal departments and agencies responsible for defense acquisition (or for industrial resources needed to support defense acquisition) shall:
(b) Assess continually the capability of the domestic industrial and technological base to satisfy requirements in peacetime and times of national emergency, specifically evaluating the availability of adequate industrial resource and production sources, including subcontractors and suppliers materials, skilled labor, and professional and technical personnel. --

This includes minerals resources and it seems to me that additional support for the US Bureau of Mines is justified. It seems that the right hand---oh well, you know the rest!!!


The USGS is interested in potential partners that have the following capabilities: National or extended geographic coverage of well servicing and well rehabilitation; financial, marketing, and educational support; and scientific expertise. Interested parties contact: Richard B. Wanty, USGS, Box 25046, MS 916, DFC, Denver, CO 80225, (303) 273-8620.

Sounds like an opportunity for some of you readers.

Karst Control


"The Pressure Grouting Specialist"

Contact: Dave Taylor 314- 828-5858
EXECUTIVE DIRECTOR'S COLUMN

Education - Where Is It Going?

William V. Knight, CPG-0153

When a good friend of mine wrote her high school valedictory address, strongly influenced by her faculty advisor, she titled it "Whither Education." That title has been a source of embarrassment to her ever since. But, it illustrates the influence that professional educators can have on impressionable youth. As I travel about the country, visiting campuses and talking with students and recent graduates, I find that this phenomenon is undiminished. The attitudes, ideals and standards of students usually reflect those of the faculty whom they admire, i.e., their role models. For this reason, if for no other, it behooves all professionals in every field to take an interest in what is being taught on campuses.

Some of AIG's Sections regularly invite faculty members from nearby colleges to speak at their meetings, telling what the departments are doing and what sorts of graduates they are trying to produce. (They range all the way from highly esoteric to highly practical.) The Colorado Section does this each May, inviting speakers from four of the area departments to share the podium. It is an enlightening experience, on all sides.

As most of us know, our profession has been going through some radical changes in recent years. This was reflected in my July column on examinations. The departments feel this and are trying to accommodate to it as best they can. The approaches they take are varied and interesting. At this point, who is to say that any one is better than any of the others?

Those departments which seem to be having the most success in placing their graduates in geological employment appear to have a few things in common, despite the overall differences in their approach.

First, while they try to add technical subject matter to provide for new demands, they seek to maintain a strong "core" program of classical geology. They recognize that one of the main purposes of a college education is to teach students to think and to give them the foundation of concepts and information with which to do it. At the same time, the students must be provided with the technical foundation which will make them sufficiently employable to attract job offers. Thus, the departments must be able to give a multidimensional answer to the students' question, "What am I getting for my money?"

Second, they recognize the need to give their students some understanding and appreciation of the social orders in which they are likely to find themselves. They try to do this with varying emphases on the humanities. Thus, we see some colleges providing a geological major within what is basically a liberal arts curriculum, while others supplement an essentially science curriculum with a dose of the humanities which varies in intensity from place to place. In attempting to prepare their graduates for life in a shrinking world, most offer and a few require some degree of proficiency in foreign languages. Others, recognizing that specific language requirements will change from time to time and place to place, emphasize study of the international differences in social structure and practice. When asked the question, "How are the colleges doing in teaching foreign languages?" one answer was "very poorly." This was countered by the contention that one may come out of college proficient in a language which will never be used, while lacking any familiarity with one which is found to be essential. There are numerous language "short courses" available to bring one up to a basic conversational level, so it might be preferable to take the second approach and study different social customs. But, does this have the same disadvantage as studying specific languages? Who can say? Much depends on the approach in both cases.

One thing that seems to be largely lacking in most departments is any introduction to economic and management theory and practice. It is argued that geology is a science, not

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Executive Director's Itinerary
(subject to change)

The Executive Director is visiting various Sections, agencies, campuses, and other organizations. He is talking, listening, and exchanging information and ideas. Members are encouraged to attend these meetings wherever and whenever possible. His itinerary for the next several months, as presently scheduled, is

Sep. 17: Geoenvironmental Forum, Austin, TX (tentative)
Sep. 30-Oct. 1: Wisconsin Section, Madison, WI
Oct. 7: Utah Section, Salt Lake City, UT
Oct. 12: Executive Committee, Flagstaff, AZ
Oct. 18: Colorado Section, Denver, CO
Oct. 22-28: Geological Soc. of Amer. Convention, Seattle, WA
Oct. 31-Nov. 4: Assoc. of Ground Water Scientists & Eng. Convention, Houston, TX
Nov. 9-14: Assoc. of State Boards of Geology, Chapel Hill, NC
Nov. 18: Colorado Section, Denver, CO
Nov. 30-Dec. 3: North West Mining Assoc. Convention, Spokane, WA

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AUGUST 1994 • The Professional Geologist 25
China Trip Deferred

Arvada, CO, June 27, 1994 - AIPG and American People Ambassador Program of People To People International have agreed to postpone the professional mission to Hong Kong and China which had been scheduled for August 13 through 28, 1994. The principal reason for the postponement was the uncertain climate for Americans in China in view of the current political situation in Korea.

The new date is August, 1995, tentatively the 14th through the 29th. So, mark your calendar now. Invitations will be mailed later this year.

A number of persons indicated that they would have appreciated more advance notice of the 1994 schedule so that they could have better planned for it. That should not be a problem for 1995. Next year's mission is scheduled to be identical to the one planned for 1994. It is to include visits with counterparts, beginning in Hong Kong, then Guangzhou (Canton), Changsha, Beijing, and Guilin, concluding in Hong Kong. We again plan to meet with our colleagues as arranged through the Ministry of Geology and Mineral Resources, the Geological Society of China and the Hong Kong Regional Group of the Geological Society of London. There also are to be separate on-site visits, including the spectacular karst area about Guilin and construction and environmental geology problems of Hong Kong. In addition, we are scheduled to see some of the wonderful historical and cultural sites of China, such as the Great Wall and the Ming Tombs.

Advance reservations for the 1995 mission can be made any time by telephoning the operations office at 1-800-777-0067.

Missouri Passes Registration

On July 6th, 1994 the Governor of the State of Missouri, Mel Carnahan, signed into law Missouri Senate Bill 649 now informally referred to as the Geologist Registration Act, which creates a formal board of geologists and requires geologists working on matters of health, safety and welfare of the public to be registered with the state.

The bill proceeded through both houses without amendment and was sponsored by Senators Howard and Lybyer and Representative McBride.

The AIPG - Missouri Section worked closely with the Association of Engineering Geologists (AEG) St. Louis, to draft the legislation.

The act contains two very important features. One, registration is only required of those geologists doing geologic work where the public health, safety and welfare is at stake. Two, the bill specifically mentions that work classically done by related professions such as soil scientists and geotechnical engineers does not require a registered geologist.

AIPG Missouri Section dedicated funds from its treasury and collected additional funds from its members to cover lobbying expenses.
AIPG Members!

Membership Input Requested

AIPG Referral Service - (Should there be one?)

**Background:** AIPG Headquarters occasionally receives calls requesting referral of a geologist in a given discipline and geographic area. To show no favoritism (and in some cases to protect Member's privacy), callers are generally referred to the membership directory, which is not free, and may be confusing to nonmembers. Perhaps information on where certified professional geologists may be located should be more available. This type of information is common in medical and legal professions. Some Members of the AIPG executive committee have proposed that a voluntary referral list be kept at the headquarters, cross-referenced by specialty and geographic area. CPGs would be put on the list by request. **Referrals would be made stating simply that these individuals are Certified Professional Geologists with declared specialty(ies).** Responses would be in the form of a list of CPGs that fit the specialty and geographic description. The AIPG executive committee requests membership input on the following questions:

1. Should the AIPG be in the referral business?

2. Would this be a valuable service to Members?

3. Would Members who want to be listed pay a nominal charge for maintenance of the list? (no cost to Members who do not want to be on the referral list)

4. How detailed should specialties be listed? (e.g. instead of "petroleum geology", could the referral also list "-log analyst"; or "hydrogeology/ground water modeling", etc.)

5. Would it pay to advertise? (i.e. If there is sufficient response, would it be appropriate for the AIPG to place ads in national publications such as the Wall Street Journal announcing the availability of the service, thereby promoting the use of CPGs.)

**Your response, comments, or ideas will be appreciated!**

**Mail or FAX to AIPG Headquarters, Attn: Referral Svc. (303) 431-1332**

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**Short-Course Series**

**Principles and Applications of MODFLOW**

**October 18-21, 1994**

Instructors:
Peter F. Anderson and Robert M. Greenwald (Geo Trans, Inc.)

This course focuses on the use of the U.S.G.S. Three-Dimensional Finite-Difference Ground-Water Flow Model MODFLOW and its accompanying programs. Lectures on the principles of ground-water flow modeling and the use of MODFLOW will be complemented by hands-on computer sessions during which participants will work through a series of real-world problems.

For more information contact the IGWMC.

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**IGWMC International ground water modeling center**

Institute for Ground-Water Research and Education
Colorado School of Mines
Golden, Colorado 80401-1857
Phone: (303) 273-3103 FAX: (303) 273-3278
In State 800-245-1060
Out of State 800-446-9488

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AIPG Foundation Contributions

During 1993 the following members and organizations contributed to the AIPG Foundation:

**Ben Parker Circle**
- David M. Abbott, Jr.
- John D. Haun
- Grover E. Murray

**Inner Circle**
- Kelvin J. Buchanan
- William L. Fisher
- William M. Greenslade
- Adolf U. Honkala
- Travis H. Hughes
- Ernest K. Lehmann
- Charles J. Mankin
- Russell G. Slayback
- Dan F. Tobin

**Centurian**
- Severn P. Brown
- Rev. Robert L. Brownfield
- Lorraine C. Council
- Robey H. Clark
- Russell R. Dutcher
- Sherill E. Drum
- Richard E. Faggiolli
- James A. Gibbs
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- Michael T. Halbouty
- Kenneth F. Keller
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- Konrad B. Krauskopf
- Wilbur E. McMurtry
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- Richard M. Powers
- Richard H. Ragle
- Noel M. Ravneberg
- Michael J. Ryan
- John W. Rold
- Duane H. Sackett
- Helen L. Sadik-McDonald
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- Peter J. Schreuder
- Michael J. Skopos
- Robert R. Smart
- Clay T. Smith
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- Dewitt C. Van Siclen
- Victor H. Veroda
- Ronald J. Wallace
- Robert J. Wahlstrom
- Robert C. Warthen
- Russell Wayland
- John W. Webb
- Robert J. Weimer
- James F. Wescott
- Dall A. Wilson
- Clyde F. Wooton
- Milton Zeni

(One anonymous contributor)

**Organizations**
- Arco Foundation Inc.
  (Matching funds for R.F. Kraze)
- Illinois-Indiana AIPG Section
- Northeast AIPG Section

Note: Ben Parker Society $1,000 and over; Inner Circle $500 and over; Centurian $100 and over.

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**Europe’s First Professional Geologists**

The European Federation of Geologists (EFG) represents 65,000 geologists.

June 11, 1994 - EFG awarded the first professional title of European Geologist to 21 of its members. In a ceremony in the Geological society’s office in Burlington House, London, certificates were presented to six of these European Geologists.

Eva Paproth, (Germany), Christian Schaffitzky, Gareth Jones (Ireland), Richard Fox, Gilbert Kelling, John Shanklin (United Kingdom).

The title recognizes high standards of education and experience and will encourage the free movement of geologists throughout Europe.
AIPG MEMBERSHIP BENEFITS

Certification
AIPG certifies the qualifications of professional geologists prior to admitting them into membership. By means of a rigorous and thorough peer review process, the Institute investigates applicants who voluntarily apply for self-regulation through the Institute. This screening carefully evaluates their education, experience, technical competence, and ethical conduct. If they meet AIPG's high standards, applicants are granted Certification and the title of "Certified Professional Geologist" (CPG). When the letters CPG follow an individual's name, they proclaim to the public that this person has met the standards and subscribes to the Institute's Code of Ethics and Bylaws.

Representation
Members are represented by qualified geological professionals. Congress, Legislatures, and Federal and State agencies are lobbied on specific mining, petroleum, water, environmental and other issues of special interest to geologists.

A portion of AIPG's monthly magazine The Professional Geologist (TPG) is devoted to reporting developments at all government levels. Thirty-six sections of AIPG provide group representation on a state or regional level and offer opportunities to meet, work and exchange ideas and information with colleagues.

Education
At the national and section level, AIPG provides materials designed to enhance the professional knowledge and skills of its members. Educational opportunities range from seminars and short courses to sectional and national meetings. To encourage high standards of educational programs, the Institute recently established a program of Accreditation of Continuing Education opportunities offered by other organizations.

The Institute prepares and distributes comprehensive publications giving background and scientific explanations on geologically-related matters of public concern. Topics include: ground water, radioactive waste, and hazardous waste.


Insurance
Professional liability, health, and life insurance are available to members.

Information
AIPG disseminates information to its members and to the public in a number of ways on a wide variety of topics. The Institute publishes a monthly magazine The Professional Geologist (TPG). It is mailed to members and interested individuals, businesses, and political leaders. Subscriptions are available to non-members.

A comprehensive Membership Directory is published annually. Copies are sent to federal, state, regional and local governments, libraries, consulting firms, corporations, and other potential users of geologic services throughout the United States and abroad. The Directory may also be purchased by non-members.

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1994


Oct 3-5. 1994 Focus Conference on Eastern Regional Ground Water Issues, Burlington, VT. Contact: National Ground Water Association, P.O. Box 182039, Dept. #017, Columbus, OH 43218-2039, Ph.: (614) 551-7379.


Oct 11-13. 8th Annual Regional Environmental Business & Management Conference & Expo - Beyond 2000 Organizing For Environmental Compliance, Denver, CO. Contact: Environmental Resource Specialists, P.O. Box 440112, Aurora, CO 80044, Ph.: (303) 690-4245.


Nov 1-4. Covers and Liners for Landfills. Mobile, AL. Contact: Dan Thompson, The University of AL, Box 870388, Tuscaloosa, AL 35487, Ph.: (205) 348-9937.


Nov 2-4. Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Protection, Detection, and Remediation, Houston, TX. Contact: National Ground Water Association, P.O. Box 182039, Dept. #017, Columbus, OH 43218-2039, Ph.: (614) 551-7379.


Nov 28-29. NWMA 100th Annual Convention, Short Course & Trade Show, Spokane, WA. Contact: Northwest Mining Association, 10 N. Post, Ste. 414, Spokane, WA 99201-0772, Ph.: (509) 260-6244.


1995


Mar 6-9. SME/AIME 124th Annual Meeting & Expo, Denver, CO. Contact: Meetings Dept., SME, P.O. Box 625002, Littleton, CO 80162-5002, Ph.: (303) 973-9550.


May 2-5. International Trade Fair and Congress for the Geosciences and Geotechnology, Cologne, Germany. The correspondence address: Alfred-Wegener-Siittung, Wissenschaftszentrum, Alt-strasse 45, D-53175 Bonn.

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ATEC Associates, Inc.                                      BC
Geraghty & Miller, Inc.                                    6
International Ground Water Modeling Center                 9
International Ground Water Modeling Center                 27
Job Bank USA                                               10
Krueger Enterprises, Inc.                                 13
Northern Environmental                                      7
Spatial Utilities, Inc.                                    26
Strata Services                                            24

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1995

1996

1997

1998

2000

30 The Professional Geologist • AUGUST 1994
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