TPG ARTICLES

AIPG needs quality articles for future issues of *The Professional Geologist*. Members are encouraged to submit articles or call Headquarters and recommend individuals who should be asked to submit articles. Submissions should be 800 to 1600 words in length. Articles submitted on diskette along with a hard copy are appreciated. Headquarters uses DOS, WordPerfect 5.1, and can utilize 3 1/2 or 5 1/4 diskettes. Photographs, figures, tables, etc., are welcome. Photographs enhance articles and make great TPG covers. Be sure to send photographs when possible with your articles OR send your favorite photograph for consideration as the cover for a future TPG issue. Submission deadline is six weeks preceding month of issue.

EDITORIAL EMPHASIS

**TECHNICAL TOPICS**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Geology</td>
<td>January</td>
</tr>
<tr>
<td>Petroleum Geology</td>
<td>March</td>
</tr>
<tr>
<td>Hydrogeology</td>
<td>July</td>
</tr>
<tr>
<td>Environmental Geology</td>
<td>September</td>
</tr>
<tr>
<td>Geophysics/Engineering</td>
<td>November</td>
</tr>
</tbody>
</table>

**PROFESSIONAL TOPICS**

- Government and the Geologist
- Ethics and Standards of Practice
- Public Perception of Geology and Geologists
- Definition, Certification, and Licensing
- Practicing Geology Internationally

Send your article and/or photograph TODAY to:

*The Professional Geologist*

AIPG - Editor

7828 Vance Drive, Suite 103

Arvada, CO 80003-2125

For further information on articles or advertising call Wendy Davidson at (303) 431-0831

FAX (303) 431-1332

QUALITY CONTROL

Please contact AIPG Headquarters if any issue of *The Professional Geologist* you have received has had blank or double printed pages.

The CITIZENS’ GUIDE to Geologic Hazards

A guide to understanding geological hazards including asbestos, radon, swelling soils, earthquakes, volcanoes, landslides, subsidence, floods and coastal hazards.

Published by the American Institute of Professional Geologists, *The Citizens’ Guide to Geologic Hazards* is written by professionals for a more general audience. It combines solid, practical content with easy readability. Through over 100 color illustrations, the reader is introduced to the role geologists play in preventing losses from geological hazards.

- List price $19.95. Members’ price $15.95. All orders must be prepaid.
- Published April, 1993.
- An additional $5.00 is required for shipments outside of the U.S.

SLIDE SET NOW AVAILABLE!

- Set of fifty 35mm slides available for $65.00

Please send your order to:

*American Institute of Professional Geologists*

7828 Vance Drive, Suite 103

Arvada, CO 80003

(303) 431-0831

SAVE TIME

FAX YOUR ORDER

(303) 431-1332

VISA and MASTERCARD accepted.

AIPG Membership Totals

<table>
<thead>
<tr>
<th></th>
<th>As of 05/22/93</th>
<th>As of 05/23/94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>3,842</td>
<td>4,243</td>
</tr>
<tr>
<td>Retired</td>
<td>509</td>
<td>520</td>
</tr>
<tr>
<td>Affiliates</td>
<td>39</td>
<td>74</td>
</tr>
<tr>
<td>TOTALS</td>
<td>4,390</td>
<td>4,837</td>
</tr>
</tbody>
</table>
The Professional GEOLOGIST

FEATURES

The Drilling Program – An International Partnership In Geological Oceanography
William D. Rose, CPG-0783

Guest Editorial
Ethics Considered
Adolf U. Honkala, CPG-0007

Doing Well By Doing Good
Ernie Lehmann, CPG-0688

AIPG Cooperative Evaluation Program
Robert G. Corbett, CPG-4502

Legislative Affairs Advisor Retained By AIPG

Cobalt Exploration In Missouri
Mark A. Koestel, CPG-9307

Problems Of A Geologist With Laymen Friends
Melinda Ebert, CPG-8737

Opinion
Take Back The Power
Ron W. Pritchett, CPG-7063

COVER - San Francisco Peaks, northern Arizona. These are the nucleus of the San Francisco Volcanic Field which has 400 plus volcanoes of Quaternary age. Triassic Moenkopi Formation (sandstone, siltstone and mudstone) in foreground. Photograph by Mark A. Koestel, CPG-8307

DEPARTMENTS

PRESIDENT'S MESSAGE
STATE NET
TODAY IN WASHINGTON
EXECUTIVE DIRECTOR'S COLUMN AND ITINERARY
CONSULTANTS' COLUMN
LETTER TO THE EDITOR
MEMBERS IN THE NEWS
CALENDAR
NEW MEMBERS, APPLICANTS, ETC.

 Entire contents copyright 1994 by The Professional Geologist. Original material may be reprinted with permission. Deadline for articles and advertisements is six weeks preceding publication. Advertising rates available upon request. Opinions and views expressed by the authors are their own and do not necessarily reflect those of the American Institute of Professional Geologists, its staff, or its advertisers.

 POSTMASTER: Send address changes to:
AIPG, 7828 Vance Drive, Suite 103, Arvada, Colorado 80003-2124.
Governance Of AIPG

Russell G. Slayback, CPG-2305

The greatest strength, and potentially the greatest weakness, of AIPG are its individual state or multi-state sections. National AIPG cannot hope to meet all of the professional aspirations of members around the country because so many issues are local, driven by local politics, the local economy, the nature of regional resources and the distribution of geologists within a section's territory. Local sections are the key to a strong and influential AIPG. The strength of our individual sections varies from year to year and depends on the leadership of the current section officers and executive committees. Some sections have a tradition of strength, some have surged and ebbed, and others have struggled for many years. Sections that are the strongest hold frequent meetings, are politically active and keep their members informed by publishing newsletters. Some sections have the natural edge of having the majority of their members based around a single center of population and others struggle to reach widely-scattered members.

Regardless of the local situation, I don't believe there is any society in geology where it is so easy to become a local leader, and then eventually a national leader of AIPG. If you call the president of your local AIPG Section, volunteer for a committee and indicate your interest in getting on the section executive committee, you will be put to work. If you give it any real effort, your chances of being asked to run for the executive committee are excellent. As in any small organization, those who perform well are asked to run to become section officers.

The individual AIPG Sections are represented directly within national AIPG by the Advisory Board, and each year four members of the Advisory Board are elected by their colleagues to the national Executive Committee. This year, Lisa Worthington (Arizona), Phil Davis (Minnesota), John Philley (Kentucky) and Larry Weber (Tennessee) are the Advisory Board representatives on the AIPG Executive Committee.

Depending on the bylaws of each section, the Advisory Board Delegate may be the Section President, its Past President or an individual designated by the Section President. Each Advisory Board meets twice at an Annual Meeting of the Institute, once mainly to elect its representatives to the next Executive Committee, and then again at the next Annual Meeting to report on section progress and problems, and to offer advice to the Executive Committee. The Executive Committee generally acts on Advisory Board resolutions by adopting them in whole or in part, or setting up a feasibility study where appropriate.

Membership on the Advisory Board and election to the Executive Committee is the most common route to becoming an officer of AIPG. Strong performance as an active and involved section officer also works. Those who work hard, perform well and show common sense are eventually recognized by nomination to run for national offices. AIPG is unusual among geological societies in that all of its officers run in contested elections.

So if you aspire to make an impact on AIPG, start at your local section level by volunteering for section committees. Each year, the national President invites volunteers to offer their services on a variety of standing and ad hoc committees. Volunteers for specific committees are turned aside only when a committee is fully staffed, and generally a volunteer is offered the opportunity to join another committee.

SO GET INVOLVED!

VOLUNTEER!

ATTEND A NATIONAL ANNUAL MEETING!

WHY NOT GET STARTED AT FLAGSTAFF THIS OCTOBER?
The Ocean Drilling Program — An International Partnership In Geological Oceanography

William D. Rose, CPG-783

Introduction

When Leg 155 sailed from Barbados in March to core the Amazon Fan off the northeast coast of South America, the Ocean Drilling Program (ODP) began its 55th drilling leg.

This program of "scientific ocean drilling," which involves mostly coring, consists essentially of basic research into the history of the ocean basins and the overall nature of the crust beneath the ocean floor. Thus the term scientific ocean drilling is not meant to disparage the great amount of scientific effort that goes into identifying prospective areas for exploratory and development drilling for mineral resources but only to characterize ODP's operational purpose.

The program is funded principally by the National Science Foundation (NSF) with substantial contributions from our international partners. In addition to the United States—the majority shareholder—full partnerships in ODP are held by the Federal Republic of Germany, France, Japan, and the United Kingdom. Australia and Canada hold a joint partnership. Another partner is the European Science Foundation, represented by Belgium, Denmark,
This program remained at Scripps until 1983, when the NSF, the principal funding agency, designated Texas A&M University, College Station, as the science operator. At this time the name Ocean Drilling Program was adopted.

**Current ODP Operations**

The drilling vessel chartered by ODP, the Sedco/BP 471, was built in 1978 in Halifax, Nova Scotia, as a conventional oil-drilling ship. She was refitted in Pascagoula, Mississippi, during the fall of 1984 to accommodate the laboratory stack's seven levels and other scientific facilities and equipment necessary for carrying out the program's objectives. Thus she is probably the best equipped vessel in the world for conducting research in marine geology.

When drilling operations began in January 1985, the ship was informally christened JOIDES Resolution after Captain James Cook's flagship of two centuries ago, HMS Resolution.

The Resolution is 471 ft (144 m) long and 70 ft (21 m) wide. Her derrick rises 211 ft (64 m) above the waterline. The ship maintains location, even in heavy seas, by means of 12 computer-controlled thrusters, which are part of her dynamic-positioning system. She can drill in water depths to 27,000 ft (8230 m) and handle as much as 30,000 ft (9144 m) of drill pipe (Figure 2). Contrary to standard petroleum practice, drilling is done in riserless mode; therefore, extreme caution is exercised at all times in avoiding significant hydrocarbon accumulations.

The ship's laboratories, from top to bottom, include those for downhole measurements; core handling, sampling, and description; physical properties; paleomagnetism; paleontology; thin-section preparation; X-ray analysis; and photography. Refrigerated cores are stored in the lower two levels. An underway-geophysics lab is housed in the poop deck, beneath the helipad.

---

**Background**

As many readers know, deep-ocean drilling did not begin with ODP, but with its predecessor, the Deep Sea Drilling Project (DSDP). This program was based at Scripps Institution of Oceanography at La Jolla, California, a division of the University of California, San Diego.

In 1964 the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) was formed in the United States (Rabinowitz et al., 1986), and in 1968 drilling operations began under their aegis with DSDP and its drilling vessel, the Glomar Challenger. A total of 96 legs were drilled.

The program became international in 1975, with the addition of the U.S.S.R., the Federal Republic of Germany, France, Japan, and the United Kingdom. Thus began the international phase of ocean drilling (IPOD), which has continued to the present.
Each drilling leg lasts about 2 months, resulting in 6 legs per year on average. The ship's complement includes about 28 scientists, 20 ODP engineers and technicians, and a crew (including drilling personnel) of 62. Two co-chief scientists and one ODP staff scientist sail on each leg.

Advanced computing equipment is available to aid the seagoing scientists in capturing and processing data electronically, thus speeding up data acquisition and the processing of texts, illustrations, and tables for later publication by ODP. This equipment includes about 50 Macintosh and 50 IBM-compatible microcomputers, 3 Unix (Sun) workstations, and a central processing unit of 2 VMS VAX Cluster DEC 3500 series, all linked to an Ethernet local-area network.

Geophysical and geochemical logging is an important part of the program. The Borehole Research Group of LDEO supervises this activity, which comprises the usual suites of geophysical and geochemical logs used by the petroleum industry, plus several wrinkles specific to ODP goals. The Formation MicroScanner, a Schlumberger tool, is especially helpful in providing detailed, high-resolution images of the borehole wall for determining lithology, bedding, and fracture patterns, especially in zones of poor or no core recovery, and for correlating coring and logging depth.

Some of ODP’s major engineering developments include a hard-rock guide base for spudding-in on bare rock (typically basalt), thus stabilizing the drill string; reentry cones to be placed at the seafloor so that previously drilled holes can be re-worked or deepened; a diamond-cor-ing system, a slim-hole system based on mining-industry technology, for better core recovery of igneous and metamorphic rock, which is commonly fractured; the use of cement slugs for stabilizing the hole in drilling through rubble; and a downhole television system, which facilitates reentry and other downhole applications (Francis, 1987). A multisensor track was installed in the core lab, which is a three-in-one device that contains (1) a gamma-ray attenuation porosity evaluator (GRAPE), (2) a compressional-wave (P-wave) logger, and (3) an instrument to measure magnetic susceptibility.

During 9 years of drilling operations, a total of 773 holes were drilled at 311 sites on 53 legs, with a recovery of more than 87 km of core. Most of the core barrels used are 31 ft (9.5 m) long.

The Published Results

The results of each 2-month drilling leg are published as the Proceedings of the Ocean Drilling Program, which comprises two series of reports: (1) an Initial Reports portion, published within 1 year after the cruise, and (2) a Scientific Results portion, published within 3 years after the cruise. Both of the reports covering a single cruise constitute a complete volume for that cruise. About 12 books, or the equivalent of 6 complete volumes, are published.

"WHEN THE WELL’S DRY... WE KNOW THE WORTH OF WATER"

Spoken by BENJAMIN FRANKLIN Nearly 250 Years Ago

It’s easy to forget the importance of basic necessities — that is until they run short. Unfortunately too many communities have learned the cost of ground-water contamination too late. Northern provides expert, practical services to help you manage or restore your ground-water resources.

Northern has a staff of talented hydrogeologists and geophysicists who specialize in ground-water exploration, wellhead protection, and environmental geophysics. We provide services to environmental consultants, civil engineers, municipalities, and industry nationwide.

Our services will help you incorporate an effective geophysical survey into your ground-water remediation plan, expand your ground-water supply capacity, or protect your existing supply from contamination.

We combine solid technical competence with imagination for problem solving and we share your commitment to managing our ground-water resources wisely.

Call Northern today to discuss your ground-water problems before the well runs dry.
1-800-776-7140

Northern Environmental™
Hydrologists • Engineers • Geologists
Your Experienced Technology Source
and portions of volumes for Legs 101 through 149.

Benefits of Deep-Ocean Drilling
Results from both DSDP and ODP drilling have confirmed some beliefs about the geology beneath the seafloor, questioned others, and brought surprising discoveries, opening new avenues of thought. These investigations thus have resulted in some of the most exciting revelations about the Earth in this century. Some of these findings are listed in the next two sections.

DSDP Results
Some of the salient results from DSDP:
1. Confirmed seafloor spreading;
2. Revealed the relative youth of the Earth's crust beneath the oceans;
3. Uncovered evidence that the Mediterranean Sea had dried up before refilling later, on the basis of massive evaporite deposits;
4. Confirmed widening of the Atlantic and shrinking of the Pacific;
5. Confirmed the fixed location of a hot spot in the mantle in relation to northwestward movement of the Hawaiian Islands and the Emperor Seamounts;
6. Confirmed the basaltic nature of oceanic crustal rocks;
7. Provided a better understanding of the diagenesis of oceanic carbonate sediments and how some of these changes might reflect profound oceanic events;
8. Confirmed the relation of crustal age to magnetic anomalies;
9. Advanced knowledge of source-rock processes, thermal history, and the formation of gas hydrates;
10. Initiated a new field of study—paleoceanography—by means of systematic sampling. For more complete information on these and additional findings, see Revelli (1981), Garrison (1981), Ruenolden (1981), and JOIDES (1982).

**ODP Results**

At the Second Conference on Scientific Ocean Drilling (COSOD II), held in Strasbourg, France, in 1987, conferences identified five main programs for ODP investigation: (1) changes in the global environment, (2) mantle-crust interactions, (3) fluid circulation in the crust and the global geochemical budget, (4) stress and deformation of the lithosphere, and (5) evolution and extinction of oceanic biota (JOIDES, 1987).

Some results from ODP drilling have addressed the above objectives in the following ways:

1. A broad-scale linkage, at least for the past 3 million years, has been documented between the polar components of the climate system and the low-latitude ocean-atmosphere components.

2. The age of the oldest sediment in the Argo Abyssal Plain is some 20 million years younger than was previously believed and suggests a Cretaceous rather than a Late Jurassic opening of the Indian Ocean.

3. Drilling of Western Pacific guyots indicated a relative sea-level fall of at least 160 m between the late Albian and middle Turonian ages of the Cretaceous Period.

4. The Great Barrier Reef, off northeastern Australia, is less than 1 million years old, substantially younger than was previously believed.

5. A cased reentry hole was established southwest of Oahu, Hawaiian Islands, as a link in the Ocean Seismic Network, the first of a global array of permanent geophysical observatories on the deep ocean floor dedicated to the investigation of earthquakes and the structure of the Earth.

6. Drilling at the Hess Deep rift valley recovered the first gabbroic rocks of Layer 3 of Pacific oceanic crust and peridotites from the uppermost mantle.

7. A Jurassic age was confirmed for the Pigafetta Basin in the Western Pacific.

8. Gas hydrates were recovered from sediments above bottom-simulating reflectors, and free gas was encountered below the reflectors at the Cascadia margin, off the coast of Oregon, Washington, and British Columbia.

9. Low-chlorinity fluids and hydrocarbon gases of subduction-related origin were documented within the Mariana serpentinite seamounts in the Western Pacific.

10. Rifting between Broken Ridge and the southern Kerguelen Plateau in the South Indian Ocean was caused by intraplate stress (passive rifting) rather than by mantle convection (active rifting).

11. Drilling on the Okushiri Ridge demonstrated that compressive tectonics began to collapse the northeast margin in the Japan Sea, starting about 1.8 million years ago, possibly representing initiation of a new subduction zone.

12. Drilling in much-visited Hole 504B in the eastern equatorial Pacific, the deepest hole in the ocean floor at 2111 m below the seafloor, has confirmed seismic and petrologic models for the layered structure of the uppermost 2 km of ocean crust; consequently the site has become a reference section for the petrology, geochemistry, hydrothermal alteration, and magnetic and physical properties of the upper crust.

**Future Operations**

Last year a committee was selected by the Joint Oceanographic Institutions, Inc., and the U.S. Science Advisory Committee to address scientific concerns in ocean drilling. The committee recognized that the role of the United States as a major contributor needs to be defined in the context of the possibility that such drilling may be multiplatform, rather than from a single vessel, by the 21st century. Some of the committee's recommendations follow (Kappel, 1993):
1. Drilling is an essential tool of the marine earth science community in the United States and should continue beyond 2003.

2. The U.S. community requires a drilling program global in scope and internationally organized and funded.

3. Future U.S. scientific programs will require access to two different types of drilling platforms: a modified JOIDES Resolution-class vessel and a platform capable of deep drilling (> 2 km).

4. The U.S. drilling community will need a JOIDES Resolution-class capability at least to the year 2003.

5. Beyond 2003, there is a clear need for significantly enhanced capabilities beyond the JOIDES Resolution, including deep drilling and facilities for borehole-based experiments.

Following this committee’s report, the science operator for ODP, Texas A&M University, has undertaken discussions with Overseas Drilling, Ltd., from which the drilling vessel is chartered, about the possibility of enhancing the capabilities and extending the life of the JOIDES Resolution. Preliminary studies indicate that the life of the ship could be extended for at least 20 years beyond the turn of the century and her capabilities considerably enhanced.

Among the enhancements proposed are the following:
1. Lengthening the vessel by 100 ft (30.5 m);
2. Providing storage space for a slim-line riser 4000 m (13,124 ft) long;
3. Strengthening the derrick and its substructure to allow deeper penetration into the seafloor;
4. Improving laboratory space and accommodations.

The cost of the refitting required to carry out these improvements would be only about 20% of the cost of building a new vessel.

Acknowledgments
I thank the following ODP colleagues for providing information and assistance in preparing this article: Philip Rabnowitz, director; Timothy Francis, deputy director; Jack Baldauf, manager of science operations; Karen Riedel, coordinator for public information; Joan Perry, data librarian; Deborah Partain, chief illustrator; and John Beck, senior photographer.

References


Kappel, E., 1993, Future course of scientific ocean drilling: Eos, Transactions, American Geophysical Union, v. 74, p. 556.


Honors For A Fossil Sponge

What if all fossils could get the notice of Titusvilla drakei. This Upper Devonian sponge was described by University of Cincinnati paleontologist Kenneth E. Caster in 1939 based on material collected along Church Run near downtown Titusville, PA. In his description, Caster wrote: "The name Titusvilla drakei is given in recognition of the place of discovery of the holotype specimen and for the founder of the oil industry in Pennsylvania [Col. E.L. Drake], without the ramifications of whose enterprise geology and paleontology could not have reached the station of eminence they hold today." That was enough for Samuel T. Pees, President of The Colonel, Inc., the associates group of the Drake Wells Museum in Titusville. Pees convinced the city to erect an historical marker at the Church Run site, perhaps the only such marker for an invertebrate fossil in the country. The unveiling of the marker was attended by no less than a local priest, who gave a benediction, a high-school marching band, representatives of town council and the Pennsylvania Geological Survey and Dr. John Pojeta of the U.S. Geological Survey, a former student of Caster's, who gave a few short remarks.

Reprinted from Nov. 1993 American Paleontologist.
Ethics Considered

Adolf U. Honkala, CPG-0007

For so many people today's outlook on life is to ignore the fundamentals for the sake of progress. This method of expediting one's career or trying to solve a problem can create enormous difficulties in the future. In all that we do the most fundamental control over our actions is the standard of ethics that we live by. Surely whether we are driven by Christian morality or by secular norms our ethical behavior determines our relationship with friends, associates and the general public's view of us as a person.

Glenn Loury, writing in the Richmond Times Dispatch on twenty-five years after Kerner - the Kerner Commission Report - states, "The advocacy of a conception of virtuous living has vanished from the American Public discourse." Surely one does not have to look hard at what goes on about us to support this statement. Students cheat on exams, public officials lie, some scientists publish only the facts to support their views for personal gratification, manufacturing companies leave problem parts in the equipment despite the knowledge of future trouble and so on. In most cases some person or persons have had the opportunity to say no, this should not be so, or that an unethical action is going on. The concept that is everyone does it - who cares! Thus it is that ethics are put down as a puritanical concept of living whose time has passed. Excuses are made for what someone has done because their actions fall into the avant-garde culture - that is, those who know what life is really about can decide if ethics are a factor in the case at hand.

These conceptions of life actions noted are far from the truth of reality. No matter how lacking a person is in morality and ethics they do look up to a standard, primarily because then there is a knowledge of what to avoid. Some people appear to have the feeling that if it's ethical it is so right that a person cannot proceed to make a way ahead if an ethical course if followed. This thought is the farthest from the truth.

What greater feeling can there be than to know that as a geologist you have struck a fair deal, given an honest answer to the best of your ability, considered the views of the others and have obeyed the laws pertaining to your activity. A clean lease; a valid, unbiased accurate opinion given; an owner protected and all rules considered are some of the needs of an ethical consideration or decision. In effect there must be an ethical tone that keeps the inner self confident and the exposed self clear of public retribution. To understand what this means as a geologist proceeds down the career path is so important.

Obviously there is a continual and primary need for AIPG to preserve the ethics of the profession, as practiced by our members, so that reliance on geological decisions is not clouded by unethical behavior. Furthermore the place in society of the Certified Professional Geologist means what it says-certified as to the skills and sound as to ethics. The cannons of the AIPG Code of Ethics as published on Page 36 of the Directory are there for a reason. Let's all make an effort to read them and rededicate ourselves to their principles. Perhaps they should be the cover page of the Professional Geologist once a year as a reminder to all.

Adolf U. Honkala, CPG-0007, of Midlothian, Virginia is a past-president of AIPG and currently the treasurer of The AIPG Foundation.
Doing Well By Doing Good

Ernie Lehman, CPG-0683

"DOING WELL BY DOING GOOD" was said to be the motto of the first missionaries to Hawaii who not only "brought" religion to the islands but started the sugar and pineapple plantations that formed the early underpinnings of the economy of the islands.

Doing well by doing good is still possible thanks to the US tax laws which encourage giving to your favorite cause, such as the AIPG Foundation.

To facilitate such gifts by those who wish to take advantage of the opportunities for doing both well and good under the income and estate tax codes, the AIPG Foundation has entered into an agreement with The Saint Paul Foundation. This agreement enables AIPG members and friends to take a full range of deferred giving opportunities to the benefit of the donor, the donor's family and the Foundation.

In addition to straight cash gifts or simple bequests, you can now make deferred gifts such as the following:

- Pooled Income Fund Gifts which provide a life-time income to the giver and, if desired, a spouse or other persons. This income varies with the performance of the Fund.
- Charitable Gift Annuities which provide a fixed income to the giver and spouse. The amount of income is determined by the age of the income recipients. Income can either start at the time of the gift or be deferred for a period of years.
- Charitable Reminder Unitrusts which can provide variable income that serves as an excellent hedge against inflation.
- Charitable Reminder Annuity Trust that provides fixed income for life.

Gifts of such funds to the AIPG Foundation may be administered through The Saint Paul Foundation (at the donor's discretion) assuring donors of the highest standards of professional management at a very reasonable cost.

In each case, by making a gift to the AIPG Foundation, the giver can take a current charitable deduction against current income and still receive the income from the gift for life of the persons specified. Even greater tax benefits are available if the gift consists of appreciated stock, real estate or other property which would be subject to capital gains if sold. The gift also reduces eventual estate taxes to one's heirs. Many other variations are available, including coupling the gift with insurance to provide an estate for one's heirs.

Why did the AIPG Foundation choose The Saint Paul Foundation to help in this program? The Saint Paul Foundation is itself a charitable community foundation that has made assisting other foundations and non-profit organizations in building endowment and programs part of its mission. It now manages over $350 million in assets and its Community Pooled Income Fund Program now serves over 125 charitable agencies in the upper Midwest. It has agreed to assist the AIPG Foundation in providing the professional services of gift development, closure and processing, at essentially no cost, and to provide ongoing professional investment and administration at a very reasonable cost. Your Foundation can provide AIPG members and friends with these gift opportunities to do well by doing good.

If you wish more information, please contact the AIPG Foundation, Suite 622, 12 South 6th Street, Minneapolis MN 55402, (612)338-5584, FAX (612)338-5457.

Ernest K. Lehmann, CPG-0683, is a past-president of AIPG and is currently Chairman of The AIPG Foundation.

Isotopic Analyses for Geology and Hydrology
GEOCHRON LABORATORIES
a division of Krueger Enterprises, Inc.

- K-Ar age determinations
- $^{14}$C age determinations
  (including A.M.S.)
- Rb-Sr age determinations
- U/Pb age determinations
- Tritium analyses
- Pb isotope analyses
- Sr isotope analyses
- Stable Isotope Ratio Analyses (SIRA)
  $^{18}$O/$^{16}$O $^{13}$C/$^{12}$C
  D/H $^{15}$N/$^{14}$N $^{34}$S/$^{32}$S
- Full-time professional staff
- Serving the geological community since 1960

Our expert staff is available to advise you in sample collection, and to assist in the interpretation of results. Please contact us for a complete price list and brochure.

711 Concord Avenue
Cambridge, MA 02138
Telephone: (617) 876-3691
Telefax: (617) 661-0148
AIPG Cooperative Evaluation Program

Robert G. Corbett, CPG-4502
Chairman of the Academic Education Committee

Undergraduate geology programs may benefit from one or two stages of program evaluation, provided as a service by the American Institute of Professional Geologists. Such an evaluation is initiated upon formal request by the Department Head or Chair to AIPG. (Sorry, requests directly from an individual faculty member, dean, provost, or president cannot be honored.)

Curricular review examines program quality and soundness as measured by expectations of AIPG for preparation of majors for professional practice. Expectations are presented in the 1991 AIPG publication Education for Professional Practice.

Other consideration involve review for adequacy of resources including faculty strengths, library resources, equipment, space, operating budget, frequency of course offerings and related matters. We also examine student opportunities to develop a sense of professionalism and ethics.

An evaluation can be undertaken through the first stage at no cost to the department. A questionnaire is completed by the department, and AIPG will respond in writing and in confidence (only the department is privy to the results). A follow-up review involving a 2-3 day site visit may be requested by the department, for which the department is obligated to pay travel expenses and provide clerical assistance to a team of three AIPG members. Team members receive no fee or honoraria for this service. A typical team includes one AIPG member located near and familiar with the department, and two others. A team is formed such that it has a balance of geologic interests, career employment, and professional concerns. At least one member of the team will be one of the eight members of the Academic Education Committee in order to provide consistency in the review and in the report. A typical report consists of formal evaluation, and an informal separate list of suggestions, many of which are practical hints of how to be more effective with current resources. The department is free to share parts or all of either report with anyone they choose, or to dismiss the report entirely. A collegial attitude, rather than an adversarial tenor describes this process. Department faculty find the evaluations eye-opening, a re-enforcement of their existing perceptions and/or of great value in bargaining for additional needed resources.

AIPG provides the service at no cost or low cost to assist faculty and programs in adjusting to the evolving mix of skills and competencies required of graduates.

Program evaluation is required periodically on many college campuses. We believe that realistic perspective and a credible report results from AIPG’s involvement. The report can be revealed to college administrators, in total, in part, or not at all, removing any threatening aspect which could be associated with this service. Although we use AIPG standards for evaluation of degree programs designed to prepare career geologists, we will include general observations on the quality of the related programs if requested (such as the B.A. degree if the professional degree is the B.S. or the geology minor, or the general education course provided by a department of geology).

For further information or to schedule a review, call, FAX or write AIPG.

Geologic Aspects of Real Estate Appraisal

At the request of AIPG, the AGI Executive Committee approved, in principle, the following statement:

The American Institute takes the position that appraisals of interests in real or personal property should be performed by qualified professionals. Thus, appraisals of mineral, or other geologically related interests should be performed by geologists, or in some cases engineers, who are qualified to do so by appropriate training and experience. Federal and state laws, regulations, and policies which govern such appraisals should reflect this philosophy.
UNITED STATES H 4213
AUTHOR: Richardson
SUMMARY: Amends the Land and Water Conservation Fund Act to authorize the Secretary of the Interior to establish a national registry of rivers and watersheds to be protected and restored.
STATUS: 04/14/94 INTRODUCED.

ALABAMA H 9
AUTHOR: Mikell
SUMMARY: Provides for the regulation and licensure of Geologists; provides for the Alabama Board of Licensure for Geologists.
STATUS: 04/26/94 INTRODUCED.

ALASKA S 371
AUTHOR: Committee on Resources
SUMMARY: Provides for exploration incentive credits for activities involving locatable and leaseable minerals and coal deposits on certain land in the state.
STATUS: 03/30/94 INTRODUCED.

CALIFORNIA SCR 45
AUTHOR: Rogers
SUMMARY: Requests the State Personnel Board of the Department of Personnel Administration to report to the Legislature within 90 days of the adoption of this measure regarding the reasons for the employment by the State of uncertified engineering geologists and regarding recommendations on how to rectify this shortcoming.
STATUS: 04/07/94 INTRODUCED.

CALIFORNIA 7134
AGENCY: Board of Registration for Geologists and Geophysicists
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Provides for procedures to implement a citation and fine system against unregistered/licensed individuals who violate the Geologist and Geophysicists Act as well as registered/licensed individuals who violate the Geologist and Geophysicists Act.
AGENCY CONTACT: Denise Pellerin, Office Manager, Board of Registration for Geologists and Geophysicists, Ste. 4060, 400 R Street, Sacramento, CA 95814-6200, (916)445-1820
CITATION: 18 CCR 3062. 3065.1, 3062.2, 3062.3, 3062.4, 3063, 3063.1, 3063.2, 3063.3, 3063.4 citation and fine system for geologist.
PROPOSAL: 04/01/94
COMMENT DEADLINE: 05/16/94
HEARING DATE: 06/19/94

CONNECTICUT 2162
AGENCY: Department of Consumer Protection
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Concerns the rules of professional conduct for professional engineers and land surveyors. Extends the objective and completely truthful standards that currently exist to include all documents compiled by the engineer or land surveyor.
AGENCY CONTACT: Joseph Lembo, Director of the Legal Division, Department of Consumer Protection, Room 173, State Office Building, 165 Capitol Ave., Hartford, CT 06106
CITATION: Sections 20-300 Rules of Professional Conduct for Professional Engineers and Land Surveyors
PROPOSAL DATE: 04/19/94
COMMENT DEADLINE: 05/19/94
HEARING DATE: 05/24/94

FLORIDA 13375
AGENCY: Water Management Districts
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION -- 18
SUMMARY: Concerns regulation of agricultural and forestry surface water management projects.
AGENCY CONTACT: Edward Yaun, P.E. Northwest Florida Water Management District Headquarters, Route 1, Box 3100, Havela, Fl 32333-5700, (904)539-5939
CITATION: FAC 40A-44.021 Regulation of Agricultural and Forestry Surface Water Management Projects.
PROPOSAL DATE: 01/28/94
COMMENT DEADLINE: 02/16/94
HEARING DATE: 02/24/94
ADOPTION DATE: 03/10/94
EFFECTIVE DATE: 03/30/94

ILLINOIS 6002
AGENCY: Department of Professional Regulation
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Requires structural engineers, starting with the 1996 license renewal, to submit to the Department of Professional Regulation satisfactory evidence of knowledge in seismic design.
AGENCY CONTACT: Jean A. Courtney, Department of Professional Regulation, 220 W. Washington, 3rd Floor, Springfield, IL 62786, (217)755-0900
PROPOSAL DATE: 04/15/94
COMMENT DEADLINE: 05/15/94

LOUISIANA H 223
AUTHOR: Gunn
SUMMARY: Relates to the tax on the severance of oil; reduces the tax on oil produced from wells incapable of producing more than twenty-five barrels per producing day; eliminates the tax on oil produced from wells incapable of producing ten or more barrels per producing day.
STATUS: 04/25/94

MONTANA 2260
AGENCY: Department of Commerce/Board of Architects
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Relates to reciprocity of architect licensure; requires all applicants for licensure by reciprocity who were licensed in their respective jurisdiction prior to January 1, 1986 to submit evidence of having successfully completed a National Council of Architectural Boards approved seminar on seismic forces or have taken and passed Division E, Structural Lateral Forces of the Architectural Registration Examination.
AGENCY CONTACT: Board of Architects, Department of Commerce, Lower Level, Arcade Building, 111 North Jackson, P.O. Box 200513, Helena, MT 59620-0513
CITATION: ARN 8.6.405 Reciprocity
PROPOSAL DATE: 04/14/94
COMMENT DEADLINE: 05/12/94

NEW YORK S 7634
AUTHOR: Larkin
SAME AS: a 5579b
SUMMARY: Provides the New York State Plane Coordinate System of 1983 System of Coordinates for defining and stating the positions or locations of points on the surface of the earth within the State of New York.
STATUS: 04/12/94 INTRODUCED.

---

Karst Control


"The Pressure Grouting Specialist"

Contact: Dave Taylor 314-828-5858
Legislative Affairs Advisor Retained By AIPG

The Executive Committee, at its April 23 meeting, acted to retain Ms. Lynn Graf as Legislative Affairs Advisor in a consultant capacity for the balance of 1994.

Graf's duties will be fourfold. (1) She will prepare a series of articles for *The Professional Geologist* aimed at helping Sections to be more effective in working with their state and local governments. (2) She will provide consultation and advice on state government relations to the Institute and, on a limited basis, to the Sections. (In this context, if any Section seeks extensive consultation on its activities, she will be available for direct consultation on a fee basis paid for by that Section.) (3) She will attend the National Conference of State Legislators, helping to staff the AIPG/AAGS exhibit booth, coaching other staffers in dealing with politicians, attending sessions and making contact with legislators from as many states as possible. She will be seeking to identify issues of interest which legislators share with geologists and those with which geologists may be able to help them. Finally, (4) she will alert and advise the Executive Committee and Sections (via Headquarters) on impending generic legislative and regulatory issues potentially affecting geologists, e.g., new or revived issues that are gaining support for action at the state and national level. It should be noted that, while every state's government has its own peculiarities, many of the principles of dealing with them are common to all. It is in this context that Graf will be working.

AIPG's Colorado Section has been one of Graf's clients since 1960. During this time, the Section has made remarkable progress in expanding its influence in the affairs of the State, especially as they affect the industries in which geologists are employed. In turn, this has had a strong and favorable impact on the ongoing efforts to preserve employment opportunities for geologists in Colorado. Her services to the national AIPG will be completely separate and distinct from those which she provides to the Colorado Section and her other clients.*

---

OHIO 4650

**TOPIC:** BUSINESS AND CORPORATION -- 2

**SUMMARY:** Relates to qualifications for registration by regular examination by the Board of Engineers and Surveyors.

**AGENCY CONTACT:** Joseph DeJorge, Board of Engineers and Surveyors, 77 South High Street, 16th Floor, Columbus, OH 43266-9314, (614)466-8498.

**CITATION:** 1 Rule: Registration by Examination

**PROPOSAL DATE:** 02/25/94

**HEARING DATE:** 04/25/94


TEXAS 13173

**AGENCY:** School Land Board

**TOPIC:** ENERGY -- 7

**SUMMARY:** Concerns exploration and leasing of oil and gas; and penalties and interest; establishes standards by which the School Land Board may reduce an assessment of penalty and interest; encourages the payment of underpaid or delinquent royalties owed to the Permanent School Fund; increase the aggregate amount of revenue collected.

**AGENCY CONTACT:** Katherine Minter Cary, General Land Office, Legal Services Division, 1700 N Congress Ave., Room 630, Austin, TX 78701-1405, (512)463-5009

**CITATION:** 31 TAC 9.7 Exploration and Leasing -- Gas and Oil

**PROPOSAL DATE:** 01/28/94

**COMMENT DEADLINE:** 02/27/94


TEXAS 13638

**AGENCY:** Board of Registration for Professional Engineers

**TOPIC:** BUSINESS AND CORPORATIONS -- 2

**SUMMARY:** Concerns general application information; deletes the restrictive provisions concerning the submission of applications for registration in order to meet deadline dates for scheduling the principles and practice of engineering examination; concerns engineering examinations required for registration as a professional engineer.

**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 131.54.101 Practice and Procedures

**PROPOSAL DATE:** 03/18/94

**COMMENT DEADLINE:** 04/17/94


TEXAS 13639

**AGENCY:** Board of Registration for Professional Engineers

**TOPIC:** BUSINESS AND CORPORATIONS -- 2

**SUMMARY:** Concerns engineering examinations irregularities; establishes the procedures and consequences the Board of Registration for Professional Engineers will exercise when an examination has been compromised.

**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 131.06 Examinations

**PROPOSAL DATE:** 03/18/94

**COMMENT DEADLINE:** 04/17/94
Summer weather - time to dust off the Brunton, grease up the boots, check the rest of the field gear, and get the bod ready for a season of field work.

Here are a few tidbits from the Federal Register:


This rule amends the regulations for assessing damage for releases of hazardous substances under CERCLA and revises the TYPE B RULE for site-specific procedures for detailed assessments in individual cases.

This rule establishes a procedure for calculating natural resource damages based on the cost of restoring, rehabilitating, replacing, and/or acquiring the equivalent of injured resources.


"Geographic information is critical to promote economic development, improve our stewardship of natural resources, and protect the environment. Modern technology now permits improved acquisition, distribution, and utilization of geographic (or geospatial) data and mapping. The National Performance Review has recommended that the executive branch develop, in cooperation with State, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data in such areas as transportation, community development, agriculture, emergency response, environmental management, and information technology".

"Geospatial data" means information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. This information may be derived from, among other things, remote sensing, mapping, and surveying technologies. Statistical data may be included in this definition at the discretion of the collecting agency.

We now have a Federal Geographic Data Committee (FDGC), established by the OMB for the "Coordination of Surveying, Mapping, and Related Spatial Data Activities", chaired by the Secretary of the Interior who shall coordinate the Federal Government's development of the NSDI. Am I missing something?? I assumed that the U.S.G.S. (and others), already had these responsibilities.

And now comes the latest in the attempts to change the mining law. Congress is still at a standoff over the committee to reconcile the two proposals which have passed the House and the Senate. Nothing is new-- right? Wrong!! According to the Public Land News, Vol. 19, No. 9, April 28, mining law reformers have opened up a secondary front to hasten the change. Representative Norman Mineta (D-CA) added tough reclamation standards to HR-3948 to revise the Clean Water Act. This bill would get to hard rock reclamation by banning any mining residues from groundwater. What about other types of operations as well? If the wording is vague enough, quarries and oil and gas operations might also be impacted as well.

The American Mining Congress said that the Mineta bill would "effectively ban exploration and mining of metallic minerals in the United States". Phil Hocker of the Mineral Policy Center stated that the provision would ensure that the hard rock miners "will finally be treated like every other industry in this country". I guess those comments are to be expected. Mineta chairs the House Public Works Committee which is in the process of drafting HR-3948. Need I say more? Meanwhile Senator J. Bennett Johnston (D-LA) has been approached by 44 senators who have been persuaded by environmental groups, to take a hard stand in the mining law reform. Another mining expert Senator James Jeffords (D-VT) took the lead on behalf of the environmentalists in writing to Johnston.

The only good news is that U.S. District Court Judge Howard McKibben ordered Secretary of Interior Babbitt to make a decision by June 20th on the validity of seven patent applications from Barrick. Babbitt has been trying to delay issuance of patents until the mining law changes - then, in all probability, there will be no more patents as we now know them.
The last three months I have given over the space for this column to the Chairmen of three critical committees. In March, Dr. Robert Font wrote of the charge and work of the State Affairs and Registration Committee. In April, Dr. Robert Merrill wrote similarly of the National and International Affairs Committee. Both are able and enthusiastic Chairmen. It behooves each of our Members to give them as much support as we can. Most of the May issue was devoted to the upcoming Annual Meeting, to be held in Flagstaff, AZ, October 12-15, and being chaired by Dr. J. Dale Nations. With all of the geologic attractions of northern Arizona and environs, as well as the program that the Arizona Section has put together for us, there should be something for everyone at this meeting. I hope to see many of you there.

It may not yet have become apparent to many of our Members that there is a progressively increasing emphasis on political activity within AIPG. For example, the Texas Section is serving as the corporate entity for the drive to enact a registration bill there. I learned just this morning that the new law to register geologists in Wisconsin is to be signed by the Governor this afternoon. AIPG's Wisconsin Section led that effort. Similar efforts are going forward in Illinois, Minnesota, Missouri and Ohio, to name a few. Some of our Sections have been very much involved with the political activity relative to the funding of their state Geological Surveys. Several have managed to get Members appointed to various boards and commissions in their states. At the national level, we are working actively with the other societies of AGI on issues which are of mutual interest, as well as taking independent action on issues which are not of mutual interest. In July, we will again be exhibiting at the National Conference of State Legislatures. Last year was our first at this conference and we feel it was an exceptionally good investment. The Association of American State Geologists will be working on this with us again this year.

With all of this going on, particularly at the state level, your Executive Committee has retained a consultant as Legislative Affairs Advisor to help us for the rest of this year. You can read more about this elsewhere in this issue of TPG.

Geologists have, for too long, been content (?) to stand back and let others handle their government affairs for them. Well, as it turns out, those others were much more interested in their own affairs than in those of geologists, specifically. The result is that any benefit to geologists was a mere by-product (usually quite incidental) of those efforts, rather than the principal product. As has been pointed out previously, most of the industries in which we work would be just as happy not to employ us if they could. It would cut their payroll costs (it is assumed) and they would probably operate just as successfully (some believe). So, when they hire us, it usually is because they have to, not because they want to. Our task, then, is the see that they have to. The reasons must be either economic or legal—preferably economic. And, we have to convince them that it is in their best interests to do so rather than to take some alternative course of action.

I remember being told early in my career never to forget that there is always somebody else who would very much like to have my job. And, that somebody else is going to try hard to get it. Unfortunately, too many geologists have either been unaware of this fact of life or have ignored it. Otherwise, why would we have abdicated so many fields of practice to other professions? For example, how many reservoir engineers would there be if geologists had not abdicated the field? Why do some of the larger environmental companies have to hire engineers to manage complex projects that are primarily geological? Why have biologists and archaeologists dominated so many of the scientific field investigations of the environmental impact of many projects? Are prospective mineral resources and geologic hazards not as important as some of the endangered species and abandoned prehistoric dwellings?

What have geologists been doing? Not enough, it seems. But, that must, and is, changing. I hope each of our Members finds some way to become involved. The future of our profession depends on it.

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:

Jul. 16: Executive Committee, Arvada, CO
Jul. 25-28: National Conference of State Legislatures, New Orleans, LA
Aug. 13-28: People to People, Hong Kong & China
Sep. 17: Geoenvironmental Forum, Austin, TX (tentative)
Sep. 30-Oct. 1: Wisconsin Section, Madison, WI
Oct. 12: Executive Committee, Flagstaff, AZ
Oct. 18: Colorado Section, Denver, CO
Oct. 23-27: Geological Soc. of Amer. Convention, Seattle, WA
Cobalt Exploration In Missouri

Mark A. Koestel, CPG-9307, RG, REA

In southern Missouri, cobalt-sulfide mineralization is present where permeable, basal Cambrian formations "pinchout" against Precambrian paleotopographic highs. This geologic setting has many similarities with the subsurface environments found in the cobalt district of Zambia and Zaire, South Africa. Exploration for this type of deposit involves test drilling targets identified by geophysics, geochemistry, trend analysis from previous drilling, and a comprehensive study of regional geologic and isopach maps.

Background

Presently, there are two known areas within the United States that have potentially economic concentrations of cobalt mineralization. One is the Blackbird district in central Idaho and the other is southeastern Missouri.

Lead was first discovered in southern Missouri in 1720 by early French explorers. Following limited production, cobalt ores were recognized and recovered in 1907. These two different deposits are categorized as Mississippi Valley-type and they have more similarities than differences between them.

The lead-sulfide ores in the "Viburnum Trend" and "Old Lead Belt" areas of southeastern Missouri carry only traces and locally interesting concentrations of cobalt, whereas the adjacent Fredericktown area has a five-fold increase overall in cobalt concentrations. Consequently, cobalt exploration has concentration in and around this area.

Geology

The subsurface environment around the St. Francois Mountains in southeastern Missouri contains Precambrian paleotopographic highs, or "knobs", against which shallow water marine carbonates of Cambrian age were deposited and hence pinchout against (photo 1). This geologic environment covers in excess of 10,000 square miles with an untold number of Precambrian knobs still buried beneath the sedimentary cover. The possibility, therefore, of discovering an ore body seems rather high.

In general, the sedimentary rocks around the St. Francois Mountains are characterized by lower Ordovician and Cambrian shallow water marine carbonates belonging to the Roubidoux, Gasconade, Eminence, Potosi, Derby-Doerun, Davis, Bonneterre and Lamotte Formations. Thicknesses of these ostensibly flat-lying units vary from 0 to 300 feet and frequently any one formation undulates in thickness laterally. The stratigraphy is basically a sequence of medium-grained, massive dolomites down to the granitic Precambrian basement. A basal ore-concentrating stratigraphic trap is formed by permeable sandstone adjacent to the basement rock, above which is an organic-rich, ore-buffering carbonate (dolomite) and an impermeable shaley sequence (figure 2).

The Bonneterre Formation (dolomite) is important because of its association with known ore deposits. Extensive secondary diomitization, which is common in mineralized zones, frequently obscure or destroys much of the original texture and mineralogy of the rock (oolitic fabrics and glauconite). The Lamotte sandstone, a typically sugary, clean, quartzose unit, is a basal, permeable channel way for ore-bearing solutions. When it occurs proximal to granitic Precambrian source rocks (highs), it is sometimes arkosic and can occur as a shaley conglomerate.

Permeability plays an important role in these types of deposits as well. Mineralization associated with col-
lapse breccias (formed as overlying units fell into Karst voids that formed from enlargement of fractures by meteoric waters) is common in the Viburnum Trend. Permeable, unconformable contacts, paleolcarenite bars and algal reefs provide pronounced breaks in the sedimentary section and hence probable pathways and/or barriers for the lateral movement of ore solutions. Faulting and associated fractures are excellent mechanism for ground preparation through which the ore-bearing waters can be channeled.

Though it appears that the bulk of the lead-zinc mineralization found in this district was deposited during one long stage at temperatures ranging from 70° C to 150° C, other minor periods of mineralization and/or changes in metal content with time are noted. Perhaps copper-nickel-cobalt came from a different source or represents changes with time of the ore-bearing mineral found here. Other mineral constants present in trace quantities include cadmium, germanium, fluorine and silver.

Geologists in the Viburnum Trend consider certain geologic features important to the deposition of Mississippi-Valley type deposits. These features are recrystallized, coarse-grained "white rock", organic-rich Bonnette "brown rock" (mineral-associated), a frequent and repetitive interfingering of these two units, and a "pinchout-type" environment. Other important features include shale partings, low-to-medium-amplitude stylolites, and up to 1% by volume sulfides throughout a drilled sequence.

A common limestone-dolomite facies change also appears to be an important ore-localizing factor in these strataform deposits. Ore is usually found at or near this boundary, most frequently in the Bonnette dolomite. The limestone is often nearby, either to the side, above, below, or as an island surrounded by the ore body.

Frequently sulfide concentrations found within shaley zones may exist because of low permeability and because the reducing-rich zones provided biogenetic sulfur or H2S necessary to chemically precipitate sulfide minerals from an acidic solution.

Mafic Precambrian rock, such as gabbro and diabase, are potentially favorable source rocks for nickel-cobalt mineralization. Reactivated Precambrian structures could provide the permeable avenues through which heated brines could leak and transport ferromagnesian minerals to their final resting place alongside lead-zinc in stratigraphic traps. This local origin for nickel-cobalt ore seems probable because some exploration drill holes with high geochemical cobalt bottom out in gabbro and diabase.

**Exploration Philosophy**

Any exploration program should start a thorough review of all available surface and subsurface data. Since most ore deposits in southern Missouri are found in association with Precambrian paleotopographic highs and in areas of sandstone/dolomite facies changes known as "transition zones", plotting researched data to identify these areas is very important. A general lack of exploration activities outside known ore districts underscores the importance of these activities to initiating any field work.

As mentioned before, the southern Missouri lead-zinc district has subsurface similarities to the geologic environments found in the cobaltiferous districts of Zambia and Zaire, South Africa. Working under the assumption that the ore-bearing fluids were derived basically, cobalt-sulfide minerals may have been leached from a local, ferromagnesian source. Following discrete, permeable channel ways, these metal-bearing, low-temperature brines collected in stratigraphic traps peripheral to St. Francois Mountains.

Using this geologic framework, an evolving model on ore transport and deposition need a generous flow of subsurface information. Strata-bound deposits commonly pinch-and-swell, end abruptly and are often discontinuous over any appreciable distance. Therefore, a mineralized test hole could be only that, while a barren test hole may well be in the center of an ore body.

Surface geological, geochemical and geophysical studies have limited value in deciphering any manifestations of a low-temperature, shallowly emplaced ore body. Thus, mineral exploration in this type of environment requires drill holes to identify local stratigraphy and to bracket and
confirm anomalous subsurface mineral occurrences. Consequently, a long-term commitment of time and money for drilling is almost a prerequisite for economic mineral discovery.

Experience gained from drilling enhances the chances of making a major discovery in rough proportion to the number of holes drilled. By continually modifying the exploration model to accommodate new data as it is collected, favorably mineralized areas can be "vectored in".

**Summary**

Favorable subsurface geologic environments, defined in part by sedimentary "pinchout zones" against paleotopographic Precambrian highlands (stratigraphic traps), are abundant in southern Missouri. The geologic similarities to known world-class cobalt deposits suggest the possibility of a domestic, minable cobalt-sulfide discovery. One key to such a discovery hinges on the stability of our present south-African source and hence the domestic price.

**REFERENCES**


Mendelson, F., Editor, 1961, The Geology Of The Northern Rhodesian Copperbelt.

Mossman, D.J., 1976, Dykes, Their Relationship To Rifting, Basement, Orogenic Trends And Metallogene-


Snyder, F.G., and Gerdemann, P.E., 1933-1967, Geology Of The Southeast Missouri Lead District; from Ore Deposits of the United States.

Tarr, W.A., 1936, Origin Of The Southeastern Missouri Lead Deposits, Part I; Economic Geology Reprint, Vol. XXXI.


Mark A. Koestel, CPG-8307, is a geologist with 15 years of experience in mineral exploration and the environmental industry. He is also a state registered professional geologist and environmental assessor. He graduated from the University of Arizona in Tucson and is listed in Who's Who in the West.

---

**AAAS Seeks Information For Resource Directory**

The American Association for the Advancement of Science Project on Science, Technology, and Disability invites scientists and engineers with disabilities to be included in the third edition of the Resource Directory of Scientists and Engineers with Disabilities. Potential candidates for the directory must hold, or be working toward, a degree in a scientific, engineering, or medical discipline, or currently be employed in a scientific field.

Funded by the National Science Foundation, the project's Resource Directory of Scientists and Engineers with Disabilities has assisted hundreds of individuals enter and advance in scientific disciplines. The directory helps to connect persons with disabilities and their families with professors, teachers, and counselors who can serve as role models and mentors.

The Resource Directory lists scientists, mathematicians, and engineers from all parts of the country with their disciplines, degrees, and disabilities. Individuals include professionals who were born with a disability, and those who acquired their disability mid-career. Persons listed in the directory are also asked to consult for academia, government agencies, and industry as well as serve on peer review panels and symposia.

Established in 1975, the AAAS Project on Science, Technology, and Disability has sought and shared expert advice from scientists and engineers with disabilities. Since the passage of the Americans with Disabilities Act (ADA), the AAAS Resource Directory has become a valuable source of expertise.

To be included in the directory, or for more information, please contact Lauren Summers, Program Associate; or Patricia A. Thompson, Editorial Specialist, AAAS Project on Science, Technology, and Disability. AAAS, 1333 H Street, NW, Washington, DC 20005, or call 202-326-6645 (V/TDD). Information can also be sent via fax to 202-371-9849.
Fred L. Fox, CPG-1273

A Special Report in a recent TPG dealt with computer modeling. Ray Wuolo and Andrew Koeniggsberg presented some pretty good arguments for treating such efforts with care, but the issue begs additional consideration for farther-reaching reasons.

A model is a representation of an object or system. It may duplicate an object in some other scale, or it may be a mathematical formula symbolizing some system in another medium. There are other forms as well.

Computer modeling of complex systems has become a popular method of manipulating various components of those systems to see how they might behave under different conditions. Models have become a very powerful tool for helping to solve complex problems and predict the possible effects of an action. But they have their limitations; one need not look beyond weather predictions to illustrate that fact.

In spite of their obvious limitations, mathematical models often command what may be unjustified respect when used to represent hydrological systems. The tendency is to attribute objectivity to the computer and believe the results of a modeling effort, a tendency that seems to increase with finite difference and finite element "solutions," probably because the complexities appear to be "more scientific" than common sense.

There are many cases where data is not sufficient to warrant a rigorous description. In those cases, simpler analytical models might be preferable to numerical ones. Such models are bases on solutions to partial differential equations such as have been used for years to calculate transmissivity; they can be as accurate for predictions as numerical models can (more so, if the GIGO rule holds).

There also are many cases when just a simple formula will suffice. Yet the tendency to use complex modeling techniques just because they are available seems to be in many cases overwhelming.

There is, in our part of the country, a rush on "nitrate dilution models" to compute effects of those compounds on ground water for drinking purposes. The "models" kept being "improved" by adding more and more variables to the point where they began to impress even advanced scientists (but in fields other than geology). Upon close examination, however, it is apparent that the "variables" are really only factors that can be combined to the point where only one variable is required. The result is the ratio 800/1, not nearly so impressive but at least as accurate as the most complex "model" in the series.

Simplest often is best. Complex models cost not only money, but time to use: also, more variables and more assumptions offer more opportunities for error. Analytical models do not require the programming or complex grid constructions needed for numerical modeling, nor do simple formulas require the advanced mathematical knowledge needed to apply Fourier and/or Laplace transforms to more complex analytical techniques.

The trick is to apply reason to the modeling effort. If the right answer can be gotten for less, it's up to the ethical profession to make that fact clear. This goes for anything we do. Rather than create a maze navigable by only the savvy specialist, we should be trying to promote "popular geology" so that everyone can appreciate and use the tools of our trade. Consulting, then, comes down to education. If we are so insecure that we must hide behind what can only be termed as bad science, then we deserve what we get. If we can, on the other hand, educate our clients and the public, then we won't be saddled with "cries" such as global warming or holes in the ozone layer. Or even phony nitrate or radon allowances.

AGI Earth-Science Education Resource Directory

While the unifying purpose of AIG is to strengthen geology as a profession, this cannot be achieved if the general public remains unaware of or unappreciative of what geologists do and what geology is. The foundations of this awareness are laid in elementary and secondary education programs. Although AIG has an education committee with a public education subcommittee, public education should be something each and every AIG member should contribute to. Thus I encourage all of you who have the opportunity to interact with and provide resource material to the public and private schools in your area.

One thing you can do is make the teachers in your community aware of AGI's Earth-Science Education Clearinghouse. The first Clearinghouse product, the Earth-Science Education Resource Directory, became available March 1st. The Directory provides educators with accessible, useful, and up-to-date information on organizations that run programs, produce classroom resource materials, and supply related earth-science activities in the content areas of atmosphere, biosphere, hydrosphere, lithosphere, and space science.

The first edition of the Earth-Science Education Resource Directory contains information on more than 125 organizations and more than 350 products. That information comes from the Clearinghouse database on earth-science organizations and educational resources. The database is one of the resources that Clearinghouse staff members use in responding to some 10,000 information requests annually.

To request information from the Earth-Science Education Clearinghouse or about AGI's education and human-resource programs, write to the Education and Human Resources Department, American Geological Institute, 4220 King Street, Alexandria, VA 22301-1507; or call (703) 379-2480. The Internet number is ncse@agirg.
Problems Of A Geologist With Laymen Friends

Melinda Ebert, CPG-8737

It's been 10 years since I graduated in Geology and Mineralogy from The Ohio State University, and since that time, I've been asked probably 15 or 20 times to explain something of my knowledge of geology. (I might have gotten more requests, but I usually find an excuse to change the topic or leave the room). Friends and acquaintances strangely believe that because I studied geology about four years, I should be able to tell them something of interest about every piece of dirt-encrusted rock, rock outcrop, or dirt embankment that comes across their path. The problem is that what I do tell them sounds unbelievable, feigned, and basically false. Am I the only geologist to experience these humiliating communication gaps with my laymen friends?

For example, when I tried to explain to my neighbors that limestone rock formations were formed from chemical precipitation processes which originated in ancient shallow seas because calcium was in disequilibrium and chemically combined with carbon dioxide, they looked at me as though I had originated from the planet Venus. I could see them trying to think about this explanation for a moment, but then they gave it up and went back to discussing Vanna White.

When I tell people that limestone, shale, and sandstone are a continuum of depositional products of a regressing or transgressing sea, they literally spit on me. When I tell them that I am not exactly sure whether a rock is a terrestrial or a marine depositional product, they cross their eyes. No one can believe that I cannot automatically identify each and every mineral fragment they find. I try to explain optics, the need for visible surface planes, and weathering/disintegration products and people leave the room. And for some reason, I have never been able to convey much understanding to my friends about how sandstone crossbedding features are derived. I kind of try to point with my hands and demonstrate currents, but it just doesn't work.

Once, when my 14-year-old cousin and I were driving through Colorado, he asked me to explain how the mountains got there. I told him that mountains were caused in part by arc subduction and that this occurs when oceanic crust is subducted under terrestrial crust. I probably overstepped my boundaries when I went on to explain that, "Unlike many mountain building orogenies, the Cordilleran did not involve the collision of continents, instead they originated from the subduction of a Mesozoic Pacific lithosphere plate. His response was, 'Gee, the crusts must have really been moving fast!' Somehow, I knew I had missed my mark by a large margin and I know it's a damn good thing I never wanted to teach a course.

The thing that initially attracted me to geology and the thing that is hardest to convey to most people, is the concept of unlimited time. This concept was introduced by Charles Lyell sometime in the 1830's. [Editorial note: Hutton, 1788] Prior to this illumination, people had regarded the present-day earth surface as a result of catastrophic events first "recorded" in the Bible. These events were considered to have occurred far in the past. The present-day earth was regarded as a large, immobile, sluggish object at the center of a cosmic, very little understood universe. People who have not studied earth processes still hold this viewpoint though they would probably deny it to anyone who asked.

As human beings with a life span of 70 years or so, we are most comfortable dealing in time increments of a hour, a day, a week, or a year. Sometimes we are even able to look out at 20 or 25 years and consider retirement objectives. Going back 100 years or more, we have to get Ph.D.s to understand what has happened. We like to have a chronological 'handle' on what it is that we are considering. For this reason, it is a giant leap of thought to integrate our human understanding of earth processes (which we see as stable and unchanging) into a real "feel" for dynamic, powerful forces which have created plains, limestone rock facies, and beautiful mountain vistas. Perhaps this is why I regress into "geological language" when trying to explain the small amount of information I retained about geology.

But this is the fun part of geology, and I have determined that I will learn how to convey some of these concepts in spite of my lack of natural ability. It will take a little longer, but the effort will be worth it. And maybe if I do try to explain a little more, my laymen friends will stop bringing over their rock fragments.
Dear Editor:

As an exploration geologist, I must comment on statements made by Parrish and Rhoades in the January issue of The Professional Geologist.

The authors say the mining geologist is the grunt of his profession whereas the explorationist is the wide receiver. I contend that mining geologists have the real chance for glory if only they would avail themselves of the opportunity. Mining geologists have access to the guts of orebodies and can document features such as fracture distribution, fault and fold traces, paragenesis, and zoning trends. Mining geologists contribute many significant reports to the literature as they can best document the geology of deposits.

Explorationists do a fair amount of grunt work and just cannot pursue an idea and go out and drill holes. They have to win company support, fill out company and government forms, and engage in routines that offer the same degree of excitement as grade control and reserve calculations.

Parrish and Rhoades say the principal duties of mining geologists are grade control and reserve calculations. That is true, but if that is all they do there is something wrong. Perhaps the company does not support geologic mapping and topical studies. Maybe the problem is with engineers as they seem to run mining operations without regard for geologists (come on engineers-let's hear from you). Sadly, I noticed that many mining geologists do not have the interest to do the geology that should be done. Often, contributions by mining geologists would greatly aid exploration efforts if such data was available.

The same authors say the vast majority of exploration geologists never pay their way. I know of no discovery where only one person deserves the credit (which is often given to the manager). Generally, several exploration geologists participate in a discovery. Perhaps an individual had the original model in mind, but no doubt that model was modified by co-workers. Plus, how can one say that an explorationist has to originate the efforts of a discovery to pay their way? Exploration geologists routinely review submittals and methodically manipulate data, all of which adds value to the company's archives. The process of exploration with its land acquisitions, mapping, geochemical sampling, drilling, remote sensing, and geophysical programs does not happen by themselves. Those efforts add value to the company. Even if a prospect does not pan out, data derived from prospect evaluation often helps zero-in on more productive areas.

True, there is glamour in exploration. Every discovery deserves to be celebrated as the company gets a new lease on life - it gets to stay in business beyond the life of the operating mines. However, a lack of glamour in mining geology indicates problems with the mine group.

If Parrish and Rhoades have a martyr complex, it is time for them to review their careers and determine if they should remain in mining geology - which brings me to another point. Mining geologists seem to have more secure jobs than do exploration geologists. It has been my experience (three times so far) that the exploration department is the first to go in hard times. Just for the record, not every exploration geologist pays their way. Likewise, not every mining geologist pays their way.

Laurence M. Nuelle, CPG-8017

Registration Statement Filed For Merger Of Geraghty & Miller, Inc. And Heidemij N.V.

Geraghty & Miller, Inc. and Heidemij N.V. (Arnhem, Netherlands) announced that a Registration Statement was filed with the Securities and Exchange Commission relating to the shares of Heidemij common stock to be issued in connection with the proposed merger of the two companies. The signing of a definitive merger agreement under which Geraghty & Miller would become a wholly-owned subsidiary of Heidemij was announced on October 4, 1993.

Geraghty & Miller, Inc. is a full-service environmental company offering a wide spectrum of consulting, engineering, hydrocarbon and remediation services. Founded in 1957, the Company specializes in the development, management, the protection of groundwater resources, and the assessment and correction of groundwater and soil contamination problems.

The merger of Geraghty & Miller and Heidemij would create an environmental consulting/engineering and contracting firm that would have had combined revenues of approximately US $359 million for the year ending December 31, 1992. The combined firms would have operations in approximately 90 countries.

David W. Miller, CPG 1757, Chairman and Chief Executive Officer of Geraghty & Miller, said, "The Board of Directors believes that a merger with Heidemij is in the best interest of Geraghty & Miller's stockholders. We have recognized for some time that the international markets offer attractive growth potential. Also, we feel many U.S. companies will be interested in working with a firm that can meet their environmental services needs overseas, as well as domestically. This is a unique opportunity to join forces with a company that is among the leaders in the environmental services markets in Europe and many other countries, and whose technical skills, geographic reach and financial strengths complement our own."
Take Back The Power

Ron W. Pritchett, CPG-7063

In 1962 Rachel Carson wrote the book "Silent Spring." Her descriptions of the use and abuse of pesticides put a spotlight on industrial products in natural environments. A cascade of regulations followed in response to genuine harm, perceived harm, and the expansion of a brilliant way to transfer power from the private sector to government. In 1994, laws administered by the Environmental Protection Agency, plus tax penalties, make a weight of regulations that discourages domestic production and use of fossil fuels in the United States.

A sentence from Carson's 1962 book is prophetic in the way the EPA has forced compliance with regulations in the 1990s: "We shall have no relief from this poisoning of the environment until our officials have the courage and integrity to declare that the public welfare is more important than dollars, and to enforce this point of view in the face of all pressures and all protests, even from the public itself."

We got the regulations and heavy-handed enforcement summoned by Ms. Carson, via a new generation of voters who were taught the mantra of environmentalism-at-any-cost, and now there is excess. A few examples are described in Dixie Lee Ray's book "Environmental Overkill" (1993) wherein Ms. Ray describes the EPA at war with the concept of private property. With regard to associations between disease and preservation of wetlands, Ms. Ray characterizes the EPA as committing "...war on public health." It's no exaggeration to say that law and enforcement that destroys production from the land is a curse on human progress.

In April 1993, President of the American Association of Petroleum Geologists, Harrison L. Townes, addressed the Annual Convention in New Orleans (text in AAPG Bulletin Vol. 77, No. 5, May 1993, p. 723-730). He showed a forecast of population growth toward a total of more than 8 billion people by the year 2050. Townes suggested a growth rate in population due in large measure to the production and consumption of energy - principally fossil fuels - and the products therefrom. If energy consumption is the foundation of population growth, the growth rate will decrease (people will die young) unless energy can be converted to use at increasing rates, or unless people invent ways to live on less and less energy.

The remarks of AAPG President Townes are ominous, but there is a bright side. Every new voice in the world cries for natural resources. Earth scientists are in demand because they can deliver the goods - when they are free to do so in nations of law.

Laws in the United States begin with pressure from people who communicate. Each member of AIPG can look to science reporting and clear writing as methods that change laws for better and for worse. AAPG members have their tools in publications and presence, together with knowledge about earth resources. AIPG members are positioned to convey information to the public that can change laws for the better; AIPG members can call for striking laws that war against invention for an increasing population.

Foremost is the need to report on results of laws that discourage financial risk and invention by individuals. Legislators who make environmental law and tax law wrestle with decisions where the trade-off is popular desire versus individual freedom, and individual freedom is often the loser. But the seeds of greater general welfare lie in individual freedom to invent solutions - this power concentrated to government has never been successful for populations in the long term. Will our legislators preserve the idea?

Given the prescription for greater general welfare, here are four areas of law that achieve treason. The following laws impact resource development and should be repealed immediately:

1) Broad definitions of life protected under the Endangered Species Act. Broad enforcement follows, and the license becomes a political weapon to subordinate private property rights and property use;

2) Alternative Minimum Tax provisions, that tax people for investing in ventures that have costs;

3) Royalty on Federal oil and gas leases during payout. Until costs are recovered in risk ventures on Federal land, operators pay royalty, which is tax on the added value from investment. It's time to quit this habit;
4) tax on savings interest. Few can build enough capital, as real buying power, to create employment opportunities when interest on savings is taxed.

And so on, deep into the tax code and EPA regulations. If only the cited four destructive laws are repealed, there will be a surge in business activity, employer-creation, and increased tax revenue. The reason for keeping outrageous law is for transfer of power, not for distribution of earned wealth or wise use of resources. The treachery is a power play, and your power is taken away.

Our community of earth scientists is charged to take back power enabling people to invent solutions for the future. Whether an energy foundation is hydrocarbon-based, or nuclear-based, or based on energy systems yet to be, earth scientists have technical methods and solutions that deserve testing in the marketplace without political revenge, where failure means only loss of capital, not loss of freedom. When scientists are silent - when we fail to call attention to maneuvers for political power - civilization erodes. For the world of people, technical writing by scientists isn't enough. For preservation of geologists, we have to display solutions for non-geologists who vote. We can work to communicate the following comparison and make it common knowledge: technical solutions that come from personal freedom have a spectacular record of benefit for the masses, in contrast to certain destruction when political ambition is at the core of law

Radon Potential Map Release
[condensed from EMANATIONS, newsletter of the Regional Radon Training Centers] Sept. 1993

The Environmental Protection Agency (EPA) is releasing a map that identifies, on a county-by-county basis, areas of the United States that have the highest potential for elevated levels of indoor radon.

The EPA, the U.S. Geological Survey, and the Association of American State Geologists worked closely over the past several years to produce a series of maps and documents that address just such legislative directives to EPA. The agency's Map of Radon Zones is a compilation of that work.

The Map of Radon Zones is designed to assist federal, state, local governments and organizations to target their radon program's activities and resources. It is also intended to help building code officials determine areas that are the highest priority for adopting radon resistant building practices.

EPA's Map of Radon Zones assigns each of the approximately 3,100 counties in the U.S. to one of three zones: Zone one countries have a predicted average indoor screening level greater than 4 picocuries per liter (pCi/L). Zone two countries have a predicted average screening level between 2 and 4 pCi/L. Zone three countries have a predicted average screening level of less than 2 pCi/L.

The zone designations were determined by assessing five factors known to be important indicators of radon potential: indoor radon measurements, geology, aerial radioactivity, soil parameters, and foundation type.

Booklets that detail radon potential assessments for each state have been developed to accompany the Map of Radon Zones. These booklets discuss each of the five radon potential facts in terms of the data available and their potential impact on indoor radon levels.

The EPA has received many requests for this type of map from states and other organizations that need additional information on the priority radon areas throughout the country. The Map of Radon Zones has been extensively reviewed by EPA staff and management, all state radon contracts and state geologists, and a number of independent organizations and other federal agencies.

Information on the map should be supplemented with locally available data. For example, zone two and zone three countries that have found localized areas of consistently elevated indoor radon levels should consider implementing radon resistant construction codes in these areas.

EPA officials believe that the current map represents the best available data on radon potential at this time. However, this map is only a starting point and is subject to revision as more is learned about radon potential.

EPA is encouraging states to improve on the current information, make appropriate adjustments to the map and notify EPA of any proposed changes. The agency is investigating its own refinements of the map by working with the U.S. Geological Survey and the Department of Energy to gather more information regarding the highest radon potential areas.

The Map of Radon Zones was made available through state radon programs in October. EPA's headquarters and regional offices also have copies of the map and its documentation.
Geotechnical Aspects Of Hazardous Waste Management

GEOTECHNICAL ASPECTS OF HAZARDOUS WASTE MANAGEMENT: by Stephen M. Testa, Lewis Publishers (1993), 550 PAGES, $55.00. This book focuses upon hazardous and toxic waste, and the role of the geologist in addressing this problem. How subsurface geologic and hydrogeologic conditions affect the decision-making process and interfaces with critical issues facing industry, government and the public is emphasized. Principle aspects of hazardous waste management as it applies to the subsurface are presented including discussion of the waste problem, regulatory aspects, geologic and hydrologic principles, conventional geologic and geophysical techniques for subsurface characterization and monitoring, and types and characterization of waste material. The predominate physical, biological and chemical processes which affect these constituents and contaminants in the subsurface, and immiscible fluids in regards to their occurrence, detection and behavior are also discussed.

The later portion of this book is devoted to environmental issues pertaining to how waste is managed and disposed of in regards to criteria, geologic and hydrogeologic consideration on a regional and site specific basis, geochemical aspects, and design criteria. How waste is managed and disposed of in regards to landfill disposal and detection monitoring, underground injection, underground geologic repositories and ocean disposal is addressed. A glossary of regulatory terms of geologic significance is also provided.

This book will be of practical use to the professional consultant, regulator, project manager, engineer and attorney as a useful reference tool in dealing with subsurface hazardous waste-related issues. Adequate technical treatment is maintained for this book to also serve as a textbook suitable for undergraduate and graduate courses in environmental sciences, environmental geology with an emphasis in hazardous and toxic waste management, and hazardous waste management certification programs.

OPINION

Dear Mr. Davis:

Your letter in the December 1993 AIPG Professional Geologist, is one of the most cogent letters I have read for a long time. You characterize our profession by dividing it into two: There is the geologist working in the "productive economy", who according to your analysis, is a poorly dressed, honest, Neanderthal, working to extract the mineral resources from the Earth for everyone's benefit.

Alternatively there is the "service economy" geologist who appears to be some sort of parasite, overly concerned about impressing his boss and clients: a geologist dressed in pinstripes and oxfords, more concerned with the environment and self-preservation than honest work.

Where would an environmental geologist fit into this scheme who is not particularly concerned about what clothing people wear, and who spends much of his working hours trying to conserve our precious shared resources? A geologist who sometimes wears pinstripes, sometimes a wool sweater, but tries to undo the impact of ignorance and self-interest on the environment? A geologist who joined the "environmental movement" when at a Canadian mining conference, dominated by US business interests, voiced concern over the impact of asbestos tailings on the water resources in Lake Superior from the operation of the Reserve Mining Company? I wonder where you, Mr. Davis, would classify such a geologist?

Those geologists who contribute to the thoughtful development of our natural resources are worthy of our respect. As for me, call me sentimental, but I am partial to clean air to breathe and fresh water to drink, so I know what choice for employment to make: cleaning up other people's messes.

The sentiments expressed are not necessarily the opinion of the embarrassed staff of Shakti Consultants, Inc. — JMB

John M. Bee, CPG-6173, President Shakti Consultants, Inc., NJ
MEMBERS IN THE NEWS

David J. Allison, CPG-6850, will be Vice President in Charge of the new Cleveland area office for Civil & Environmental Consultants, Inc. Allison has 15 years of experience in technical and managerial positions with large consulting firms.

Leonard J. Billingsley, CPG-6256, was named the Oklahoma Corporation Commission’s outstanding employee of the month for November. He is a geologist specializing in groundwater environmental projects.

Richard F. Carroll, CPG-7501, to Texas Gulf Coast acquisitions and exploration geologist, Trans Texas Gas Corp., Houston. Previously senior exploration geologist, Utramar Oil and Gas Ltd., Houston.

Bruce Coffman, CPG-8904, has been moved to manager of hydrogeology, Sierra Geological & Environmental Consultants, Inc., Grand Rapids, MI.

Peter T. Flawn, CPG-0430, was awarded the Ian Campbell Medal by the American Geological Institute, its most prestigious award, at the Geological Society of America’s Annual meeting in October in Boston. Flawn was selected for this honor for his singular contributions to the profession of geology as a researcher, educational, leader, administrator, and public servant. Citationist William L. Fisher (Bureau of Economic Geology, Austin, Texas) said, “At the conclusion of his remarkable presidency of the University of Texas at Austin, Peter Flawn noted that no institution becomes great by pursuing and extolling the average. The Campbell Medalist and the man whose memory is honored by that medal never pursued, and certainly did not extol, the average.”

Peter Flawn joined the University of Texas in 1949, a graduate of Oberlin and Yale. He served as professor of geological sciences and as director of the Bureau of Economic Geology, moving in 1970 to university administration as executive vice president of the University of Texas at Austin, President of the University of Texas at San Antonio, and from 1979 to 1985, President of the University of Texas at Austin.

Flawn is past president of GSA, AGI, and AAGS. He was elected to the National Academy of Engineering in 1974 and also served on the National Science Board. Peter Flawn has held and holds several important state and federal appointments and has received numerous awards from universities and professional societies.

Peter Flawn and Ian Campbell were state geologists of Texas and California respectively, during the 1960’s. They were colleagues and friends, and shared several important agendas. To the honor of both, they now share one more.

William L. Fisher, CPG-2398, University of Texas at Austin. Austin Texas, was awarded the Sidney Powers Memorial Medal. This is AAPG’s highest honor.

Gerald M. Friedman, CPG-1531, has received the John T. Galey Memorial Award, the highest award granted by the Eastern Section of the American Association of Petroleum Geologists. Mr. Friedman is also the 1993 winner of the Association of Earth Science Editors Award for Outstanding Editing or Publishing Contributions.


Frank W. Harrison Jr., CPG-2500, received the William B. Heory Jr. Award for distinguished service to AGI. Harrison served AGI as treasurer, vice president, president and currently, he chairs the AGI Foundation Board of Trustees.

Jeffrey B. Lennox, CPG-7952, was named a senior associate of Leggette, Brashears, & Graham, Inc., Mr. Lennox is also a member of the American Geophysical Union, the Association of Ground-Water Scientists and Engineers, and the American Water Works Association. He received a masters of science degree in Civil Engineering for Colorado State University where he concentrated in Ground-water Hydrology, and a bachelors of science in Hydrology for the University of New Hampshire.

Bimal Mukhopadhyay, CPG-7708, to hydrogeology group leader, Lawrence Livermore National Laboratory, Livermore, CA.

Haydn Murray, CPG-2795, past president, AIPG 1991, has been elected president of the Association International pour l'Etude de Argiles.


Victor E. Oppenheim, CPG-3965, of Dallas Texas, received a 20th Century Award of Achievement from the International Biographical Centre of Cambridge, England in recognition of his achievements in the field of Geology. He has also been elected a member of the National Council of Engineers and Scientists of France.

Lisa Curci Worthington, CPG-6298, has been appointed commissioner to the state’s Oil and Gas Conservation Commission by Arizona Gov. Fife Symington. Lisa is currently an AIPG Advisory Board Representative.

Donald C. Haney, CPG-4053, director of the Kentucky Geological Survey, Kentucky state geologist, and president of AGI, has been appointed to a two year term on the Earth Sciences and Resources board of the National Research Council, an agency of the National Academy of Sciences. The board conducts studies on fundamental issues in the earth sciences and issues relating to the nation’s energy mineral resources.

Michel T. Halbouty, CPG-0010, Houston, TX was presented with an Honorary Professorship in Geology from the University of Nanjing, Nanjing China.
## Program - 31st AIPG Annual Meeting
Flagstaff, Arizona - October 12-15

### Monday, October 10
- 8:00 am - 9:00 am: Short Course registration
- 9:00 am - 4:00 pm: Premeeting Short Course #1: Appraisal of Industrial Minerals

### Tuesday, October 11
- 8:00 am - 9:00 pm: Short Course registration
- 9:00 am - 4:00 pm: Premeeting Short Course #1: Appraisal of Industrial Minerals (continued)
- 1:00 pm - 5:00 pm: Premeeting Short Course #2: ASBOG Workshop on Geological Registration

### Wednesday, October 12
- 7:00 am - 6:00 pm: Registration
- 8:00 am - 5:00 pm: 1994 Executive Committee Meeting
  (Closed Executive Session 8-9 am; Members welcome after Executive Session)
- 9:00 am - 5:00 pm: 94-95 National Committees
- 8:00 am - 5:00 pm: Exhibits setup
- 8:00 am - 5:00 pm: Hospitality Room
- 8:00 am - 4:00 pm: Field Trip #1 to Grand Canyon National Park
- 1:00 pm - 4:00 pm: Field Trip #2 (guest) to Sunset Crater/Wupatki National Monument
- 3:30 pm - 5:00 pm: Foundation Trustees meeting
- 5:00 pm - 7:00 pm: Icebreaker; exhibits open
- 7:00 pm - 10:00 pm: Dinner at Black Barts (no host)

### Thursday, October 13
- 8:00 am - 6:00 pm: Registration
- 8:00 am - 10:30 pm: 94 Advisory Board Meeting (continental breakfast)
- 8:00 am - 4:00 pm: Field Trip #3 (guest) to Oak Creek Canyon, Sedona and Jerome
- 10:30 am - 11:00 am: Coffee/juice break
- 11:00 am - 12:00 pm: General Session - Welcome & Keynote
- 12:00 pm - 2:00 pm: Annual Awards Luncheon
- 2:00 pm - 5:00 pm: Presentations - Geologic Mapping In Land Use and Exploration; Professional Ethics Challenges for Geologists; The Role of Geologists in Water Adjudication; Coffee/soft drinks
- 3:45 pm - 4:00 pm: Hospitality Room
- 8:00 am - 5:00 pm: Exhibits
- 5:00 pm - 10:00 pm: Dinner at Mormon Lake Lodge

### Friday, October 14
- 7:00 am - 9:00 am: Registration
- 7:00 am - 9:00 am: 95 Advisory Board Meeting (continental breakfast)
- 7:30 am - 9:00 am: Past Presidents Breakfast
- 8:00 am - 6:00 pm: Exhibits
- 9:30 am - 11:30 am: 94-95 Executive Committee Meeting
- 9:00 am - 4:00 pm: Field Trip #4 (guest) to Navajo & Hopi Indian Reservations
- 9:00 am - 11:30 am: Presentations - Legal Issues & Mining; Changing Roles of Geologists in The New Age of Environmental Management; Environmental Quality Issues
- 12:00 pm - 2:30 pm: Annual Business Meeting Luncheon
- 3:00 pm - 5:00 pm: Presentation - Professional Lobbying & The Geologic Community
- 4:00 pm - 5:00 pm: Annual Meeting Committee
- 5:00 pm - 6:00 pm: Reception
- 6:00 pm - 9:00 pm: Annual Banquet & entertainment by Earl Kingston

### Saturday, October 15
- 8:00 am - 4:00 pm: Field Trip #5 to Grand Canyon National Park
- 8:00 am - 4:00 pm: Field Trip #6 to Verde Valley & Jerome
- 8:00 am - 4:00 pm: Field Trip #7 to Meteor Crater, Petrified Forest & Painted Desert
- 8:00 am - 12:00 pm: Exhibit removal
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.

REQUEST FOR APPLICATION AND ADDITIONAL INFORMATION

NAME

EMPLOYER

STREET

CITY_________STATE______ZIP_____

DAYTIME PHONE

Mail, fax, or call:

AIPG
7828 Vance Drive, Suite 103
Arvada, CO 80003-2125
(303) 431-0831 • FAX (303) 431-1332

Please send me information on:

☐ Certification - (degree and 36 semester hours in a geological science, plus five years of experience).

☐ Candidate for Certification - (degree and 36 semester hours, but less than five years of experience).

☐ Student (major in a geological science and minimum of 18 semester hours in geological science).

☐ Publications

☐ Subscriptions

☐ Advertising Rates

☐ Insignia Items
1994


Jul. 7. AAPL 1994 North American Prospect Expo, Houston, TX. Contact: LeAnn Embrooke, AAPL, 8675 Riverside Dr., Fort Worth, TX 76137, Ph.: (817) 847-7700.

Jul. 7-9. Third Annual Meeting of the History of the Earth Sciences Society, Troy, NY. Contact: Gerald Friedman, 15 Third St., P.O. Box 746, Troy, NY 12181, Ph.: (518) 3247.

Jul. 11-13. Risk Assessment for the Environmental Profession, Madison, WI. Contact: NGWA, 6375 Riverside Dr., Dublin, OH 43017, Ph.: (800) 851-7379.

Aug. 12-15. Principles of Subsurface Contaminant Fate and Transport Modeling, Madison, WI. Contact: NGWA, 6375 Riverside Dr., Dublin, OH 43017, Ph.: (800) 851-7379.


Aug. 2-4. Ground Control in Mining, Lakeview Resort & Conference Center, Morgantown, WV. Contact: Dr. S. Peng, Dept. Mining Eng., College of Mineral & Energy Res., West Virginia University, P.O. Box 6070, Morgantown, WV 26505, Fax: (304) 293-5708.


Aug. 21-24. AAPG International Conference/Exhibition, Kuala Lumpur, Malaysia. Contact: AAPG Convention Dept., P.O. Box 979, Tulsa, OK 74110, Ph.: (918) 594-3055.

Aug. 22-27. Mining Engineering Pre-Preparation Course, University of Nevada, Reno, NV. Contact: The Division of Continuing Education, University of Nevada, Reno/048, Reno, NV 89557, Ph.: (800) 233-9826.

Aug. 29-Sep. 1. Third International Conference on Environmental Issues and Waste Management in Energy and Mineral Production, Perth, Western Australia. Contact: Co-Ordinated Functions Pty Ltd, P.O. Box 1305, West Perth, WA 6872 Australia, Ph.: (Int) +619 324 2555.


Oct. 5-7. ISO 9000 - Moving Industrial Minerals Into The 21st Century, Nashville, TN. Contact: Meetings Dept., SME, P.O. Box 629003, Littleton, CO 80162-5003, Ph.: (303) 973-9350.

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.: (800) 551-7379.


Oct. 11-13. 5th 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. Covas 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.: (800) 551-7379.


1995


FUTURE AIPG ANNUAL MEETINGS

1995 Denver, Colorado

1996 Columbus, Ohio

1997 Austin, Texas

1998 Baton Rouge, Louisiana

1999 Anchorage, Alaska

ADVERTISERS INDEX

ATEC Associates, Inc. BC

Geraghty & Miller, Inc. 6

International Ground Water Modeling Center 9

International Ground Water Modeling Center 16

Krueger Enterprises, Inc. 12

Northern Contzntional 7

Pennsylvania Drilling Company 24

Spatial Utilities, Inc. 11

Strata Services 14

FUTURE AIPG ANNUAL MEETINGS

1995 Denver, Colorado

1996 Columbus, Ohio

1997 Austin, Texas

1998 Baton Rouge, Louisiana

1999 Anchorage, Alaska
New Members (Call and welcome as professionals and add them to your directory)

MA - CARRIGAN, John A., CPG-9209
46 Collins Ave., Amherst, MA 01003, (413) 254-5064.

LA - KERSTING, J. Jeffrey, CPG-9210
4224 Vincennes Pl., New Orleans, LA 70125, (504) 592-7451.

MI - ZAYATZ, Mark R., CPG-9211
1004 Alpine Dr., Brighton, MI 48116, (313) 489-3023.

New Students

MI - HAVRILLA, John M., SA-0028
43213 Citation, Novi, MI 48375, (313) 557-2508.

PA - KRISHNA, Ganesh, SA-0027
403 Longview Dr., West Chester, PA 19104, (215) 895-3444.

ID - MUNSON, Steven A., SA-0026
1320 1/2 8th St. #3, Lewiston, ID 83501.

CA - NADDEEM, Mahnoor, SA-0029
1555 Lincoln St. #12, Santa Clara, CA 95050, (408) 924-6050.

In Memoriam

We are deeply saddened by the passing of Alabama Section member Paul H. Moser, CPG-1982, on May 1, 1994. As many of you know, Paul was a very active, highly respected member of our organization, having held numerous offices and committee positions, and having served as one of the authors of the Citizens' Guide to Geologic Hazards. Throughout his career, Paul devoted himself to the advancement of geology through his extensive research at The Geological Survey of Alabama, active membership in AIPG and other professional organizations, and through innumerable civic activities such as speaking engagements for citizen groups, government agencies, and local schools. Paul's life was the embodiment of the cornerstones of the AIPG creed: Competence; Ethics; and Integrity. Paul was truly an inspiration to all of us. We extend our deepest sympathies to the Moser Family - wife Dusti and son Cody. As we mourn the passing of Paul Moser, we should realize how fortunate we are to have known someone who gave so much of himself for the advancement of our profession. Paul's life should serve as the standard of excellence that all of us should strive to achieve.

Special Thanks!!!

A special thanks goes out to Gary C. Mitchell, CPG-4771, of Arvada, Colorado. Headquarters continues to receive numerous requests for membership information. The AIPG Headquarters staff would like to extend their appreciation to Gary for taking time out of his busy schedule to help the staff assemble a supply of membership information packets.

We would also like to thank those members who have helped staff the AIPG booth. All efforts are appreciated.
ATEC Associates, Inc
Quality Services for 36 years.

We are seeking growth-oriented, client-sensitive Environmental Professionals.

ATEC Associates, Inc. is a client-driven environmental service firm with over 1400 associates in 50 offices nationwide. We are interested in professionals who are responsive to client's environmental service needs while providing strong technical expertise. Hundreds of major industrial, commercial and governmental clients are satisfied with ATEC's responsiveness in the areas of:

- Soil and Groundwater Contamination Assessment
- Hazardous and Non-Hazardous Remediation Design
- Hazardous and Non-Hazardous Remediation Construction
- Tank Management, Closures, Removal and Replacement
- Health & Safety Training
- Industrial Site Assessments
- Air Quality Permitting
- Environmental Risk Management
- Analytical Laboratory Services
- Industrial Hygiene
- Fugitive Air Emissions
- Asbestos Services
- NPDES Permitting
- Waste Minimization

We have opportunities for experienced and proven leaders to help us expand our expertise in the following areas: National Accounts Management, Technical Operations Management, Senior Project Management, Profit Center Management, Sales & Marketing, and Geotechnical Engineering.

All qualified individuals are encouraged to apply.