Mining Geology - Part 2
TPG ARTICLES
New 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 material, submittals should be sent to AIPG headquarters six months 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 sections:

Title
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One original and two copies of each manuscript should be submitted. Whenever possible, text should also be submitted on diskette (3.5 inch or 5.25 inch IBM/PC format). Headquarters uses DOS WordPerfect 5.1, which is preferred, but Word (for Windows or DOS), ASCII, or translatable files (such as MacWord) are acceptable. The program or format of the text should be clearly marked on the diskette.

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 .dxf, .hgl, .pic, .pcx, .bmp, .eps, .GIF, or other standard formats.

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

General Topics:

TECHNICAL
Mining Geology (January)
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PROFESSIONAL (any issue)
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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 and the Military, Unusual Applications of Geology.

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The American Institute of Professional Geologists
Wendy Davidson, Publications Manager
7828 Vance Drive, Suite 103
Arvada, CO 80003-8124
Voice (303) 431-0831
FAX (303) 431-1332
Internet aipg@netcom.com

Lyle G. Bruce, Editor
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FRONT COVER - Headframe from an abandoned gold mine in Anaconda, Montana. Photograph submitted by Robert C. Freas, CPG-2673. The photograph on page 8 was submitted by Ron W. Pritchett.

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Acid mine drainage emanating from sulfide bearing waste rock at an inactive and abandoned mine in the central Black Hills.
Photograph submitted by Thomas V. Durkin, CPG-9138
SULFIDE MINE WASTE MANAGEMENT:

The Need For New Technology Development

Thomas V. Durkin, CPG-9138

Introduction

Sulfide based metal mining at active, inactive, and abandoned mines has a history of unacceptable environmental problems caused by acid mine drainage (AMD) when sulfide waste rock and tailings are improperly managed. There is a need to develop new technologies and improved ways of successfully using conventional technologies to control these problems and prevent new ones from developing.

The mining industry in this country has depleted a large part of the oxide deposits that are economical and available to mine. At many mines, the upper oxidized portion of the ore body has been mined and the precious metals recovered by pad leaching techniques developed in the early 1980's. A large reserve of sulfide metal resources remains in American soils and will be the focus of future permitting requests as a result of new sulfide leach techniques developed in the early 1990's that render these deposits economically recoverable. Control of AMD, and associated environmental concerns, from sulfide mine wastes is considerably more difficult to achieve than for oxide deposits.

With stricter environmental protection regulations being required, the need to develop proven sulfide waste management technologies is crucial if sulfide mining is to have a viable future in the U.S. and if we are to avoid overdependence on foreign mineral resources. Additionally, existing sulfide problems at abandoned mines are in need of innovative, less expensive cleanup techniques if a lasting solution is to be achieved.

Defining the Problem

Environmental control and sulfide waste management practices have focused more on treating AMD rather than preventing the problem at the source. This has resulted in "reaction" rather than "action" in many cases. Conventional sulfide waste management practices can prove overly expensive. This warrants new approaches to address the problem. For example, AMD problems that resulted from improper sulfide waste management at a heap leach gold operation in the Black Hills of South Dakota required remedial actions that included removing 3.5 million tons of waste rock from a valley fill depository, backfilling the waste in the original pit, and capping the reactive rock with a low permeability multi-media cover. A significant increase in reclamation surety was required. The original bond of $1.1 million that was in place before the acid problem developed was raised to $10.7 million upon permitting the AMD reclamation plan. The ten fold increase in bonding is testimony to the economic, as well as the environmental, liability posed by improper sulfide waste management. It also exemplifies the need for the development and use of more economical control techniques.
In addition to AMD problems caused by modern mines, historic mining activities have left a legacy of environmental problems associated with billions of tons of waste material and thousands of abandoned sites. Some of these sites exhibit problems associated with unacceptable levels of acid generation and contaminant migration as a result of uncontrolled sulfide oxidation.

**Barriers to Remediation and Technology Development**

Many potential remedial entities (government, industry, and private) are hesitant to undertake reclamation of abandoned mines due to regulatory and institutional barriers that act as disincentives to cleanup. Examples of barriers include potentially expensive Superfund liability and conflicting regulatory requirements. In addition to discouraging cleanup of these sites, this situation somewhat stifles the development of new technology that might otherwise successfully come to bear on the problem. The private sector and financial institutions have often been reluctant to make initial capital investments to support technology innovation. This is in part due to a perception that the barriers to remediation lessen the chances for eventual widespread use and commercialization of the new technology and thus lessen the chance for making a profit.

**Proposed solutions and efforts to promote balance between industry viability and environmental compliance.**

Several abandoned mine sites are being voluntarily reclaimed by active mine operators in the Black Hills. A few of these exhibit problems associated with AMD. The South Dakota Department of Environment and Natural Resources (DENR) views these voluntary projects as opportunities for cleanup that might not otherwise take place and is working with the companies in developing acceptable reclamation plans and avoiding unnecessary regulatory barriers.

The South Dakota DENR has been actively involved with national groups such as the Abandoned Mine Waste Working Group of the Committee to Develop On-site Innovative Technologies ("DOT") and the Western Governors’ Association Mine Waste Task Force. The DOT initiative represents a partnership between the Federal government and the western governors that is designed to establish a more cooperative approach to the development of innovative technical solutions to environmental cleanup and mine waste management problems shared by states, industry, the Federal government, and private entities. Efforts are being taken to demonstrate, evaluate, and potentially commercialize innovative cleanup technologies and to identify and remove regulatory/institutional barriers that pose disincentives to the development and use of these technologies.

Once the disincentives to remediation are removed, commercialization of effective sulfide waste management techniques should naturally result considering the market that exists. For example, application and commercialization of new waste management technologies that prevent AMD problems at modern mines will naturally result, assuming the industry remains viable. Industry will need to incorporate more effective sulfide waste management practices into their standard operating procedures if they are to obtain new permits and maintain environmental compliance. Additionally, with growing national concern for abandoned mine remediation, the sheer volume of the wastes and the magnitude of historic AMD problems in certain areas of the country represent a significant market demand for implementing improved remedial technologies.

Canada has set up the Mine Environment Neutral Drainage (MEND) Program, a cooperative research effort between the Canadian government and the mining industry. It is charged with addressing the issue of sulfide waste management and developing new techniques to successfully deal with the problem. The U.S. partnerships described above can address the issue but they are quite broad based. We would benefit by having a group solely dedicated to the subject of sulfide waste management, whether it is institutionalized like Canada’s or is an informal endeavor.

With the advent of the information superhighway and its availability increasing by leaps and bounds, establishing "newsgroups" and similar interactive communications on the Internet that deal with sulfide waste management issues might provide an effective means for technology transfer.

**Focus for New Technology Development**

Coordination with previously completed and ongoing sulfide management projects will avoid duplication of efforts and will incorporate "lessons learned" from currently available projects into new research. Investigations should center on, but not necessarily be limited to:

a) source control options, primarily oxygen exclusion and alkali addition technologies;

b) waste blending of acid generating material within a waste pile, such that the waste system as a whole remains in the alkaline phase during oxidation of the contained sulfides;

c) monitoring conventional dry covers to determine chances for long term success including reference to barometric pumping, oxygen diffusion, and pore gas measurements;

d) biooxidation as a preventive measure for modern sulfide wastes;

e) biotreatment for modern and historic sulfide wastes;

f) approaching the issue of perpetual contaminant/waste control by focusing technological manage-
ment options on resource recovery rather than treat-
g) pursuing alternative neutralizing agents; and
h) other technological/waste management options.

In summary, geologists will need to play a major role in these efforts. In addition to identifying ore reserves, the geologist must work with engineers, environmental staff and company management in properly assessing potential waste management problems in light of existing tech-
nology limitations. This is a necessary component of mine planning that should begin at the early stages of exploration in order to effectively identify the potential for mineral resource development in sulfide deposits.

Thomas V. Durkin, CPG-9138 is a hydrologist and regulator with the South Dakota DENR, Office of Minerals and Mining and Project Manager for various mine waste management research projects.

Mining Vet Sees Bright Future

Miners may be leaving the United States today in droves, but a 45-year industry veteran thinks they will be back to look for minerals.

"Fifty percent to 60 percent of mining exploration money has dried up in the United States, and I assume it has gone overseas," says T S Ary, convention chairman of the Northwest Mining Association centennial meeting and former director of the U.S. Bureau of Mines. "But there is no place in the world that is as satisfactory to work in as the United States, if the playing fields are level."

Today those fields aren't level, Ary says, because of redundant, unreasonable regulations and uncertainty related to proposed revisions of the nation's basic mining law, the Mining Law of 1872.

"If we don't resolve the Mining Law issue soon, the rest of our exploration money will go overseas," Ary said.

Recent efforts to amend or even replace the law haven't made it Ary said, but new bills will assuredly be proposed when the new Congress takes over in January. Because the issue is unsettled, the financial community is reluctant to loan money to companies wishing to work in the United States.

Ary sees hope, however, tied mainly to the upcoming Republican majority in Congress. He thinks the new elected representatives will be more reasonable in their approach to regulation, and he says states are pressuring federal lawmakers to mind their own business when it comes to some issues, such as private property.

"The states are a little closer to the economic side of things," Ary says. "I hope the new Congress realizes this is not a Democratic versus Republican problem -- this is an economic problem. Senator Larry Craig in his bill has recognized this fact by tying his royalty to a net proceeds figure."

Ary says he sees a trend to include cost benefit studies in future regulations, as suggested by Senator Craig, R-Idaho.

"What's more important? The economic well-being of our citizens or some damn bug we have never heard of?"

Ary talked about the Mining Law of 1872, the future of the minerals industry, his disenchantment with the current administration and his optimism for the Northwest Mining Association and other regional groups at news conferences on Nov. 29 and Nov. 30 at a meeting of the Northwest Mining Association.

The meeting, held in Spokane, Washington, November 30 through December 2, had delegates from 30 different countries and more than 300 exhibitors at the trade show.

From the Northwest Mining Association

Mining Consultant Sees Dim Future For U.S. Exploration

The future of mining exploration in the United States doesn't look good, according to one mining industry expert speaking at the Northwest Mining Association centennial meeting in Spokane, Washington.

"The risks of exploration in the United States are significantly higher than anywhere else in the world," said Douglas R. Cook, president, Cook Ventures, Inc.

"Some people want to stick it out here, but I'm not optimistic, unless the present administration's anti-minerals policies change."

Cook, who was a speaker at the State of the Industry session at the Northwest Mining Association's annual convention in Spokane, chronicle the history of exploration in the United States.

During the peak years of exploration, after World War II, "There was no such thing as an environment to be concerned about," Cook said.

"The '90s brought a sharp decrease in exploration ventures in Canada and the U.S. while large increases in activity were seen in Latin America and Australia, and to a lesser extent, the rest of the world," Cook said.

Cook foresees an increase in mineral prices, most significantly in copper.

"The demand, he said, 'exceeds the supply.'"

The price hike, however, won't change the exploration landscape in the United States, Cook said.

"Given the present scenario, I see a world-wide increase in exploration," Cook said, "but not in the United States."

From the Northwest Mining Association
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PERSISTENCE AND INTRIGUE:

A Geologist And 
The Great Canadian Diamond Rush

(A review of The Great Canadian Diamond Rush, by Kevin Krajick, Discover, December, 1994)

Lyle G. Bruce, CPG-7714

Many fascinating and informative (sometimes even accurate) articles about geology are published in science magazines. Kevin Krajick's The Great Canadian Diamond Rush, published in the December 1994 issue of Discover, is one of them. Krajick tells the story of Charles Fipkes successful search for diamonds in North America. Armed with a B.S. in geology, an uproarious laugh, and an extreme case of absentmindedness, he, and a few of his friends (mostly other geologists), have unearthed a whole cluster of kimberlite dikes in the Northwest Territories. Fipke, now 48 and worth 350 million dollars, had wanted to be an ornithologist. But as a student in the late sixties at the University of British Columbia, he studied geology because he had a young family to support ("With geology, you can at least get a job, eh?"). He and his wife and kids bounced through mining camps around the globe for seven years before spending half of their meager life savings to start their own business processing mineral samples for prospectors in a small town in British Columbia.

Fipke also worked when he could for companies doing mineral exploration. In 1978, he was hired by Superior Oil to look for base metals, gold--and diamonds. Since knowledge of exactly how diamonds form in the earth is still theoretical in many respects, companies like Superior guard their scientific information closely. Company scientists are organized into guerrilla-like cells, so no one knows too much about what others do. Field geologists were seldom, if ever, informed about any of the companies projects to develop new diamond finding techniques.

In the last several years, some of the secrets have emerged. Most diamonds come from at least 70 miles down, formed within Earths mantle. There, under enormous pressure and at temperatures of 1700 to nearly 2300 degrees F (925 to 1260 degrees C), carbon atoms form into diamond crystals. In many areas, however, the geothermal gradient is too high. Lower than normal temperatures for those great depths are required. The right combination of great pressure and low temperature is called the diamond-stability field. These conditions seem to occur chiefly under archons (I assume Krajick means...)

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cratons here, unless he is talking about Greek politicians), the most ancient nuclei of continents, to which more recent land masses are appended. Apparently archons sic, stable for at least 2.5 billion years, develop cool roots with the proper temperature gradient. Studies in the 1960s had duly located archons under the African and Siberian diamond fields. By 1990, seismologists had mapped an archon containing the worlds oldest dated rock 3.962 billion years—in a place where diamonds were unknown: the Barren Lands of Canada.

If diamonds are to survive, they must shoot to the surface quickly; estimates vary from hours to weeks. Otherwise they revert to graphite or burn, which is probably the fate of many. Kimberlite pipes are the volcanic routes through which diamonds rise. The oldest known kimberlites are 1.6 billion years old; the youngest, in Tanzania, date back only 40 million years. Kimberlites are like elevators picking up passengers: as the magma smashes through layers of rock, it rips out debris, creating a supercharged breakfast cereal of liquid and solid material. If the pipe intersects diamonds, some may come along. For reasons that are unclear, kimberlite erupts from farther down than ordinary volcanic rock, which comes from roughly 6 to 50 miles below the surface. No one knows what triggers kimberlite pipes, nor why they come in clusters of 6 to 40. One theory says that disturbances in Earth's magnetic field periodically send them through weaknesses in the crust. Near the top, liberated from the pressure of surrounding rock, the pipe blows out a carrot-shaped crater (no pun intended) that can cover many acres, then settles and cools. Layers of unrelated rock may subsequently build up over the pipe. In the Canadian Northwest, most pipes are under small lakes, but this is getting ahead of the story.

Diamonds are so rare that they are almost impossible to detect directly. Very rich pipes may contain 3 care per ton of kimberlite. Therefore, explorers look for specks of indicator minerals peculiar to the mantle, but carried up in far greater quantity than diamonds, and eroded out of pipes into the surrounding land. The standard ones are reddish pyrope garnet, dull-hued chromite, iron-heavy ilmenite, and bright green chrome diopside. The problem is that one can spend years panning indicators out of streambeds, beaches, even anthills, and trace them back to their source, but 90 percent of the 4,000 known kimberlite pipes are barren, and most of the rest are too sparse to mine. Therefore, indicators may point to kimberlite, but not necessarily to diamonds.

What Fipke did not know, and was not told at the time, was that Professor John Gurney of Cape Town, hired by Superior, had found a secret weapon. What Gurney discovered was simple but significant. The garnets, chromites, and other indicator minerals found in diamond-rich pipes—and in diamonds themselves—had subtly different chemical signatures from those found in barren ones. He zeroed in, for example, on G10 garnet, which is lower in calcium (under 4 percent) and higher in chrome than other garnets. Diamond inclusion chromite, too, was high in chrome (62.5 percent or more). He showed that minerals took on these compositions only in the diamond-stability field. Gurney also found that, though ilmenites did not form in the diamond-stability field, there was a link useful for prospectors. When the iron in ilmenite was highly oxidized, a pipe contained few diamonds. He reasoned that iron took on more or less oxygen in response to conditions in the kimberlite magma itself, mainly in response to heat and available oxygen. When iron got highly oxidized, so did diamonds; that is they vaporized into carbon dioxide. If garnets and chromite gauged how many diamonds entered the kimberlite, then ilmenite gauged how many survived.

By 1981, Fipke and fellow Superior geologists had narrowed their search to the Mackenzie Mountains in the Northwest Territories. Reports back to the field geologists, based on analyses of indicator minerals they had collected, indicated some people in Superior's management were ecstatic, but no one would tell the geologists why. Unexpectedly, Superior stopped the exploration. At the time, the company was in negotiation with De Beers, the giant international diamond cartel, and did not want to jeopardize it by competing with the cartel in Canada.

Fipke was left in the cold, but he had contracted a fever—diamond fever. For the next ten years, Fipke and friends risked life and personal fortune to pursue their geological dream. At one point, they floated shares in their newly formed Dia Met Minerals for as low as 17 cents each to friends and neighbors. They continued their search. Around this time, in 1985, Gurney's research leaked. The Russians, it turned out, had been working along the same lines, and they began to publish. Gurney wanted credit, so he published too. This was the final link, the missing information that Fipke needed to narrow the field and claim the right pipes.

Eventually, Fipke and partners, on the verge of bankruptcy and fearing claim jumpers, went to the man who had originally hired them at Superior, but who now worked for Broken Hill Proprietary (BHP), an Australian mining conglomerate. BHP agreed to front a half-billion dollars in exploration costs in return for a 51 percent controlling interest in the claim.

There is more to the story, including good geology in tracking the movement of Pleistocene glaciers back to the real location of the dikes. Danger, deprivation, and intrigue were carried throughout, including brief references to remote sensing techniques, spying, high-tech claim jumping, and ways of fending geophysical instruments when opponents overfly your claim. Unfortunately for me, the story was too brief. There should be a book about it.

Discover magazine is a product of Disney Publications (as in Walt Disney).•
Congress Threatens To Abolish U.S. Geological Survey And U.S. Bureau Of Mines

Craig M. Schiffries, American Geological Institute

The U.S. Geological Survey and the U.S. Bureau of Mines are facing one of the most serious challenges in their history. Both agencies have been targeted for complete elimination according to an attachment to the Contract with America. The Contract contains a package of 10 bills that 224 Republican members of Congress have pledged to introduce in the first 100 days of the new Congress. The attachment identifies $176 billion in possible spending cuts over five years. Although many programs would be reduced, restructured, or frozen, the USGS and the USBM are among a handful of organizations that would be abolished.

"We are deeply concerned about the Contract with America proposal, because it reflects a lack of understanding about the broad range of scientific activities conducted by the U.S. Geological Survey, as well as our active role within all 50 states," says Gordon P. Eaton, director of USGS. "We serve as the archivist of this nation's Earth resources -- monitoring the rivers, for example, and helping to maintain healthy water standards. Our geoscientists help citizens prepare for emergencies such as earthquakes and floods; and we address the challenges of sustainable development of our oil, gas, and minerals resources. In fact, the USGS touches the lives of every American citizen every day."

The geosciences would absorb a disproportionate share of spending cuts relative to other scientific disciplines, and the U.S. Geological Survey and the U.S. Bureau of Mines would take the most direct hits. Abolishing the USGS ranks as the fifth largest cut among all discretionary programs in the federal budget. Eliminating the USGS represents the largest single reduction for any science and technology program.

Congressional staff members indicate that abolishing the U.S. Geological Survey might be accomplished by transferring some of its functions to other organizations. They suggest that some programs in the water resources division might go to the Environmental Protection Agency. Likewise, certain functions of the national mapping division might move to the Defense Mapping Agency or to the private sector, while some functions of the geologic division might be transferred to universities. But shifting programs from one agency to another would offset some of the proposed savings, and no estimate of the net savings has been made available. It is unlikely that other organizations would pick up these programs at no expense to the nation.

Rep. John R. Kasich (R-Ohio) is a key figure behind the proposal to abolish the USGS and the USBM. Last year, Rep. Kasich cosponsored an amendment that would have eliminated the two agencies, a proposal included in a package of numerous budget cuts. Although his amendment was rejected by the House of Representatives last year, Kasich is in a much stronger position to pass these measures now that he has become chairman of the House Budget Committee and Republicans control both the House and the Senate.
The Clinton Administration has made clear its support of the USGS and the USBM. Secretary of the Interior Bruce Babbit has said, "The USGS is the nation's premier water and earth-science information agency, and its role is increasingly important at a time when we are facing many critical decisions on the environment." Last August, Secretary Babbitt stated, "This Administration is firmly committed to maintaining a strong, viable, U.S. Bureau of Mines in the Department of the Interior." In October, when Rhea L. Graham was sworn in as director of the USBM, she said, "I believe that the agency has a vital role to play in helping the nation solve its mineral-related problems -- problems that involve our environmental and economic goals as well as basic human issues such as worker health and safety."

It is ironic that Congress is considering legislation to abolish the USGS and the USBM at a time when the United States is beginning to recognize its increasing vulnerability to earthquakes, floods, droughts, water pollution, volcanic eruptions, global environmental change, contamination from waste disposal, and reliance on unstable sources of foreign oil and minerals.

Gold In Southern Wyoming

According to the Wyoming State Geological Survey, several gold occurrences were discovered in southern Wyoming in 1991 and 1992 by the State agency through a project partially funded by Union Pacific Resources. The discoveries were made by three geologists - W. Dan Hausel and Gordon Marlatt of Laramie, and Eric Nielsen from Nebraska. A report, which was released last year as unpublished Mineral Report MR93-1, has been edited and newly released as Open File Report 94-2.

The discoveries included placer gold found in a few gravel pits and in several streams draining the northwestern Medicine Bow Mountains. In some instances, visible gold was panned from creeks adjacent to Interstate 80 between Laramie and Rawlins. Twenty-four of 54 samples collected between Laramie and Rawlins yielded visible gold. The Survey also discovered gold anomalies in two silicified zones near Rock Springs; one was located at Quaking Asp Mountain and the other at Black Butte.

These silicified zones exhibit hydrothermal alteration mineral assemblages similar to some large disseminated gold deposits found in the western United States. In addition to the alteration characteristics, the State Geological Survey detected anomalous arsenic (11 to 1,430 parts per million), zinc (5 to 690 parts per million), and mercury (up to 0.709 parts per million), and a few weak gold (maximum of 0.115 parts per million) anomalies in the silicified zones. The silicified zones appear to be related to paleo-hot springs.

Several silver anomalies (up to 12.5 parts per million) were discovered in coal from the Kimmerer district in western Wyoming (12.5 parts per million silver is equivalent to 0.36 ounce per ton).

Known mineral deposits were also examined in the Medicine Bow Mountains and Sierra Madre. In the Medicine Bow Mountains, the Survey examined several gold and copper deposits in the Cooper Hill district and examined the Lake Owen layered mafic complex for platinum, palladium, gold, chromium, vanadium, and titanium. In the Sierra Madre, samples collected from the Broadway property were highly anomalous and assayed 0.2 to 12.2 ounces per ton silver, 0.104 parts per million to 0.1 ounce per ton gold, 0.05 to 1.82 percent copper, 0.3 to 5.66 percent lead, and 0.02 to 8.17 percent zinc.

From the office of the Wyoming State Geologist,
Gary B. Glass, CPG-2503, State Geologist

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Professional Registration - Resolving The Ethical Paradox

Fred L. Fox, CPG-1273

We're all so accustomed to the term professional registration that we don't recognize its inherent ambiguity (the term is actually more oxymoron than ambiguous). "Professional" has nothing to do with law, and registration is nothing if not a function of it.

In a paper written four years ago I suggested that we find a process leading to a registration law based in ethics. One reviewer suggested that I "outline a 5-step program of truth and enlightenment." Well, I've risen to his challenge. I have, in fact, reduced the steps necessary to one, leaving him the other four for dancing around the issue.

About a year ago a former Association President argued that "(My) idea of truth may not be the same as [his]." Recently a radio personality excused a major lie by one of our more conspicuous political figures by saying, "at most: it was an ethical lapse... there was nothing illegal..." Just a week or so ago a similar remark showed up in the usually-astute Wall Street Journal! These statements all reveal a lack of knowledge of basic concepts without which mankind is lost. Nevertheless, this lack of knowledge is widespread.

It's time we got back on the track, and I'm going to suggest a very simple way to do just that.

Privilege and Principle

Dwight Eisenhower spoke the truth when he said that those who value privilege over principle will certainly lose both. What is based on privilege rather than principle is critically flawed and will fail.

Many of us are so taken by the First Amendment (and the privileges that it provides) that we forget that it's an amendment. It's not free-standing. It can't exist without the parent document that sets forth the principles on which its privileges are based.

Consider: without the principles set forth in the Constitution (including its oft-forgotten basis stated up front: "in order to form a more perfect union"), what supports the privileges granted by the Bill of Rights?

When we venerate the amendments at the expense of the Constitution, we're putting privilege ahead of principle. This is symptomatic of a far-reaching affliction.

What's this got to do with registration? Plenty.

There's been a lot of rhetoric regarding registration, but little real progress. Why? Because conventional "wisdom" has it that the reason for registration is "protection of the public welfare." Balderdash. Until we acknowledge the real reason for anything, we will never understand it nor will we achieve equity.

The reason for registration is power and control, whether or not we choose to admit it. But power and control are privileges, not principles, so the basic foundation of registration is weak. And therein lies the problem.

Because the tenet that privilege must follow principle extends to the law as well. The law cannot stand alone without the principles on which good law is based; truth, veracity and integrity.

The Problem

The paper I delivered four years ago was not the one that appeared in the Proceedings because of the reviewers' comments even before it was finally accepted. Those comments prompted an entirely different presentation. For instance:

There were several comments that "not everyone will agree." This remark needs only a "so what?". Another reviewer accused me of not using the scientific method, totally missing the point. It's not a scientific subject, and I wasn't speaking scientifically.

My thesis, then as now, was this: If we continue our preoccupation with definitions, references, precedent, lining up supporters, leaving a paper trail, agreeing with each other and limiting ourselves to existing law, we'll never resolve the issue. Reacting to the existing system keeps us from getting at the heart of the matter. So, in fact, does the "scientific method."

Professional registration is a legal notion, professional status an ethical one. And while registration must be defined by law, the stuff of ethics can't be. Like it or not, ethics stands before the law. The law cannot stand without the ethical foundation of truth, veracity and integrity on which good law is based.

Placing law before ethics (privilege before principle) has the tail wagging the dog. This absurd situation results in, among other things, a lack of perspective and a general
lowering of standards. Just consider what's been happening in this country regarding individual rights. Look at the indignities suffered in the name of "free speech" and "freedom of expression". Look at court awards of millions to a mugger, even more to a mental patient who lost his legs after jumping in front of a subway train. Look at the crime rate. Look at how far criminal rights have progressed. Look at how far criminal rights have progressed (and how far victim's rights have regressed) and you'll get an idea of the magnitude of the problem. Examples are rife.

We have to get past the confines of flawed law. Tolerating flawed law compromises our integrity and undermines our professionalism. Attempting to change the law using its own rules is a tough road. We can't do it ourselves and considering prevailing conditions, we can't rely on others for help. What to do?

Back up to solid ground. Go before the law. Precede it. Return to the roots--basic truth and ethics. We can do this ourselves, safely and confidently. How?

Start with the purest of motives, founded in truth and honesty. Now that's radical! But the way I see it, there's no shortcut.

Stop with the privilege, and consider principle.

Ethics

We're talking real, basic principle here, not other-defined rules, regulations and laws. This is about integrity. Character. Truth. Honesty. Even morality. We're talking ethics.

Ethics can be a difficult subject but, if approached head-on, it becomes simple (not easy, but simple). Why? Because ethics deals only with the truth, unconditionally, and by any means (including intuition). Intuition is anathema to science. Science considers intuition invalid. Science insists on "proof." But intuition is valid. Look it up.

But beware. A preoccupation with definition can stop you from thinking for yourself. It's one of those givens we can simply accept. It exits without us or our approval. It's in our face whether or not we see or embrace it.

Ethics and morality can't be regulated by law. They are concepts that can't even be defined by law.

What do ethics (and morality) really mean? Just as truth can't be false, there exists a distinction between right and wrong (and not in terms of words, society, or even law either--simply because the distinction exists). Morality is simply right being, manifested in man. Being means existence, actuality, authenticity, truth. Right means correct, valid, precise, genuine, accurate. Not right by my definition, nor the court's, nor any group's or institution's no matter how learned, sophisticated or benevolent they may be. The concept of morality can thus be reduced to honesty, and ethics to the system of moral principle. Ethics is universal, preceding the laws of man. Complete and perfect.

Difficulties in dealing with ethics begin when we ignore or avoid its inherent truth. Ethics and morality are about virtue, probity, integrity and similar absolute verities. If you're uncomfortable when confronting absolutes like perfection, that's your problem. We have to do exactly that, to get to the heart of the matter--come head-to-head with perfection.

But how do we deal with perfection in an imperfect world?

By refusing to cave in. Simple concepts like dignity, courtesy, empathy, decency, honor, character, honesty and respect (to name but a few) have been diminished in the name of what we are told is reality. They are played down by what we perceive to be the facts of life (but what are more accurately described as factors of living).

Look at it this way. Do we have laws protecting us from those positive concepts of dignity, courtesy, empathy, decency, honor, character, honesty and respect (to name but a few)?

Why not? Because they're elements of moral behavior. They are, if I may use the word, "good." They are right. They have no negative aspects. And that's what we're given to start with. In fact, they precede--go before--the law! Lucky us, if we'd only accept it.

Wyoming Oil And Gas Lease Sales
On Near-Record Pace

According to Rod DeBruin, Petroleum Geologist with the Wyoming State Geological Survey, lease sales held by both the U.S. Bureau of Land Management and the Wyoming State Land and Farm Loan Office are doing better this year than they have done since 1988.

The first nine oil and gas lease sales in 1994 generated slightly more than $25 million in total revenue, leased over 1.4 million acres, and averaged over $17 per leased acre. The last sale of the year will be held in December by the U.S. Bureau of Land Management and should boost total revenue for the year to around $30 million for ten sales.

Total revenues from lease sales were highest in 1988 and 1985. Twelve sales in 1988 generated total revenue of nearly $34 million; 13 sales in 1985 generated a record total revenue of almost $40 million. Last year's 10 sales generated only slightly less than $15 million. DeBruin noted that the heaviest leasing activity in the first nine sales in 1994 was in southwestern Wyoming and in the Powder River Basin.

From the office of the Wyoming State Geologist, Gary G. Glass, CGP-2503, State Geologist
On the other hand, we do have laws protecting us from (at least some of) their antitheses: vice, intolerance, contempt, depravity, dishonesty, corruption and things of that ilk. Why?

Because they're inherently "bad"—wrong, if you will—and we don't need the law to tell us so. We KNOW they're wrong. A person can't be any of these without a negative, even destructive, effect on others. They are, in fact, immoral and unethical, and not because the law says so. They are just as bad without laws. The law simply deals with them according to the desires of society.

The Solution

The solution starts with each of us, individually. You can be ethical alone (in fact, that's the way you have to do it). Just begin everything you do in truth and choose to be honest with yourself and others, and you will be ethical in everything you do. Communicate honestly and make your relationships honest. That's where it starts, and that's how it goes. We confront perfection by being honest with ourselves and with others. We deal with others by insisting on honesty from them. If they choose otherwise, we can't force them to be honest. But we can react honestly.

And we can resolve the "ethical paradox" of registration if we admit that registration is a legal notion, founded not on ethical principles but in power and control. Laws not founded in ethical principles will collapse in the face of the truth.

You will admit that you do not need registration to be a good geologist. Competence and honesty make you a good geologist. Acting in your clients' and profession's best interest makes you a good geologist. Being ethical makes you a good geologist. (And if you're unethical, no amount of registration will save you.) Why work for a registration law if you already have the means to practice geology ethically? Only one reason: POWER. Admit it.

If you think you need the control—the power—to keep the charlatan out, then raise the standard from within. Put principle—truth, virtue, character, excellence, all those good things—first, and refuse to succumb to the dictates of those who are not ethical. If you need a support group, make it a good one. A geologic community* of truly ethical professionals can do more to raise professional standards from within, promote professional development and police itself than can any amount of law. And QA is built into the system (quality comes directly from ethics). But don't empower the charlatan, and certainly don't be one.

Simply choose truth and honesty and you'll be on the right track. What you do must be founded in principle, not privilege, and you can do this without registration law, individually.

You can preempt registration simply by avoiding it.

But if you feel that registration is necessary in order to be allowed by others to practice your profession, then by all means get registered. But be and stay ethical. And remember—you don't have to be registered to be a good geologist. You only need registration if you're not.

There are alternatives, if we choose to recognize them, but we have to back up to solid ground before we can make significant forward progress. It seems to be human nature to resist giving up hard-won ground, but there are times when backing up is the best way to go. We're already past that time, and we're paying dearly for it.

Start with motives founded in truth and honesty. Stop with the privilege, and consider principle.

*There exists a mechanism for doing this in the body of AIPG, which began by championing certification. Unfortunately, AIPG left the track when it sought to gain membership by relaxing standards (it later corrected that error, but has never quite recovered its original strength of purpose). The fact remains that it would be easier to correct AIPG than it would be to try to correct the law, but it has to begin with a properly-conceived ethical code rather than a "model legislation."

Fred L. Fox, CPG-1273, P.O. Box 5356, Clinton, NJ 08809.

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NEW PUBLICATION:

Compensation Of Professional Geologists

The report of the Compensation Survey of Professional Geologists, conducted during the latter part of 1994 and sponsored by AIPG, is now available.

Abbott, Langer & Associates performed the survey, at no cost to AIPG. It is similar to surveys they have conducted for various other scientific and engineering organizations. As such, it follows a standard format, with the questions tailored to professional geologists. The standard format and arrangement of questions enhances its usefulness to personnel administrators, employment services, bid estimators, etc., who are accustomed to using this type of resource. It also is useful for assessing employment opportunities and compensation in various areas of the country and fields of practice.

The 445-page volume contains a discussion of the survey methodology, definitions of each category, notes on interpretation of the data, and twelve tables which together occupy 437 pages.

There is a great variety of cross-referencing among the many variables.

Each of the tables shows compensation Means, First Decile, First Quartile, Median, Third Quartile, and Ninth Decile for Base Annual compensation, Fees-Bonuses-Commissions, and Total Annual Cash compensation.

Some interesting implications derived from, and questions by, the tables include:

- The compensation of self-employed geologists does not show much difference between the four largest employment groups (Environmental, Exploration, Hydrogeology, and Petroleum-Natural Gas). Some of the smaller groups (e.g., Appraisal & Investment Analysis, Economic-Mining, Engineering, etc.) do exhibit considerable differences both among them and in comparison with the four largest. The smaller groups seem to exhibit broader ranges of compensation, in general.

  - Self-employed geologists generally seem to earn more than salaried geologists, though their ranges are greater (i.e., the lows are lower and the highs are higher).

  - Where are salaried geologists paid the most? The least?

  - Where do self-employed geologists earn the most? The least?

  - How does level of education relate to compensation at various levels of experience?

  - As might be expected, the best paid faculty members appear to be in the Northeast.

  - Salaried geologists, like their self-employed colleagues, seem to be compensated best in the West. However, they generally appear to have lower compensation than either self-employed or faculty geologists.

  - The larger the firm, generally the higher the compensation.

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UNITED STATES 156
AGENCY: Department of the Interior/Office of the Secretary
TOPIC: ENVIRONMENT, PROTECTION AND POLLUTION CONTROL -- 8
SUMMARY: Amends the regulations for assessing natural resource damages resulting from a discharge of oil into navigable water under the Clean Water Act or a release of hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act. Provides procedures that designated federal, state, and Indian Tribe natural resource trustees may use to obtain compensation from potentially responsible parties for injuries to natural resources.
CITATION: 43 CFR 11
PROPOSAL DATE: 08/06/94
COMMENT DEADLINE: 02/09/95

UNITED STATES 1205
AGENCY: Environmental Protection Agency
TOPIC: ENVIRONMENT, PROTECTION AND POLLUTION CONTROL -- 8
SUMMARY: Amends the regulations under the Resource Conservation and Recovery Act in two areas: Removes the current requirement for a post-closure permit, and allows the agency to use alternative authorities to address facilities with units requiring post-closure care; amends the regulations governing state authorization to require authorized states to adopt authority to address corrective action interim status facilities.
AGENCY CONTACT: Barbara Foster, Office of Solid Waste, US EPA, Washington, DC 20460; (703)308-7057
CITATION: 40 CFR 264, 265, 270, 271
PROPOSAL DATE: 11/08/94
COMMENT DEADLINE: 01/09/95

UNITED STATES S 34
AUTHOR: Breaux
INTRODUCED: 01/04/95
SUMMARY: Amends the Internal Revenue Code of 1986 to allow a tax credit for fuels produced from offshore deep-water projects.
STATUS: 01/04/95 INTRODUCED.
1/04/95 To SENATE Committee on FINANCE.

UNITED STATES S 70
AUTHOR: Dole
INTRODUCED: 01/04/95
SUMMARY: Permits exports of certain domestically produced crude oil.
STATUS: 1/04/95 INTRODUCED.
01/04/95 To SENATE Committee on BANKING, HOUSING, AND URBAN AFFAIRS.

UNITED STATES S 89
AUTHOR: Inouye
INTRODUCED: 01/04/95
SUMMARY: Amends the Science and Engineering Equal Opportunities Act.
STATUS: 01/04/95 INTRODUCED.
01/04/95 To SENATE Committee on LABOR AND HUMAN RESOURCES.

CALIFORNIA 7107
AGENCY: Department of Health Services
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Defines the effective data off accreditation of any engineering curriculum leading to a first degree in engineering one year prior to that specified in the Accreditation Board for Engineering and Technology (ABET) yearbook.
AGENCY CONTACT: Cindi Christenson, P.E., Program Manager, Board of Registration for Professional Engineers and Land Surveyors, 2355 Capitol Oaks Drive, Ste. 300, Sacramento, CA 95833, (916)263-2248.
CITATION: 16 CCR 460
PROPOSAL DATE: 03/25/94
COMMENT DEADLINE: 05/09/94
HEARING DATE: 05/10/94
ADOPTION DATE: 12/09/94
EFFECTIVE DATE: 12/09/94

CALIFORNIA 7108
AGENCY: Department of Health Services
TOPIC: BUSINESS AND CORPORATION -- 2
SUMMARY: Defines requirements and conditions for renewal, restoration, reinstatement, or reissuance of license/registration to an applicant who has been practicing with an expired or revoked land surveyor license/registration.
AGENCY CONTACT: Cindi Christenson, P.E., Program Manager, Board of Registration for Professional Engineers and Land Surveyors, 2355 Capitol Oaks Drive, Ste. 300, Sacramento, CA 95833, (916)263-2248.
CITATION: 16 CCR 424.5
PROPOSAL DATE: 03/25/94
COMMENT DEADLINE: 05/09/94
HEARING DATE: 05/10/94
ADOPTION DATE: 12/12/94
EFFECTIVE DATE: 12/12/94

INDIANA H 1243
AUTHOR: Wilkins
INTRODUCED: 01/04/95
SUMMARY: Amends the prohibition against the use of the word "engineer" in a state job title if the person holding the job is not a professional engineer to jobs filled in the department of environmental management after June 30, 1995.
STATUS: 01/04/95 INTRODUCED.
01/04/95 To HOUSE Committee on ENVIRONMENTAL AFFAIRS.

IOWA H 5522
AUTHOR: Committee on State Administration
INTRODUCED: 11/28/94
SUMMARY: Relates to the duties of the State Geologist.
STATUS: 12/01/94 INTRODUCED.
12/01/94 Reported on H 457.

MINNESOTA
AGENCY: Department of Natural Resources
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION -- 18
SUMMARY: Establishes the leasing procedures by which the Department of Natural Resources issues leases for selected industrial minerals; includes industrial, leased, and metallic minerals.
AGENCY CONTACT: Kathy Lewis, Department of Natural Resources, 500 Lafayette Road, St. Paul, MN 55155-4045, (612)296-4607.
CITATION: MCSR 14.22 - 14.26
PROPOSAL DATE: 11/07/94

MISSISSIPPI H 88
AUTHOR: Ellington
INTRODUCED: 01/03/94
SUMMARY: Removes the requirements that the engineering curriculum required for professional engineers be approved. Deletes the ten-year enrollment term requirement for an engineer intern and clarifies that only a registrar may use the seal issued to him or her. Clarifies that criminal penalties may be assessed in addition to civil penalties. Clarifies the meaning of the term "principal officer or partner".
STATUS: 01/03/95 INTRODUCED.
To HOUSE Committee on JUDICIARY A.

MISSOURI 6072
AGENCY: Department of Economic Development/ Board for Architects, Professional Engineers and Land Surveyors
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Establishes professional development requirements for renewal of land surveyor certificate registration.
AGENCY CONTACT: Shirley Russell, Executive Director, 3605 Missouri Boulevard, Suite 380, P.O. Box 184, Jefferson City, MO 65102.
CITATION: 4 CSR 30-8.020
PROPOSAL DATE: 06/01/94
COMMENT DEADLINE: 08/01/94
ADOPTION DATE: 11/15/94
EFFECTIVE DATE: 11/25/94

NEW MEXICO 420
AGENCY: Environment Department
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL -- 8
SUMMARY: Sets out the rules by which the department will: 1) pay or reimburse the costs of a minimum site assessment in excess of ten thousand dollars ($10,000) or lesser amounts determined in accordance with existing law, and corrective action other than a minimum site assessment; 2) determine compliance; 3) determine cost eligibility.
AGENCY CONTACT: New Mexico Environment Department, P.O. Box 26110, Harold Runnels Building, 1190 St. Francis Drive, Santa Fe, NM 87502.
CITATION: Correction Action Fund
PROPOSAL DATE: 12/01/94
ADOPTION DATE: 12/01/94
EFFECTIVE DATE: 12/01/94
MESSAGE: RULE ADOPTION
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NEW MEXICO 296
AGENCY: Board of Registration for Professional Engineers and Surveyors
TOPIC: BUSINESS AND CORPORATIONS – 2
SUMMARY: Concerns revisions to the regulations and rules of procedure of the Board of Registration Engineers and Surveyors.
AGENCY CONTACT: Board of Registration for Professional Engineers, 1010 Marquez Place, Santa Fe, NM, 87501.
CITATION: Regulations and Rules of Procedure
PROPOSAL DATE: 08/31/94
COMMENT DEADLINE: 09/23/94
HEARING DATE: 09/29/94
ADOPTION DATE: 10/28/94
EFFECTIVE DATE: 10/28/94

NEW MEXICO 445
AGENCY: Board of Registration for Professional Engineers and Surveyors
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Discusses the code of professional conduct for professional engineers and surveyors in order to safeguard life, health and property, to promote the public welfare and to establish and maintain a high standard of integrity and practice.
AGENCY CONTACT: Board of Registration for Professional Engineers, 1010 Marquez Place, Santa Fe, NM, 87501.
CITATION: Rule 700.1
ADOPTION DATE: 10/28/94
EFFECTIVE DATE: 10/28/94

NEW MEXICO 450
AGENCY: Board of Registration for Professional Engineers and Surveyors
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Discusses the rules of professional conduct for professional engineers and surveyors.
AGENCY CONTACT: Board of Registration for Professional Engineers, 1010 Marquez Place, Santa Fe, NM, 87501.
CITATION: Rule 700.2
ADOPTION DATE: 10/28/94
EFFECTIVE DATE: 10/28/94

TEXAS H 200
AUTHOR: Madden
INTRODUCED: 11/29/94
SUMMARY: Relates to the definition of professional surveying.
STATUS: 11/29/94 PREFILED.

TEXAS H 201
AUTHOR: Madden
INTRODUCED: 11/29/94
SUMMARY: Relates to certain requirements for registration or certification by the Board of Professional Land Surveying.
STATUS: 11/29/94 PREFILED.

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THE FEDERAL REGISTER

Vol. 59, No. 227, 11-28-94, pg 60876
Department of Interior, OSMRE, 30 CFR Parts 840 and 842. Surface Coal Mining and Reclamation Operations; Initial and Permanent Programs; Abandoned Sites, Final Rule.
This changes the inspection frequency for inspection of mines abandoned without completion of reclamation of abatement of violations. For further information contact: Daniel Stocker, OSMRE, 1951 Constitution Ave. NW, Washington, DC 20240, Ph. 202-208-2550.

Vol. 59, No. 230, 12-1-94, pg 61744, Part VIII
This proposed designation includes a total of 880,000 acres of stream, river, lake, and shoreline as critical habitat in Oregon and California and was the result of court action filed by the Oregon Natural Resources Council. THIS PROPOSAL ENCOMPASSES ABOUT 5,301,000 ACRES. More restrictions for MORE, MORE, AND STILL MORE ENDANGERED CRITTERS!!

Vol. 59, No. 235, 12-8-94, pg 63328
Department of Defense, Corps of Engineers, Notice of Intent. Intent to Perform the Second Periodic Nourishment of the Sunny Isles and Miami Beach Segments of the Beach Erosion Control and Hurricane Project. One wonders that if they fed them properly the first time—would they have to do it again. That's the Corps!

EPA, Solicitations for Graduate Fellowship Applications - 1995; Office of Exploratory Research. This involves applications for Grad fellowships in physical, biological, and social sciences; mathematics and computer science; and engineering. EPA intends to award approximately 100 multi-year fellowships in 1995. Interested students may request an initial application from: Campus offices of Graduate Deans, Deans of Mathematics, Science, and Engineering Departments, or Virginia Broadway, attn: Graduate Fellowships, Office of Exploratory Research (S703), Room 3102, NEM, 401 M Street SW, Washington, DC 20460 FAX No. 202-260-0211. Vol. 59, No. 241, 12-16-94, pg 65086 Office of Personnel Management. New Application Procedures for Federal Jobs [Elimination of SF-171, Application for Federal Employment. This eliminates the use of the application form SF-171. Applicants may use the format of their choice for future applications. Thus endeth the readings for 1994. All in all, there were 68107 pages of Federal Register during 1994. I hope you found some of it useful. The writers seem to be improving--there was not as much humorous material this year. I wonder why.–
EXECUTIVE DIRECTOR'S COLUMN

The following is excerpted and condensed from an address, given as the National Research Council/Board on Earth Sciences Distinguished Lecture in Geoscience Policy, to a convocation of presidents and executive directors of U.S. earth sciences professional societies, November 14, 1994, National Academy of Sciences, Washington, D.C.—William V. Knight, CPG-0153.

---Guest Column---

The Geosciences: Adapting To A World Of Change

William L. Fisher, CPG-2398

Change and our need to adapt are always with us. But there are times when elements of change converge, take on a symmetry of their own, and move at an alarming speed; our adaptation tends to lag. Most of the scientific community, and for sure the geosciences, are in the midst of such rapid, structural change. It may be disconcerting or even disastrous for some, but it is well to remember that change can be fertile ground for the resourceful—those who sense the direction and gear to it.

What are these changes about us?

For one, a broad change is occurring in the scientific enterprise as the federal R&D effort seeks to shift emphasis from historical government-for-government R&D in national defense to R&D in a commercially driven environment dedicated to economic enhancement and global competition. Of the public R&D expenditures of the past 50 years, 60 percent went directly to defense, and a good part of the rest was defense related. During much of the period, federal R&D grew well in excess of GDP. In the 50's and 60's, growth was exponential; it slowed in the 70's and 80's and has been flat in real terms since the late 1980's. The FY 1995 federal R&D budget, as a percentage of GDP, is the lowest of any year since 1958 and in outyears may well be lower. But beyond volumetric shrink and the shift in emphasis, the real challenge for the nation's R&D constituency is the development of new rationales by which research can be defended. The current idiom is strategic or goal-oriented research as opposed to curiosity-driven research. The geosciences, with their historical mooring in earth resources, should be able to make the transition easily. But alas, this broader R&D shift is occurring when resource-oriented research in the corporate enterprise is being massively downsized. Further, some agendas currently in the Congress call for elimination or substantial reduction of most of the geoscience and resource research effort of the federal government, impacting agencies of Interior, Energy, and other departments as well. Those entities currently expend about 35 percent of the total, public, and private, geoscience R&D effort.

For another, the massive, and seemingly relentless, growth in federal entitlement programs, unfunded federal and court mandates to the states, and a growing federal deficit are both squeezing and reducing governmental support and conduct of public R&D. We see the current

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

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uncertainty of the federal R&D effort along with the corporate downsizing already under way. But drop to the state level to see another squeeze play working. In my state, and at least in this regard it may be typical, about 85 percent of the state appropriations process is effectively out of the hands of the Legislature. As a result from 1985 to 1995, funding for prisons, largely mandated by the courts, grew 159 percent in real dollars; health and human services, generally under unfunded federal mandates, grew 139 percent. By contrast, higher education appropriations increased a bare 3 percent. Many state universities in the country now receive the bulk of their operating budgets from some source other than general revenues. The ultimate consequence of this privatization of public higher educational institutions is not known, but it makes for a major historical change.

Yet another, the new reality of a world of low-price energy is leading to substantial corporate change with particularly acute impact in the geosciences and their historical homing in resource exploration and development. The corporate R&D enterprise, for a long time constituting about one-third of the total public and private geoscience R&D effort, has declined precipitously in the past decade and is now likely no more than 15 percent of the total enterprise. But the R&D reduction is only a part of massive corporate downsizing. Such downsizing is not unique to the extraction industries, but arguably it has been more severe. Historically, nearly three-fourths of U.S. geoscience graduates initially were employed in the energy and mineral industries. That proportion is now much lower as most of the impact on U.S. geoscience employment has been realized. The reduction in number of U.S. geoscientists working in the extractive industries is likely permanent because of the changed nature of much of the remaining oil and gas resource base. The substantial economy of scale, offered by giant field discovery and subsequent large-volume, low-cost production, is greatly diminished, certainly in the United States and indeed in much of the world, and with it the large-scale corporate R&D and geoscience employment. Economics have shifted from those of scale to those of efficiencies. In the past decade of low oil and gas prices, the industry has significantly substituted technology and know-how for price. Smaller exploration and development companies are pursuing the ample, but relatively small-increment resource base in the United States and doing so profitably with economies of efficiencies. Many of the remaining, potentially large economy-of-scale prospects, which major companies have historically sought, are abroad and mostly in the hands of state-owned companies. Increasingly, the majors are creating joint ventures with foreign governments for exploration and, especially, development. These changed structures in the United States and abroad will require geoscientists. But the number will likely be lower than historically, and abroad at least, foreign nationals naturally will become increasingly larger parts of the employment mix.

And finally, the change in demand for geoscience graduates as regards volume and practice orientation is posing challenges academic departments have not fully
addressed. To be sure, the tightening of university budgets is beginning to be felt, and the impact of declining employment opportunities is coming home, albeit somewhat offset by departments guiding a goodly number of their graduates to environmental areas, by continuing not readily employable students to the already-surplus Ph.D. degree, and by steadily increasing the enrollment of foreign nationals. While faculties and their students, especially at the Ph.D. level, have long become more and more specialized, future trends for employment are pointing other ways. Historically, the overwhelming majority of geoscience graduates joined, at least initially, major companies. The companies, with their own internal training, provided the applied aspects of practice while the universities provided the basics. That historical, symbiotic relationship is now greatly reduced and yet declining. Major companies are increasingly going to outsourcing; the smaller E&P companies can staff with readily available experienced geoscientists; and the environmental companies that now offer employment go directly to billable hours, not structured in-house practical training programs. Practitioners, the stuff of most viable professions, will have to be trained differently and with broader perspective and flexibility, if a new core employment for geoscientists is to be established and maintained.

How healthy this grand enterprise of geoscience remains will depend upon how well we recognize and manage change that is inevitable by the fact that much of it is already upon us. Many of the changes we must accommodate are opposite to historical trends we have experienced. Wide-angle turns are difficult but no less imperative. We must become more flexible and broader in perspective in contrast to two generations of ever-increasing specialization. We will be more global, and we will compete globally in practice and in research. We will, of necessity, continue to be more efficient and more productive. If we face reality and make the changes necessary, we can assure a future as exciting and rewarding as ever and certainly as challenging. But I am sure it will not be the same.

William L. Fisher, CPG-2398, Leonidas T. Barrow Chair in Mineral Resources, The University of Texas at Austin.

Summitville Mine Superfund Site Publication Available

A new publication that evaluates many environmental aspects of the Summitville mine Superfund site will be available January 21 from the Colorado Geological Survey.


Summitville is a mine site high in the San Juan Mountains of Colorado. Mined intermittently for gold and copper from 1870, the mine was abandoned due to bankruptcy in 1992. Remaining was a 10-million-ton heap-leach pad fully loaded with cyanide, 15 million tons of sulfiderich waste rock, a draining mine adit and 550 acres of disturbed earth. Today the mine is a Superfund site being managed by the U.S. Environmental Protection Agency (EPA).

The 375-page hard-bound book contains original studies by the U.S. Geological Survey, the EPA, Colorado State University and other authors covering environmental, engineering, legal, geological, and hydrological aspects of the mine site area and should be useful to scientists and engineers in earth, environmental, and mining sciences, and to attorneys and public policy analysts. It will serve well as an environmental science text or case study for an upper-level undergraduate or graduate level course.

This special publication is available for $95 from the Colorado Geological Survey, 1313 Sherman St., Room 715, Denver, CO 80203. For phone orders call (303) 866-3340; for FAX orders, call (303) 866-2461. Payments by MasterCard and VISA are accepted. A 8.95 shipping and handling charge will apply to all domestic orders; phone for international order rates. For a free list of all Colorado Geological Survey publications, call (303) 866-2611.

From the Colorado Geologist Survey, Division of Minerals and Geology.

We look into the earth
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* **PROFESSIONAL CERTIFICATION** - Certifies Professional Geologists based on their Competence, Integrity and Ethics.

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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.


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

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

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

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From Prospect to Prosperity:
Wildcating In Arabia
And The Rockies


Review by John D. Haun, CPG-0136

This book is an autobiography of petroleum geologist Paul Walton. Rather than describe significant events in his life sequentially, Walton entertains us with a blow-by-blow description of his more important or more exciting adventures first. Briefly, Walton was born in 1914 to a Mormon family and grew up in Holladay, Utah. He graduated as a geological engineer in 1935 and received a master's degree in 1940, both from the University of Utah, and completed a Ph.D. in geology at MIT in 1942 (with a dissertation on the "Geology of the Cretaceous in the Uinta Basin, Utah"). Today he lives on his ranch near Jackson, Wyoming.

The first five chapters describe the negotiations and concession agreement Walton concluded with Saudi Arabia on behalf of J. Paul Getty's Pacific Western Oil Corporation, for a concession in the Neutral Zone between Saudi Arabia and Kuwait. The first lines of Chapter One describe the 1949 signing of the agreement and set the scene: "Sheikh Abdullah Sulaiman beckoned us to follow. We filed into the great marble hall of the King's palace. Garbed in black camel's hair abbas with gold beaded trim and white gutras (head cloths) with black, ropelike agals wrapped around our heads, Barney Hadfield and I were shown our chairs before the small table. Abdul Aziz Ibn Saud, the King, sat behind."

Walton had been in Saudi Arabia in 1938 as chief of a gravity meter party with Standard of California (described in later chapters), but came home after contracting rheumatic fever. He was division geologist in the Casper, Wyoming office of Pacific Western when Mr. Getty asked him to return to Saudi Arabia. The amazing detail consisting of names, dates, hotels, flights, etc. that describe Walton's daily activities from November, 1948 to the signing of the agreement on February 20, 1949 obviously are based on detailed diary entries. During the course of the negotiations Walton suffered from amoebic dysentery, and this was only one of a number of life-threatening health problems he encountered in the Middle East.

A wildcat well drilled near a surface anticline Walton had seen during an aerial reconnaissance of the Neutral Zone was the 1953 discovery well of the Wafra field. This became Getty's single biggest asset. "By 1990 the Neutral Zone had produced nearly five billion barrels of oil." The Oil and Gas Journal reports (12/27/93) that Wafra, plus the related S. Fumaris and S. Umm Gudair, had produced almost two billion barrels. Getty gave Walton a $1200 bonus!

Chapters 6 through 9 describe Walton's work with the gravity meter party in Saudi Arabia in 1938-39 (for Standard of California, before working for Getty). His crew mapped an anticline that had previously been indicated by shallow drill holes. Drilling in 1941 developed the giant Abqaiq oil field (seven billion barrels). Walton had not fully recovered from rheumatic fever and his boss, Max Steineke, sent him home. The trip back to Salt Lake City (the subject of Chapter 10) was a Cook's tour of the major cities of the Middle East and Europe. When he told Standard of California he was home, the chief geologist terminated Walton's employment! The next two years he worked for the Texas Company (now Texaco) in the Rocky Mountain region.

Chapter 11 described Walton's move back to Salt Lake City in 1949 where he prospected in various parts of the Rockies, with emphasis on the Uinta Basin. He obtained royalty interests in Uinta Basin and Wasatch Plateau production. His Clear Creek field made between 100 and 200 billion cubic feet of gas.

The last chapters of the book (12-19) review brief ventures in uranium, Libyan iron ore, gold, geothermal energy, more oil exploration, ranching, hunting, and polo. We learn on page 319 that Walton leased 90,000 acres...
of fee land in the Uinta Basin, much of which became the greater Altamont-Bluebell field. The Utah Geological Association in the 1993 "Oil and Gas Fields of Utah" estimates primary recovery at 316 million barrels of oil and 360 billion cubic feet of gas. This must be a large part of the prosperity mentioned in the book title.

The last five pages are devoted to an index of almost 300 names of people mentioned in the text. I have been involved in oil and gas exploration in the Rocky Mountain region for 45 years, and worked for Stanolind in the Uinta Basin in the early 1950s, so many of the names (including the name of Paul Walton) are very familiar to me.

I highly recommend the book as an example of the exciting life of a petroleum geologist during what may turn out to be the golden age of petroleum exploration. It would have been easier on the reader (and on the reviewer) if Walton had told his story straight through from the beginning of his life until 1994 rather than jumping back and forth to time periods that were out of sequence.

MEMBERS IN THE NEWS

In Honor Of William L. Fisher

More than 250 well-wishers gathered in September to honor William L. Fisher, CGP-2398, outgoing director of the Bureau of Economic Geology, University of Texas, Austin, for 34 years of service. Fisher, who holds the Leonidas T. Barrow Centennial Chair of Mineral Resources at the university, returns to full-time teaching. Congressman J.J. Pickle (D-Texas, 10th District) of Austin and AGI’s Executive Director Marcus E Milling, CGP-4518, were among those who recognized Fisher for his distinguished and outstanding contributions to the profession.

Fisher, an AGI past president and Ian Campbell Medalist, is a member of the National Academy of Engineering. Fisher serves on the National Petroleum Council; the Advisory Council of the Gas Research Institute; the National Research Council’s Commission on Geosciences, Environment, and Resources; and the board of the Texas Low-Level Radioactive Waste Disposal Authority. He has served on numerous state and federal advisory councils and committees, including the White House Science Council, the Secretary of Energy Advisory Board, and the Department of the Interior’s Outer Continental Shelf Policy Advisory Board. Fisher is also an AIPG past president and was awarded the AIPG Public Service Award in 1985.

This year, Fisher was awarded the Sidney Powers Medal by the American Association of Petroleum Geologists, the society’s most prestigious award. AAPG recognized Fisher for his early research contributions to basin analysis and his leadership in forming and advancing concepts in depositional systems, as well as his later contributions to national energy and mineral policy.

Gary D. Davis, CGP-7241, was promoted to the newly-created position of Director, Planning & Business Development by Central Resources, Inc. He will be responsible for acquisitions, new ventures, and the strategic direction of the company. Formerly, Mr. Davis was the Manager, Exploitation for the company. He has been affiliated with Central since 1991 in various capacities.

Central Resources Inc. operates approximately 500 wells throughout the Rocky Mountains and the Permian Basin of West Texas and southeast New Mexico. The company employs 31 people with headquarters in Denver, Colorado and field offices in Midland, Texas and Sidney, Nebraska.

The promotion of Mr. Davis coincides with the completion of a new financing facility through Banque Paribas (New York) which will allow the company to aggressively pursue growth opportunities in the oil and gas industry, possibly including international ventures.

The Geological Society of America (GSA) held its annual meeting in Seattle, Washington, October 22-27, 1994. Geological Investigation geologist Tom Scott, CGP-4950, and Paulette Bond presented papers at the meeting. Dr. Scott’s paper, entitled "Reinterpretation of the peninsular Florida Oligocene: A multidisciplinary view" with Drs. L. Wingard, L. Edwards and S. Weedman of the USGS (Reston) presents new information on the development of the Florida Platform during the late Paleogene. Dr. Scott is also a co-author on a paper with Tom Missimer, CGP-4549, and others from the University of Miami entitled "Cenozoic record of global sea level events in the Hawthorn Group and Tamiami Formation on the Florida Platform."

Richard Gray, CGP-1257, Senior Vice President of GAI Consultants, Monroeville, Pennsylvania, was recently elected national President of the Association of Engineering Geologists.

John Parrish, CGP-3326, resigned on June 30, 1994 as Executive Officer of the Board of Registration for Geologists and Geophysicists to take a similar position with the Division of Mines and Geology. His contributions to our Board were significant and we wish him success.

Walt Schmidt, CGP-6029, State Geologist and Chief of the Florida Geological Survey within the Division of Technical Services, was installed as the President-Elect of the Association of American State Geologists (AASG) at their annual meeting held recently in Ohio. The AASG is an organization of the chief executives of the state geological surveys in the 50 states and Puerto Rico.
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1995

Feb. 28-Mar. 3. International Erosion Control Association - 26th Annual Conference & Trade Exposition, Atlanta, GA. Contact: IECCA, P.O. Box 4904, Steamboat Springs, CO 80477-4904, Ph.: (303) 879-3010.

Mar. 4. Ecology Field Trip, Bureau of Land Management, Kern Canyon-Lake Isabella-Walker Pass, California. Dr. Wilkerson, Ph.: (805) 321-6081 or write to MOTHER LODE c/o Greg Wilkerson, 7005 Hooper Ave., Bakersfield, CA 93308.

Mar. 5-8. Petroleum Technology of the World, Houston, TX. Contact: AAPG Annual Convention, P.O. Box 979, Tulsa, OK 74101, Ph.: (918) 584-2555.

VISIT THE AAPG BOOTH #1552 AT THE AAPG ANNUAL CONVENTION

Apr. 23-26. Symposium on the Application of Geophysics to Environmental and Environmental Problems (SAGEEP '95), Orlando, FL. Contact: Mark Cromack, PEQP, P.O. Box 4475, Englewood, CO 80115, Ph.: (303) 771-6101.

Apr. 24-27. In Situ and On-Site Bioreclamation - The Third International Symposium, San Diego, CA. Contact: Bioreclamation Symposium, The Conference Group, P.O. Box 5 West Fifth Ave., #5, Columbus, OH 43212, Ph.: (614) 424-5461. Sponsored by Battelle.

May 2-5. International Trade Fair and Congress for the Geosciences and Geotechnology, Cologne, Germany. The correspondence address: Alfred-Wegener-Stiftung, Wissenschaftszentrum, Alfred-Wegener Strasse 45, D-50765 Born.


May 14-18. AIA Annual Meeting - Water Resources at Risk, Denver, CO. Contact: Helen Kloes, AIA, 9416 Univ. Ave. S.E., Minneapolis, MN 55414, Ph.: (612) 967-6160.

May 15-17. 46th Highway Geology Symposium, Charleston, WV. Contact: Ken Ashton, West Virginia Geological Survey, P.O. Box 879, Morgantown, WV 26507, Ph.: (304) 594-2331.


Jun. 3. Ecology Field Trip, Bureau of Land Management, Bakersfield to Carpinero, California. Dr. Wilkerson, Ph.: (805) 321-6081 or write to MOTHER LODE c/o Greg Wilkerson, 7005 Hooper Ave., Bakersfield, CA 93308.


Jun. 4-10. Canadian National Chapter of the International Association of Hydrogeologists - Solutions, Edmonton, Alberta, Canada. Contact: Allan Kerr - Chair, 10768 - 99 Street, Edmonton, Alberta, Canada T6H 3H6, Ph.: (403) 429-1472.


Jun. 15-23. Companion Carbonate-hosted Field Conferences in Ireland and Australia. Contact: J. R. Vearncombe, Dept. of Geology, Univ. of Western Australia, Nedlands, Western Aus-


Jul. 15. Geology Field Trip, Bureau of Land Management, Bakersfield to Point Sal, California. Dr. Wilkerson, Ph.: (805) 391-6081 or write to MOTHER LODE c/o Greg Wilkerson, 7005 Hooper Ave., Bakersfield, CA 93308.

Jul. 23-25. Seventh International Williston Basin Symposium, Billings, MT. Contact: Dennis Rehrig, SWIS, 4824 Rinnrock Road, Billings, MT 59106, Ph.: (406) 256-4785.

Aug. 5. Ecology Field Trip, Bureau of Land Management, Bakersfield to Ojai and Santa Paula, California. Dr. Wilkerson, Ph.: (805) 391-6081 or write to MOTHER LODE c/o Greg Wilkerson, 7005 Hooper Ave., Bakersfield, CA 93308.

Sep. 2. Ecology Field Trip, Bureau of Land Management, Brokenridge Mountain and Kawa, California. Dr. Wilkerson, Ph.: (805) 391-6081 or write to MOTHER LODE c/o Greg Wilkerson, 7005 Hooper Ave., Bakersfield, CA 93308.

Sep. 10-14. Geohazards and Engineering Geology, Coventry University, England. Contact: The Engineering Group of the Geological Society, Conference Secretary, Steve Penn, Coventry Univ. School of the Built Environment, Priory St., Coventry, UK CV1 5FB.


Oct. 14-17. Joint Annual Meeting AAPG Eastern Section and New York State Geological Associa-

FUTURE AAPG ANNUAL MEETINGS

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- 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
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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.

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