WANTED - TPG ARTICLES
Instructions to Authors

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

Manuscripts should have the following section:

Title
Author(s) with CPG number and address
Text
Tables if included
Figures with captions if included
Appendix(es) if included
References Cited

One original and two copies of each manuscript should be submitted. Whenever possible, text should also be submitted on diskette. Headquarters uses WordPerfect 7 for Windows ’95, which is preferred, but Word, ASCII, RTF, or translatable files are acceptable. The program or format of the text should be clearly marked on the diskette. Articles can also be transmitted by e-mail.

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

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

General Topics:

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

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

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

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

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J. Dale Nations, Editor
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The Professional GEOLOGIST

Feature: Mining Geology
Peer-Reviewed Papers

New Lithium Production in Chile
George H. Edwards, CPG-2570 and Peter W. Harben

Tin as a Strategic Resource in Malaysia and Indonesia
Karl A. Riggs, CPG-2740

1998-99 Fulbright Awards for U.S. Faculty and Professionals

VOLUNTEER
Philmont Scout Ranch

FRONT COVER - Brine evaporation pond on the Salar de Atacama, with potassium chloride plant and halite storage piles in background. Photograph submitted by George H. Edwards, article on page 4.

DEPARTMENTS

TODAY IN WASHINGTON

PROFESSIONAL ETHICS & PRACTICES - Column 14

LETTER TO THE EDITOR

MEMBERS IN THE NEWS

MEMORIAL - Hans W. Schreiber, CPG-1337

AIPG BENEFITS AND INFORMATION

SECTION ACTIVITIES

IN MEMORIAM

NEW MEMBERS, APPLICANTS, ETC.

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Angular salt blocks pave the surface of the Salar de Atacama near the MINSAL potassium and lithium operation. A 10-ton dump truck hauls clay for the construction of evaporation pond berms across the surface to the Salar de Atacama. The Andes Mountains are in the background.
New Lithium Production in Chile

George H. Edwards, CPG-2570 and Peter W. Harben

Lithium has traditionally been produced from the silicate minerals spodumene and petalite, with lesser contributions from lepidolite and amblygonite. Major spodumene production has come from Gwalia, Ltd. in Western Australia, Cyprus Foote Mineral Company and FMC Corporation in North Carolina, and the Tantalum Mining Company of Canada, Ltd., at Bernic Lake, Manitoba. Petalite production has been limited to the Bikita Mine near Masvingo, Zimbabwe, with minor exceptions in Brazil, Western Australia, and Namibia.

Since 1984 Cyprus Amax Minerals Company (as Cyprus Foote Mineral Company) has produced lithium from brines of the Salar de Atacama, a salt pan in a structural depression lying between the Coastal Range and the Andes of Northern Chile.

Now two new brine-sourced lithium operations are coming on-stream in South America, and the owners of the last North American spodumene mine have announced plans for closure. MINSAL (Sociedad Minera Salar de Atacama, S.A.) has inaugurated facilities at the Salar de Atacama, and near the city of Antofagasta, on the Pacific coast, and FMC Corporation is constructing a lithium carbonate facility farther inland, at the Salar del Hombre Muerto, in Argentina.

The MINSAL brine operation is situated on the largest and richest lithium resource in the world. With mineral rights on a concession totaling 1586 sq. km., MINSAL states their ore reserves at 21 billion pounds of lithium carbonate equivalents. Production capacity for the new plant near Antofagasta will be 40 million pounds of lithium carbonate per year.

The MINSAL Salar de Atacama facility has been producing potassium chloride since late 1995, with the off-take going to their parent company, SQM (Sociedad Química y Minera de Chile, S.A.), one of the world’s largest specialty fertilizer companies, for use in fertilizer production. The salar brines also contain boron and sulfate, and production facilities for potassium sulfate and boric acid are underway.

**Location Map of the Salar de Atacama. (After Evans, 1986).**

The Salar de Atacama, the largest in Chile, and one of the largest in the world, lies in a tectonic depression of internal drainage (Ide and Kunasz, 1989; Evans, 1986). The slopes surrounding the Salar are mantled in volcanic deposits, including abundant rhyolitic ash-flow tuffs, which have been shown to leach lithium (and potassium) to ground water.

While rainfall in this region has been scant at least since the Miocene (Erickson and Salas, 1989), run-off from snowmelt in the high Andes has provided water to the Salar basin. Salts leached from the surrounding volcanic rocks have been concentrated, first by desiccation of the saline lake which first filled the basin, and since by evaporation of spring water, ground water, and intermittent flood water.
Evaporation is rapid in the Salar de Atacama. Annual rainfall depends on rare storms, so totals are variable, but averages between 10 and 30 mm. Peak ambient temperatures range from -5° in winter to 35° in summer, and afternoon wind velocities can reach 100 kph. As a result evaporation rates as measured by MINSAL are in the range of 3300 mm per year.

Production of lithium involves producing brine from shallow bore-holes (10 to 30 m) and flooding into polymer membrane-lined evaporation ponds. As halite salts are precipitated, the brines become increasingly enriched in potassium, lithium, and boron, and are pumped to the next stage of evaporation.

Potassium salts are harvested using modified pavement profiling machines produced by Caterpillar or Rahco, and trucked to the processing plant by contract truckers. The precipitated potassium chloride is separated from contaminating sodium chloride by froth flotation using an amine as the collector, and methyl isobutylcarbinol as a frother. Sylvite is floated, while the underflow halite is dewatered and sent to tails.

Bitterns from the potassium chloride evaporation ponds are enriched in lithium, and a portion of these are sent to lithium concentration ponds for further evaporation. The eventual lithium brine is about 6% lithium, and this is shipped by tank truck to the lithium plant near Antofagasta. Surplus lithium-enriched bitterns are recharged to the Salar where they can be recovered for future production.

Lithium and boron are separated by solvent extraction. Boron values are presently sent to a holding pond for future recovery when the boron plant is completed in 1998. Magnesium is removed from the liquor by precipitation as the hydroxide and the carbonate, and the pregnant lithium liquor goes to the lithium carbonate precipitation stage, where it is reacted with soda ash.

Precipitated lithium carbonate is dewatered on a belt filter with fresh water sprays, dried, and packaged. Packaging options include half-ton and 1-ton maxi-bags, 25-pound, 25-kg, or 50-kg kraft-paper bags, or polyfilm-lined fiber drums.

The lithium chemical plant is extremely modern and highly automated. Production is supported by an analytical laboratory equipped with atomic absorption and infra-red spectroscopy, as well as physical property capabilities such as particle size analysis.
Packaged lithium carbonate in containers is exported on general cargo vessels from the port of Antofagasta. It can also be transported to the port of Tocopilla, 160 km north of Antofagasta for loading aboard bulk cargo ships. This port facility is owned by SQM and used to export bulk nitrates. Bagged products are loaded on top of bulk nitrate cargo, after trimming and separation by plastic. This arrangement achieves low bulk cargo shipping rates for the bagged material, as SQM utilizes bulk-charter vessels.

References


New Geologic Mapping and Digital Maps Proposed

The Wyoming State Geological Survey recently submitted a $31,000 proposal to continue a geologic mapping project in northeastern Platte County and to initiate the digitizing of 1:100,000-scale surficial and bedrock geologic maps. The State Geological Survey applied for funding through the State Geologic Mapping Program (STATEMAP), which is administered by the U.S. Geological Survey. STATEMAP is a component of the National Mapping Act of 1992 in which States and the Federal government share equally in the cost of geologic mapping projects. For these projects, the State must match each Federal dollar. The two-part proposal was developed by Ray Harris of the State Geological Survey's Industrial Minerals and Uranium Section and Jim Case of the Geologic Hazards Section.

Harris has proposed mapping the Guernsey Reservoir Quadrangle (1:24,000-scale) during the 1997 field season. The quadrangle is within the Hartville uplift of southeastern Wyoming. The area included in the quadrangle is quite active in the production of industrial minerals and decorative stone. Completion of the map will provide information useful in the exploration and development of minerals as well as in the planning and siting of industrial facilities and housing developments. A portion of the town of Guernsey is located within the quadrangle.

Case, in the second part of the STATEMAP submittal, will digitize the Casper, Cheyenne, Laramie, and Rawlins 1:100,000-scale surficial geologic maps and the Cheyenne 1:100,000-scale bedrock geologic map. This effort will test and evaluate both scanning and hand-digitizing technologies to determine the best and most efficient approach to digitizing the maps. Final digitized layers for each map will include bedrock or surficial geology, hydrography, roads, and boundaries of the public land survey.

STATEMAP previously funded the State Survey's mapping efforts in the Laramie area during the 1994 and 1995 field seasons and in northeastern Platte County during the 1996 field season.
Tin as a Strategic Resource in Malaysia and Indonesia

Karl A. Riggs, CPG-2740

Introduction

Malaysia is the world's leading producer of tin and supplies most of the imports of tin to the U.S. As in Thailand, western, central and eastern tin belts are recognized in Malaysia. In 1987, the official quota for tin for Malaysia was 28,526 tons of tin metal. Declining reserves make the upper limit of potentially worldwide production about 60,000 tons per year. Malaysia is also the world's largest smelter of tin, with smelting capacity of 100,000 tons per year. Much of these tin concentrates come from other countries such as Australia and Zaire.

In spite of the surplus of tin on the current market, Indonesia has made no effort to reduce its tin production, and Indonesia has in fact actually increased production. Although the local tin plate industry uses much of the surplus production, Indonesia has almost exceeded its export quota in recent years. Also in recent years, Indonesia has imported as much as 119,000 tons of tin plate of which 113,500 tons was consumed by the canning industry of Indonesia. Indonesia exports a product of 99.85% tin to Europe, Japan and the U.S. It also sends 99.92% tin product to Japan which, under contract may not be re-exported. Usually Indonesia is a net exporter of tin.

In the City of Singapore, tin metal is believed to be produced from concentrates smuggled out of nearby countries. Of course tin ore is not mined in the City of Singapore itself.

Malaysia

Malaysia hosts several major deposits of tin. The Selanger deposit is believed to be one of the world's largest subsurface alluvial tin deposits. It is worked by 4 dredges which began operation in approximately 1985. Other important tin deposits are at Fraser's Hill, 20 to 40 miles northeast of the Selanger River deposits. The Kuala Langat is also one of the biggest tin deposit areas ever discovered in the world, having at least 300,000 tons of proven tin reserves.

Since 1890, the Kinta Valley area in the state of Perak has been the largest and most productive tin field in the world. It has contributed approximately 30% of Malaysia's total recorded tin production. Production actually started as early as 1876; since then, about 2,000,000 long tons of metallic tin have been produced in Kinta Valley.

Kinta Valley is reputed to possess the largest concentration of alluvial tin deposits in the world. Alluvial tin deposits have been found almost everywhere in the valley. Much of the Kinta Valley tin is recovered from alluvium by dredging and by the gravel pump method. The production has cut-off grades from 0.20 to 0.26 pounds of cassiterite per cubic yard. Production from the placers of Kinta Valley will decline indefinitely. More needs to be done to search for primary tin lodes in the granites, skarns, pegmatites, aplite dikes and aplite sills.

Kinta Valley is flanked by granitic ranges to the east and west. The tin is associated mainly with the late phase finer-grained granite. Fissure and fracture-filling veins in the limestones, and in other rocks also have potential as tin oreas. At present, the tin recovered from these hard rock lode deposits is minor compared to the tin recovered from the placers. Nevertheless, the various kinds of lode deposits are an important resource for tin production of the future in Malaysia.

Some currently important lodes are: the Gunong, Bakau in the Selanger area, Lahat Pipe in the Kinta Valley of Perak State, the
Beatrice Mine in Selabin, and Sungei Lembing in the State of Pahang. Sungei Lembing is the largest lode tin deposit in the world, and is of the Cornwall, England type. This is significant because it implies adequate reserves for the long term future. From the mined area of 6 square miles, Sungei has produced about 60,000 long tons of tin concentrate from more than 5 million tons of ore since 1888. Since World War I, the Pahang mines have produced 5% of Malaysia’s tin production, or about 1.5% of the tin production of the world. Some of the lodes of Pahang State range from a few inches up to 10 feet in thickness. Veins are 50 to 2000 feet apart and can be followed for a one-half mile and worked one-half mile down the pitch of the vein.

All of this implies vast reserves and resources, both in the jungle placers and rich tin lodes that await discovery in Malaysia. However, location of these potential placer and lode deposits will require extensive and intensive exploration. Much of the tin potential lies in the coastal and offshore areas.

Indonesia

Indonesia is capable of producing at least 34,000 tons of tin metal per year. Of this, about 24,000 tons of tin metal is produced on Bangka Island. This is one of the three “tin islands” 10 to 100 miles to the north-east of Sumatra, and 120 to 400 miles to the southeast of Singapore. Another of the major “tin islands” nearby is Belitung. Belitung can produce about 8,600 tons of tin metal per year. The third island in the area is Singkup, with the capacity of about 1,500 tons of tin metal per year. The large island of Sumatra produces only 54 tons of tin metal per year.

Belitung Island hosts several types of deposits. Complex carbonate mineral suites called skarns are one type. At Kelappa Kampit in 1979, tin production started from unusual bedding plane veins. Also at Kelappa Kampit, banded pyrite, pyrrhotite and cassiterite ore has been extracted since 1979. However, output from these primary ores is insignificant, and much remains to be documented about their possible economic potential. The primary cassiterite occurrences have been studied most on Billiton, but the tin deposits on all of the islands seem to be similar. The main plutonic rock is a coarse porphyritic biotite granite.

Most of the tin deposits of Indonesia are offshore, but offshore and onshore placers are in the Java Sea and are concentrated around the islands of Belitung, Bangka, and Singkup. Additional reserves may be discovered on the Sunda Shelf.

The potential of the onshore areas is revealed by an approximate 4,000 square miles on Banka, about 1,450 square miles on Belitung and less than 300 square miles of Singkup. The residual concentration deposits are called koelit and kaks in Indonesia. Kaks is the Indonesian name for the transported alluvial placer ores. The koelit deposits are more residual than *eluvial. This soils term should not be confused with alluvial. The proportions of koelit and kaks are not known. While no exact figure can be given for the depth at which the deposits formed, it is estimated that the Indonesian ores total over 5,000 feet of ore, and probably this would be too small.

Other tin deposits occur around Bangkinang on the western coast of Sumatra Island. Offshore of Sumatra in the Tujah Riau (Riouw) Island area, occurrences include the islands of Karimun and Kundur and a few other possibilities on islands of the Riau (Riouw) Archipelago. Also Flores Island, which is about 300 miles east of Java, has tin.

At least 50% of Indonesia’s potential tin resources are offshore. Offshore dredging costs are much lower than mining on land. Deep-seated tin layers in offshore areas are potentially the most important source for new production. The offshore ores average a much higher grade. This is partially the result of three big bucket (22 cubic feet) dredges which have been constructed. The large dredges are capable of reaching a depth of 45 meters.

Conclusion

Indonesia has been one of the world’s major producers of tin for many decades, and it has the potential to hold its place as one of the world’s major producers throughout the twenty-first century. As in Indonesia, the greatest potential for further tin reserves in Malaysia would be in the offshore areas. Malaysia has a great future potential for much additional tin production if exploration is done for offshore deposits. Malaysian tin production probably would be less than 60,000 tons per year in the foreseeable future.

The genesis of the tin deposits of Asia and Southeast Asia is still uncertain generally because it has not been studied in detail. It is likely that a number of genetic types exist. The proper detailed genetic research would be valuable for locat-
ing additional tin deposits in southern Asia and Indonesia.

More tin deposits await discovery in southeastern Asia and Indonesia because of the great extent of the placer deposits, the remoteness of the jungle country, and the great potential for undiscovered lodes and placers.

*Eluvial is primarily a term used in soils geology. It means a complex near surface deposit consisting of weathering residuals, sheet wash deposits, soil creep and slumping in the most complex mixture of sediment imaginable.

**Selected References**


9. A complete list of references used is available on request from the author.

Karl A. Riggs, CPG-2470, has had a complex career in teaching, research and consulting. His consulting has involved companies and corporations in the fields of petroleum, mining, engineering and the environment. Also he has done consulting assignments for various state and federal agencies. In addition he has served on various projects sponsored by the U.S. Army Corps of Engineers. Dr. Riggs is a member of numerous professional societies including the National Military Intelligence Association and the U.S. Naval Institute. On his flight around the world in 1960, Dr. Riggs visited Darwin, Australia; Djakarta, Indonesia; Singapore; Bangkok, Thailand; and Calcutta, India. This route took Riggs over much of the tin country of southeastern Asia, and Indonesia.

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**1998-99 Fulbright Awards for U.S. Faculty and Professionals**

Opportunities for lecturing or advanced research in over 135 countries are available to college and university faculty and professionals outside academe. U.S. citizenship and the Ph.D. or comparable professional qualifications required. For lecturing awards, university or college teaching experience is expected. Foreign language skills are needed for some countries, but most lecturing assignments are in English.

The deadline for lecturing or research grants for 1998-99 is August 1, 1997. Other deadlines are in place for special programs: distinguished Fulbright chairs in Western Europe and Canada (May 1) and Fulbright seminars for international education and academic administrators (November 1).

Contact the USIA Fulbright Senior Scholar Program, Council for International Exchange of Scholars, 3007 Tilden Street, NW, Suite 5M, Box GNEWS, Washington, DC 20008-3009. Telephone: (202) 686-7877. Web Page (on-line materials): http://www.cies.org E-mail: cies1@ciessenet.cies.org (requests for mailing of application materials only).

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**Advanced Degree Geology Classes over the Internet?**

Dr. Tom Wilson, Geology Department at West Virginia University is interested in getting any kind of feedback to the possibility of starting an Advanced Degree Geology program over the Internet.

Taking classes over the Internet may become a great way for continuing your education when hectic daytime schedules or work hours inhibit you from college enrollment programs.

Please contact Dr. Wilson at (304) 293-5603 or send E-mail to wilson@wvugeo.wvnet.edu if you have any desire or interest in College Level Internet classes. Instructional Technology Grants are a possible way for the University to create new programs. The Geology department needs to obtain feedback from the geologic community for any interest in such programs.

Editorial note: If you are unable to access the Internet via your own personal computer, more than 178 libraries across the state now offer free access to the Internet via their computers. Contact your local library to see if they provide this service. Now access to the Internet has become even easier!

From the PA Association of Petroleum Geologists newsletter, October 1996
Greetings!! Have a happy new year. Here it is; unsullied and waiting for the taking. *Carpe diem.*

And to give you an idea of things to come - here are some goodies from the Federal Registers:


EPA developed a set of Q's and A's to assist municipalities and permitting authorities in implementing its recent policy outlining an interim approach for incorporating water quality-based effluent limitations into storm water permits.

For further information contact: William Hall, Urban Wet Weather Flows Matrix Manager, Office of Wastewater Management, at 202-260-1458 or by internet at hall.william@epamail.epa.gov.

**Vol. 61, No. 217, 11-7-96, page 57605.**


This proposed rule consolidates, adds, deletes and rewrites to clarify, regulations dealing with prohibited actions on BLM administered lands.

Comment by 1-6-97. My guess is that the comment period will be extended, so comment anyway. For further information contact Dennis McLane at 208-387-5126 or send comments via the Internet to woacomment@wo.blm.gov. Please include Attn: AC30 and your name and address in your message.

**Vol. 61, No. 218, 11-8-96, page 57837.**


BLM proposes to amend its regulations to carry out the Bodie protection Act of 1994 which withdrew Federal lands located around the historic former gold mining town of Bodie, California from availability under the mineral laws of the U.S.

You may send your comments via the Internet to the address listed in the previous note above and include attn: AC60 and your name and address in your comment, or you may contact Roger Haskins at 202-452-0355 for further information.

I'll sign off this month with a quote from Sophie Tucker, "Keep Breathing".

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**University of Wyoming Announcement**

**The Bernard L. Majewski Research Fellowship**

The American Heritage Center announces its inaugural offering of the Bernard L. Majewski Fellowship and invites applications from interested scholars. The Fellowship is named in honor of the late petroleum industry pioneer, Bernard L. Majewski, and provides a stipend of $2,500 in support of research conducted in the archival collections at the American Heritage Center on the campus of UW. Acceptable areas of research include history, oral history and historical archaeology pertaining to economic and petroleum geology, or environment and natural resources, business or economic history pertaining to economic and petroleum geology. The deadline for applications for the 1997 Fellowship is March 1, 1997 and research should be conducted by the Fellow within one year of appointment. For application information or a comprehensive listing of available research collections, contact: Bradford R. Burton, International Archive of Economic Geology, American Heritage Center, P.O. Box 3924, University of Wyoming, Laramie, WY 82071. Phone: (307) 766-6506, fax (307) 766-5511 or E-mail: bburton@uwyo.edu.

For updated information on this subject, check our web page:

http://www.uwyo.edu/ahc/iaeg/majewann.htm
AIPG National Meeting
1997

The TEXAS Section of the American Institute of Professional Geologists is pleased to announce that the 33rd ANNUAL MEETING will be held at the DOUBLETREE HOTEL POST OAK

in

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October 8-11, 1997

Theme of the meeting will be:
The 21st Century Professional Geologist - Training, Credentials, Business and Political Considerations

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Contingency Fees for Experts
(see Column 11, October 1996)

Allan Juhas, CPG-6441, called to note that geologists who accept stock, stock options, royalty, or other interests in mineral properties as part of their professional service fees are receiving a form of contingency fee. The amount received for the professional work depends on the success of the venture. Clearly such payment arrangements have long been part of the range of professional compensation and are not unethical per se. (Note that disclosure of such interests to those contributing the funds for the venture is generally required and failure to make such disclosure may constitute an ethical violation and may be a violation of the securities laws.)

The point of the original question and discussion was not whether contingency fees in general were always ethical or unethical, but rather was whether contingency fees could be accepted by an expert witness. That discussion expressed the view that while such fees are not prohibited by the AIPG Code of Ethics, acceptance of contingency fees presents various legal and tactical difficulties and that conventional practice is to avoid them. Doing so promotes a sense of impartiality on the part of the expert, a sense vitally important to the expert’s success.

An upcoming issue of this column will address the various types of professional work and the various forms of compensation customarily used for geologic services. This will be based on a guideline issued by the Australasian Institute of Mining & Metallurgy.

Résumé Honesty

I hope everyone read “Been There: Done That!” the excellent article on the growing lack of truth in résumés by John T. Howard, CPG-8740, in the November TPG, p. 26. The increased unwillingness of former employers to talk about former employees for fear of being sued compounds the problem. If you haven’t read the article, do it. It was not written for this column but it sure could have been.

Continuing Education and Professional Development

Introduction: continuing education is one of the hot topics of discussion in the geologic profession these days. Should geologists be required to complete some amount of continuing education or professional development courses or activities in order to maintain their professional status as licensed or certified geologists? Those organizations having such requirements argue that their members are more qualified than those organizations which do not. Other professions, law, medicine, accounting, etc. have various types of requirements. And, given the continual and increasing amount of knowledge and new techniques being used in any profession, the need for continuing education and professional development has never been in question. Indeed, the AIPG Code of Ethics states, “STANDARD 5.1: Members should strive to improve their professional knowledge and skills.” The issue is not whether participation in such activities is incumbent on the professional geologist, it is whether and in what form should such activities be required.

This column reviews my personal experience and ideas on the subject. My intent is to stimulate discussion of various issues as AIPG moves toward developing a set of requirements for maintaining one’s certified status.

The Geological Society (London) is going through the same process as AIPG and I believe that their name, “Continuing Professional Development,” improves on “continuing education” because it better summarizes the goal of the effort and encompasses a broader range of activities.

1. Continuing professional development should consist of a mix of technical, professional, and ethical activities.

Geological practice consists of applications of the earth sciences in an ethical manner within the working conditions of societies. Keeping up as a practical matter consists of keeping up in all these areas, and continuing professional development credits should recognize this. For example, one of AIPG colleague remarked that basic accounting was perhaps the most important non-science course he took in preparation for his technical career. Likewise, one of the schools I attended now requires its graduates to demonstrate the ability to write moderately complex computer programs, a requirement not existing when I attended. Keeping up professionally for me has included becoming familiar with the use of a computer through both formal and informal training. Keeping up with evolving regulatory requirements is another example of non-science but necessary professional development for many geoscientists.
Ethical practice, if truly followed by all, would take care of continuing professional development and many other things now being required. However, just what ethical practice is and how it is applied to a geological practice is a very seldom discussed topic. Further, formal courses in professional ethics are generally non-existent. This column is an effort to correct this.

Continued training in the geological sciences is obviously important. But so is training in many other areas. All should be recognized and some sort of mix of science, professional, and ethical should be required. The mix could be something like 40% science, 40% professional, and 20% ethics or, more flexibly, could require that at least 20% of one’s credits be in each of science, professional development, and ethics areas.

Over the past few years, my personal professional development activities have included attending local and national meetings of several geological organizations and on securities law (I was a geologist for the SEC for 21 years), reading various professional journals (not cover to cover, but some articles and lots more abstracts), preparing and giving talks at various local and national meetings, taking college courses on computer programming and basic accounting, completing a program leading to a certificate in paleontology from the Denver Museum of Natural History, participating in field trips on various aspects of geology (mines, paleontology, engineering, and environmental geology), reading computer magazines and learning to use new programs and upgrades of others, and studying various articles and reports relating to projects I’ve worked on. While this is my list, most geologists can assemble similar lists of varying activities.

Looking at the details of the list brings into clearer focus various issues relating to what should or should not be included in, and the relative weighting of, requirements. Let’s start with the two courses for which I’ve received academic credit hours, computer programming and basic accounting. Everyone understands the basic academic credit system, that the 6 semester hours I earned means, so the number of credits is easily identified.

But what about the relevance of these courses to my development as a geologist? Neither course was offered by a geology department. A computer is like a petrologic microscope, a tool one should know how to use. Most of us have academic credit for one or more courses involving optical mineralogy and petrology. Likewise accounting is an important course for those dealing with money and economics of companies.

The paleontological subjects and techniques I reviewed or learned as part of the certification in paleontology program is one of the clearly geologic items in my list. But I make my living as an economic geologist, not a paleontologist. The geologic value to my consulting practice is mostly due to the fact that you can never look at too many rocks or in too many ways. That, and the value I can contribute as a volunteer to a good organization. The point being that my computing and accounting courses were in fact more directly useful to me in making a living.

Attending meetings and field trips is something we all do. And we learn from these. Should one receive credit for doing so? Some argue “yes” and others, “no.” Is there or should there be a difference in the amount of “credit” one receives for attending a local meeting compared to a national meeting? How much credit should one receive for attending meetings and field trips compared with the credit received for an academic course? The geologic relevance of meetings and field trips is generally clear, but the amount of credit is not. It is the reverse of the credit/relevance situation applied to my accounting and computer courses.

We all read our professional journals to varying degrees. Should we be able to receive credit for doing so? How should such credit be granted? For example, should there be a system whereby we could short review or critique of a paper in a journal as a means of receiving at least some of our “required” credits. The advantage of doing this is that it is something which can be done anywhere in the world. But who does the “grading” and how are the graders to be compensated? Should one receive credit, and how much, for writing a paper? Should the review of a paper as a journal referee count?

Clearly, there is room for much discussion on what should count towards meeting the required amount of continuing professional development as well as discussion on the proper mix of requirements. On reflection, I believe that requiring a minimum of say 20% in each of geology, professional skills, and ethics provides both needed minimums and the flexibility each of us needs to meet our individual professional needs.

2. Continuing professional development credits should be available by a variety of means

My practice requires sufficient travel that attending formal university courses is difficult. Short courses work better, but tend to be very expensive. Attendance at meetings can be an excellent way of keeping up with certain things, provided that the meetings strive for quality programs. I believe credit should be given to those who give talks and write papers. And for those not able to readily attend meetings, etc., I understand that in some professions, open-book exams on various professional journal articles can be used for continuing professional development credit. There are and should be a broad variety of ways of meeting the requirements. And the geologist
practicing in remote areas should be able to comply with the requirements with relative ease without having to incur the time or expense of going to a larger city or more developed country.

3. Continuing professional development credits should be readily available around the world.

Denver, where I live, has an active geological community with many opportunities for training in a wide variety of geological disciplines. So receiving accreditation for many activities in Denver is not too difficult. But what about the geologists with whom I’ve worked during the past year in Nigeria. Many of them have the training and experience to qualify for membership in AIGP and similar organizations. How would they be able to comply with continuing professional development requirements of a U.S.- or U.K.-based organization? Closer to home, what about the AIGP members in Homer, Alaska; Ouray, Colorado; Lewiston, Maine; or the 18 foreign countries listed in the 1996 Membership Directory. I don’t have all the answers. But I believe that one’s ability to keep up is not and should not be dependent on where one happens to live and work.

4. Working with international organizations to provide mutual continuing professional development support.

The issue of whether and what sorts of professional development requirements should be adopted is an active topic of consideration in Great Britain as it is in the U.S. Indeed, I suspect it is indeed a world-wide topic. I also perceive geology as becoming increasingly an international practice.

Therefore, I believe that the various geological societies around the world should work, together and recognize each others courses and programs for providing continuing professional development credits.

5. Consider a 3 to 5-year rather than annual continuing professional development requirement.

The continuing education requirement for U.S. lawyers must met over a several year period rather than annually. This allows one to focus on a particular job for a number of months and then to devote a period of time for study. I would urge consideration of a similar requirement for geologists. Thus rather than requiring for example, annual attendance at major meeting, such attendance could come over a period of time. If the specific requirement were, for example (I’m not suggesting this as a specific requirement; it’s just a simple illustration), attendance at 5 days of a major meeting in five years, one could meet it by attending one day of meetings each year, or by going to a 5-day meeting once every five years. For some individuals, the ability to concentrate significant amounts of continuing professional development time into intense but infrequent time periods may be what allows them to keep up.

6. How much credit should be required?

How much continuing professional development should be required? As noted at the beginning of the discussion, part of the movement towards requiring continuing professional development stems from the competition between or perceived relative status of those professions and organizations that have requirements as opposed to those that do not. Will the next level of competition be between those with, say a 40-credit requirements relative to those requiring 30 credits? The ultimate absurd end of this sort of competition is the requirement that one be continuously engaged in continuing professional development to the exclusion of all other activities. So how much is enough?

A related question concerns the method of assigning credits to particular, approved activities. If one counts each contact hour in a class as 1 unit, then more credits will be required than if, say 10 contact hours are required for each credit (which is closer to the number of credit hours granted for college courses).

7. Who sets the standards and keeps track of credits earned?

The perceived quality control over what activities receive what amounts of credit is another important issue and potential source of competition and debate among organizations. Who sets the standards? Will reciprocity be granted to other organizations? I hope that there will be uniformity and reciprocity. With the increasingly international character of geological practice and membership in the major organizations, uniformity and reciprocity should be an important goal. But as with state licensing reciprocity, or the effectiveness of licensing and certifying organizations in policing those who do not meet the published minimum standards, I’m pessimistic.

Who keeps track of units earned? Probably the same organization granting credit will keep track of units for participants in its program. But then there is the little matter of paying the salaries and related expenses of whomever is granting credits to various activities and the staff involved in keeping up everyone’s credit records. I don’t know but would guess that for AIGP at its current membership level, the credit-granting and record-keeping might well require two additional staff members. The cost of these staff members’ salaries, benefits, equipment, office space, etc. will be significant.

I hope the foregoing will stimulate lots of discussion. My impression is that various of the issues raised have not been thoroughly addressed by those advocating required credits. As always, comments and diverging views are welcomed. Who knows, maybe it will be one way to get some professional development credit?
Dear Editor:

I read the review of “Mining Legislation in the 104th Congress” in the October 1996 issue of The Professional Geologist and wish to commend you for your interest in geology and mineral deposits.

I am a retired mining and exploration geologist with a background of more than 45 years of experience including some work in 31 foreign countries as well as all of our western states and some In the midwest and east. I do not have any stock in any mining company nor do I own any mining property; accordingly I hope that you will consider that I have no personal ax to grind. I have never been a lobbyist and, at this time in my life, I only hope to promote understanding for our common good.

It seems that the most vociferous advocates of radical change of the Mining Law of 1872 portray it as an unconscionable giveaway of the “People’s Heritage”. Aside of the need to provide assurance that patented mining claims are not sold off for real estate without fulfilling an implied contract to produce the minerals that were the basis for the issuance of patent, I see the proper functioning of that law as a prime benefit to our Society; certainly no giveaway. By enabling producers of metals to find and sell them at low prices (as in the past), the Mining law of 1872 has, in effect, been a subsidy to the American people.

It might be useful to make a comparison between the activities of inventors and prospectors (explo-rationists). We have all benefitted tremendously from the inventions of gifted people like Edison because their inventions have made our lives safer, easier and more enjoyable. The ideas that these gifted people developed in their brains were non-existent before, yet could have been developed by anyone with the proper inspiration. Those ideas were very seldom converted to useful inventions without much hard work, revision, time and money. Because we applaud the work of these inventors, we respect them and give them a certain amount of homage. We do not accuse them of stealing our heritage because they developed ideas out of thin air, nor demand that they pay the Government a royalty for producing the invention. We only ask that they pay their income taxes as any responsible citizen should do.

Similar to inventions, a metalliferous ore deposit is not known (they don’t have flags on them saying “here I am”) until an explorationist, using the knowledge he or she has been able to accumulate, gets an idea which deserves follow-up with time-consuming and expensive geological, geochemical and geophysical studies. Even when such studies seem favorable, they provide no solid assurance that an ore deposit is present. One cannot say that an ore deposit is truly discovered until it is drilled, or penetrated by shafts or adits to determine that mineral is present in sufficient quantity and proper mineralogic character to permit recovery, at a profit. This phase is analogous to an inventors pre-production development. There should be no doubt in anyone’s mind that our Society could not continue to exist without minerals and metalliferous ore deposits which are among the most elusive. It is sad and ironic that people who take the risk to find materials that our Society must have are pilloried as greedy thieves of the people’s heritage. Explorationists have only acted upon their intelligence to develop ideas, which like to an inventor, were available to anyone; but which, until developed, are nothing. Now, in contrast to an inventor’s situation, proposals have been made to levy a royalty on the gross production, without regard to profit as well as requiring the usual income taxes on profit (if any can be made under those conditions).

An inventor has many choices for location of a manufacturing plant. One must develop a mine where nature placed the accumulation of minerals. An inventor can continue to produce his invention as long as he can obtain the materials to make it and have sufficient demand to sell it. In contrast, a mine is a wasting asset; there is only so much ore that can be extracted
at a profit under the prevailing economic conditions. Characteristically, metalliferous ore deposits have higher-grade centers which fade off with distance from the mineralizing center to a point where, though ore is still present, it is uneconomical to recover. To be responsible to its stockholders and employees, a mining company must make a profit in a reasonable number of years of its operation of the mine or it will go out of business with consequent adverse economic and social impact on its employees and the community in which it operates. Any unnecessary or avoidable expense, such as certain royalties, raises the cutoff mineable grade and thereby reduces the amount of ore that can be recovered from that deposit. Such actions are anti-environmental in that they hasten the day when the mine must be abandoned as worked out or uneconomic. That also hastens the day when replacement production must be found to meet Society's needs and means that more surface disturbance will occur in developing replacement mines. Any mineral deposit left behind as uneconomic, is almost certainly lost and therefore wasteful. If we follow the wasteful policies advocated by Babbit and Bumpers, I can envision our descendants castigating us for being extremely short-sighted. We should encourage policies that make it possible to recover as much useful minerals from each mine as is reasonable possible. It will be the long term benefit for us and our descendants.

Thank you for your kind consideration of this matter.

Ora H. Rostad, CPG-1869

North Carolina Board for Licensing of Geologists

Chairman David Garrett presented the preliminary findings of a nationwide poll that require licensing or registration of geologists. This effort by the ASBOG Committee on Enforcement and Disciplinary Action found very little disciplinary activity and essentially no license revocations in the last three years among 23 states. The ad hoc Committee will continue for another year with its mission to begin fabricating language for a model disciplinary action policy.

It is fitting that North Carolina should take a leading role in this area.

For states using the ASBOG exam, national geologic exam dates for 1997 are April 18 and September 12, and for 1998 the dates are April 17 and September 18.

G. David Garrett, P.G., Chairman
AIPG Carolinas Section newsletter, Winter 1996

VOLUNTEER

Volunteer geologists, mineral or reclamation specialists, earth-science teachers, etc. are again being recruited to share a week or more of your professional expertise this coming summer with America's youth at the Philmont Scout Ranch, Cimarron, New Mexico.

This is the fifth season for the volunteer program which is under B.L.M. coordination.

Participants will be located in the forested back country at one of three historic mining sites. This affords an opportunity to talk rocks, careers, continental drift, environmental challenges or whatever. Some 20-thousand young men and women backpack seasonally in the Sangre De Cristo Mountains.

The world famous Philmont Scout Ranch provides shelter and meals. Better yet, your wife and offspring can stay over at no cost at the ranch base camp. A wide range of activities are available at a nominal cost/space available basis to keep families happy. It can be a low finance vacation.

Warm bedrolls, rain gear, the spirit of adventure and a desire to rap informally with teenagers around a campfire or on the trail are all that is needed. If interested, contact Bill Wagner,

Philmont Outreach Coordinator at (801) 539-4062, or at: Bureau of Land Management (932), 324 South State Street, POB 45155, Salt Lake City, Utah 84145-0155.
MEMBERS IN THE NEWS

Terrance Brennan, CPG-7619, is serving on the USEPA Fate and Mobility Peer Review Panel to review research grant applications in the area of Environmental Fate and Treatment of Toxics and Hazardous Waste.

John Paul Gries, CPC-0771, recently completed his book "Roadside Geology of South Dakota". The book describes the geology of South Dakota as viewed along its roads, highways, and interstates. It is written in layman terms, typical of the "Roadside Geology" series of books produced for other US states. It is divided into three sections, east of the Missouri river, west of the Missouri River, and the Black Hills.

The AIGP Kentucky Section recently awarded the section’s Lifetime Achievement Award to Dr. Wallace Hagan. Dr. Hagan, CPG-4866, was the State Geologist and Director of the Kentucky Geological Survey from 1958 to 1978, and also a past President of the Kentucky Section of AIGP. He received his Bachelors, Masters and Doctorate degrees from the University of Illinois in 1935, 1936 and 1942 respectively. Dr. Hagan has been the recipient of numerous awards over the years, some of which include: The American Association of Petroleum Geologists Public Service ward; the United States Geological Survey’s John Wesley Powell Award; and, the Kentucky Academy of Science Distinguished Science Award.

Michel T. Halbouty, CPG-0010, has been elected a member of the Chinese Academy of Engineering, Beijing, for "significant contributions to engineering and technology of China, as well as high academic standing internationally." Halbouty is CEO of the Michel T. Halbouty Energy Co., Houston.


Howard Harlan, CPG-6821, formerly Chief Evaluations Engineer for Cambior USA, has joined Granges Inc. as Manager of Business Developments.

John D. Haun, CPG-0136, has received the American Geological Institute’s Heroy Award for distinguished service. Mr. Haun, a former AIGP, AAPG and AGI president, is a consultant in Evergreen, Colorado.

Robert R. Jordan, CPG-1262, has received the American Geological Institute’s Ian Campbell Medal, AGI’s most prestigious award. Dr. Jordan, a former national editor of AIGP, is state geologist of Delaware and a professor of geology at the University of Delaware.

John M. Kaufman, CPG-7409, has joined McLaughlin Water Engineers, Ltd. As a Senior Hydrogeologist.

Robert Lamonica, CPG-5749 and Jeffrey Lennox, CPG-7958, of Trumbull have been named Interim Environmental Professionals by the Connecticut Department of Environmental Protection. Interim Environmental Professionals are able to perform the duties of Licensed Environmental Professionals until an exam is in place.

Jonathan C. Lewis, CPG-9406, was promoted to District Director of the Mequon office, for Northern Environmental Technologies, Inc.

Joseph E. Mankuke, III, CPG-6984, former President of INC 500 firm HTS Environmental Group has been appointed Director of ENTELLUS environmental services division, based in Phoenix, Arizona. Mr. Mankuke will direct the engineering consortium’s domestic and international environmental acquisitions operations.

David W. Miller, CPG-1757, noted hydrogeologist and one of the founders of Geraghty & Miller, Inc., was awarded a National Ground Water Association Life Membership at the NGWA’s recent annual conference.

Grover E. Murray, CPG-0094, received the Twenhofel Medal from the Society of Sedimentary Geology (SEPM) at its annual meeting in May, 1996.

John H. Rathbone, CPG-0571, an Honorary Member of RMAG, received its 1996 Journalism Award. Mr. Rathbone contributed his unique photographic talents in the form of photographs of significant geologic features for guidebooks over the past 40 years.

V. Steve Reed, CPG-5194, has joined the Seattle office of Geraghty & Miller, Inc. Mr. Reed, a vice president and member of the firm since 1989, transferred from the corporate headquarters in Denver, Colorado.

J. David Rogers, CPG-8977, was honored with the 1996 R.H. Jahns Distinguished Lectureship Award of the Association of Engineering Geologists and Geological Society of America for his research in reassessing the 1928 St. Francis Dam failure.

Stephen A. Sonnenberg, CPG-6201, received the award of Honorary Membership, RMAG’s highest award, in recognition of his unparalleled service to the Association, to the geologic profession, and to the petroleum industry.

Governor Fife Symington reappointed Frank S. Turek, as the geologist member of the nine-person State Board of Technical Registration (SBTR), extending his term until June 1999. Turek works for Greeley and Hansen in Phoenix.

Kenneth D. Vogel, CPG-8911, has been appointed an Associate Editor of "Environmental Geosciences," published by the Division of Environmental Geosciences of the American Association of Petroleum Geologists.

Ken Whetstone, CPG-8292, to the reservoir studies group, VICO Indonesia, Jakarta, Indonesia. Previously senior staff geologist, Union Texas Petroleum, Houston.

The Pennsylvania Department of Transportation has extended CTL Engineering of West Virginia, Inc. a contract as a direct result of the efforts of CTL’s Manager of Geotechnical Engineering, Charles Yurchick, CPG-5117.


The Society of Independent Professional Earth Scientists’ 1997 officers include Secretary Robert D. Cowdery, CPG-0517, of Wichita, Kansas and Treasurer James H. Henderson, CPG-4129, of Dallas, Texas. Board members include James S. Classen, CPG-1858, of Denver, Colorado.
The mineral industry lost a man of major presence when Hans W. Schreiber died suddenly on November 6, 1996, of a heart attack in Phoenix, Arizona. A man of intensity, technical excellence, yet very caring, Hans was 64 years old at the time of his death and had been looking forward to his retirement from a prominent career as a mineral industry consultant.

Hans was born on February 28, 1932, in Frankfurt, Germany. He emigrated to the United States at the age of 3 months with his family.

He attended Amherst College, Massachusetts, from which he received a B.A. in Geology in 1954. After serving in the U.S. Air Force, Hans attended the Henry Krumb School of Mines at Columbia University in New York, New York, from which he received a M.A. degree in Mineralogy in 1958.

Hans’ first major position in the mining industry was with Kali Chemi, A.G., in Hannover, Germany, where he undertook exploration for potash, barite, and fluor spar throughout what at the time was West Germany. It was in this position in 1958 that Hans was exposed to ore reserve methods and calculations, an area of intense interest for him in later years.

He returned to the United States in 1959 where he became a mining geologist for American Zinc, Lead & Smelting Company. He held progressively responsible positions involving surveying, mapping, sampling, drilling, and ore reserve calculation at the company’s underground zinc and lead mines in Hanover, New Mexico; Shullsburg, Wisconsin; and Mascot, Tennessee.

Following his time with American Zinc, Hans joined the consulting firm of DeWitt Smith & Company, Inc., in New York City in 1964. Hans worked internationally with DeWitt Smith in a variety of commodities and began to develop his expertise in economic evaluations of mineral properties.

In 1968, Hans joined Cerro Corporation initially as Exploration Manager for the Eastern U.S. and later as Manager of Mining Investments. He was responsible for exploration in this region but concentrated on seeking massive sulfide deposits in New England and the Carolinas. As Manager of Mining Investments, he was deeply involved in analyzing Cerro’s acquisition opportunities.

From 1972 to 1976, Hans was in England and Spain as Vice President/General Manager of Phelps Dodge Europa where he was responsible for establishing and managing all aspects of non-ferrous metal property exploration and evaluation. His heavy involvement in negotiations for property acquisitions began the development of his widely-recognized skills in this area.

Upon returning to the United States in 1976, Hans acquired Behre Dolbear & Company, Inc., where he stayed until his death. It was at Behre Dolbear where his skills in financial analysis of mineral properties, ore reserve calculation procedures, and mineral property negotiations came to the fore. Hans was internationally recognized as an expert in these areas by his peers in the industry. Under his guidance as Chairman of the Board and Chief Executive Officer, Behre Dolbear grew from the small niche firm it was to the internationally known firm with six offices it is today.

Hans was also active in professional organizations. He was a member of the Society of Mining Engineers, the Geological Society of America, a past president of the Mining & Metallurgical Society of America, the American Institute of Professional Geologists, and the Sigma Xi honorary scientific society. He was also a registered geologist in California. He taught short courses and gave many papers in his field of expertise.

Hans’ mark in the mineral industry will always be recognized. He was a strong advocate of his positions, a defender of his clients, and an intense negotiator. Because of this, many only think of Hans in his role in the industry. Importantly, however, we should not forget Hans’ achievements as a family man and as a person.

Hans married Mary Lyman in 1955. They had three children, a son, Stephen, and two daughters, Margaret and Betsy. He was a devoted father, and those of us who knew Hans well always recognized the sacrosanct times he would set aside to spend with his family at their cottage in New Hampshire or for long, extended bicycle trips. He was an avid cyclist and hiker and a proponent of the Rails to Trails movement to which the family requests any contributions be made. Hans also was an enthusiastic stamp and coin collector.

Bernard J. Guarnera
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

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

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AIPG Announces

Operations Management Seminar to be conducted on February 28, 1997 through March 1, 1997. The two-day seminar with optional CEU from the Colorado School of Mines, will be held at the Sheraton Convention Center, Valley Forge, Pennsylvania. Cost for AIPG Members is $300.00 pre-registration up to February 7, 1997. After February 7, registration is $350.00. Non-AIPG members can pre-register at a cost of $375.00 through February 7, 1997. After February 7, non-member registration is $400.00. For more information, please call Dennis Pennington (215) 723-9300; fax number is (215) 723-9344.

This seminar is a must for Project Managers in Geology and Engineering. Work elements include:

- Quality Analysis and Management
- Quantitative Analysis
- Project Planning and Budgeting
- Project Management

The Arizona Section of AIPG Invites You to the Tucson Gem and Mineral Show!

The Arizona Section of AIPG invites all AIPG Members and their guests to the section activities being held during the Tucson Gem and Mineral Show. The theme for 1997 features Arizona and copper minerals. The show is open to the public February 13 - 16, 1997 at the Tucson Convention Center. This is the single largest gem and mineral show in the world. There will be fossils, gems and minerals to delight every geologist, rockhound and even non-geologist. There are visitors from all over the world who come to Tucson for this event. Should you be planning a visit to Tucson for the show or as a winter visitor, please join our AIPG section for some activities and local hospitality. On Friday, February 14, at 6:30 pm we will meet at the home of Dawn Garcia, CPG 8313 (AZ section 1996 president), for a casual evening. Richard Allen, CPG-6610 an accredited gemologist, will be demonstrating gem appraisal techniques. Everyone will have opportunities for hands-on experience using a mobile kit that Richard will bring with him. Dinner will be included. The cost is $7 per person. Please RSVP to Dawn (520/326-1898) by February 11, 1997.

On Saturday, February 15 at 10 am we will meet in downtown Tucson at the offices of the Arizona Geological Survey (416 West Congress Street). Dr. Jon Price, our national AIPG president and CPG-7814, will be the featured speaker at this meeting. Following the meeting, we will walk across the street to the Tucson Convention Center for a "behind the scenes" tour. Erick Weiland, CPG-6892 and 1997 Chairman of the Gem and Mineral Show, will be our guide. After the tour, everyone may explore the many Gem and Mineral Show activities.

The Arizona Section Members invite other AIPG Members and their guests to join us for these activities. Please contact Dawn Garcia for further information, including directions to the activities and hotel accommodations (ph: 520/326-1898; fax: 520/747-3491; e-mail: gwrcinc@rtfd.com).
AIPG PUBLICATIONS ORDER FORM

All publications are available to both Members and non-members. Ten percent discounts are granted on quantities of ten or more copies of the same title.

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