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Petroleum Geology

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The Professional GEOLOGIST

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Tectonics, Structural Architecture And Potential Frontier Plays In Mature Petroleum Provinces

The Montague County Example Of North Texas

Robert G. Font, CPG-3953

Introduction

North Texas is a good example of a mature petroleum province where opportunities still exist for finding new reserves utilizing state-of-the-art technology and innovative concepts.

Analysis of seismic and petrologic data reveals a fascinating scenario concerning structural patterns and tectonic evolution. The Proterozoic and early Paleozoic history are related to the development of the Wichita aulacogen. Structural patterns observed in the Proterozoic basement are remarkably similar along the southern side of the Wichita-Amarillo uplift from the Hardeman basin to the Muenster Arch. An intriguing layered basement sequence of Proterozoic truncated wedges underlies the Precambrian-Paleozoic unconformity. The early history reflects rifting. Subsequent tectonism relates to plate convergence and collision during the late Paleozoic. Fault patterns mapped from seismic and subsurface data may be explained through orientation of the principal stresses. Of the major patterns mapped, the NW trending system is dominant. Normal faults formed during rifting were selectively reactivated as upthrusts during convergence.

Past discoveries are almost invariably related to structures discernible from seismic sections. With the use of state-of-the-art seismic data and seismic stratigraphic techniques, new reserves in Carboniferous reservoirs may be discovered in subtle traps. Potential frontier play concepts involve the petroleum potential of the deep Ellenburger, similar to the deep pay found in the equivalent Arbuckle of Oklahoma. Recent deep wells drilled in Montague county affirm the presence of structure and reservoir, but fail to find the indigenous source potential found north of the Red River. The best opportunities for deep Ellenburger discoveries in Texas lie where faulting juxtaposes Carboniferous source rocks against the Cambro-Ordovician reservoirs.

Tectonic History And Structural Architecture

The tectonic history and structural patterns of much of North Texas are directly related to the development of the

Wichita aulacogen. The aulacogen's importance as a tectonic entity is described by Hofman et. al. (1974). The authors define the aulacogen as the failed arm of a rift triple junction; two of the rifts opening to form ocean basins, while the third - the aulacogen - extends at a high angle to the newly rifted continental margin, far into the adjacent craton. The aulacogen is a deeply subsiding trough; its fill is contemporaneous, as thick as, and lithologically similar to the adjacent miogeosynclinal sedimentary wedge. Its early history is dominated by vertical
tectonics (Hoffman et al. 1974). Aulacogens are often characterized by intermittent maﬁc and felsic volcanism and plutonism, with initial rifting being accomplished through thermal doming of the lithosphere produced by mantle plume-generated uplifts (Walper, 1976). The vertical tectonics, volcanism, and plutonism characteristic of the early stages of the aulacogen’s development are followed by an episode of compression and development of folds and faults important to petroleum accumulation (Walper, 1976).

The Wichita aulacogen is thought to have formed in the late Proterozoic as the failed arm of the Dallas triple junction (Burke and Dewey, 1973). Walper (1976) relates this time to the formation of four major aulacogens: the Mt. Rogers, Reelfoot, Wichita, and Delaware (extending east to west from the Appalachian region to west Texas). The location of the Wichita aulacogen is believed to reﬂect a Proterozoic system of suture and fractures. Muehlberger (1965), King (1975), and Cebull et al. (1976) discuss the location of discontinuities in the orogenic pattern of the southern United States. King (1975) proposes that such discontinuities express the separation of the North American continental plate during the Proterozoic along NE-trending rifts and NW-trending transform faults. The Wichita aulacogen is interpreted to follow the trend of these ancient transforms.

Ham et al. (1964) and Walper (1976) further describe the tectonic setting and sedimentary ﬁll of the Wichita aulacogen. Developing along the pre-existing line of weakness described by King (1975) and Cebull et al. (1976), the aulacogen experienced a rifting stage attributed to the split of a proto-Pangaea supercontinent. This stage is characterized by the deposition of the Tillamook clastics, the extrusion of the Navajo Mountain basalts, the intrusion of the Raggedy Mountain gabbros, a period of uplift and erosion followed by the deposition and extrusion of the Carlton rhyolites, and the intrusion of the Wichita granites. A subsequent stage of subsidence, and sedimentation occurred from Cambrian through early Carboniferous time. Strata of the Timber Hills, Arbuckle/Ellenburger, Simpson, Viola, and Hunton groups were deposited at this time. The third and ﬁnal stage in the aulacogen’s history occurred from the late Mississippian through Permian time, as the Afro-South American plate converged with the North American plate. Basement normal faults generated during rifting were selectively reactivated as reverse and transcurrent faults due to the reorientation of the principle stresses, giving rise to a complex system of paired uplifts and basins. The episode culminated with plate convergence, the thrusting of the Ouachita-Marathon orogenic belt, the development of Pangaea, and the end of the Wichita aulacogen as a tectonic entity.

The importance of the Wichita aulacogen in petroleum exploration was recognized by Webster (1980) and Dickinson and Yarbrough (1979). Facies changes, pinchouts, erosional truncation, and faulting along the

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aulacogen's boundaries make the margins of the structure quite prospective. In addition, the strata within the aulacogen itself have experienced crumpling and deformation conducive to the trapping of hydrocarbons. The Oklahoma portion of the aulacogen has proven to be very prolific. Giant oil fields, such as Healdton, Oklahoma City, Golden Trend, and Hugoton Panhandle are all located within the aulacogen's trend. In contrast, potential opportunities along the southern margin of the aulacogen, including portions of north Texas, remain untested.

Seismic Data And Implications Concerning Future Exploration And Frontier Plays

The tectonic setting of north Texas is related to the southwestern margin of the aulacogen. As revealed by seismic data, the southwest side of the Wichita-Amarillo-Wauricka-Red River-Muenster uplifts marks the location of a late Proterozoic basin that extends from the Harde man basin area of north Texas and southern Oklahoma to Montague County. Brewer et. al. (1981) have recognized the existence of the basin and its possible petroleum potential. On the basis of COCORP's seismic data, the authors propose the presence of a deep basin, south of the Wichita Mountains, filled with clastic sediments and mafic rocks. Based on radiometric dating, the authors describe the basin as late Proterozoic (1200 to 1400 million years old) and indicate the hydrocarbon-bearing potential of the strata by comparing it to Irkutsk and Amadeus basins of the CIS and Australia, respectively, where hydrocarbon production from late Proterozoic sediments is significant (Brewer et. al., 1981).

Regional seismic coverage of Montague County of North Texas recorded by CONOCO, Inc., reveals a fascinating pattern of deep reflectors in the pre-Ellenburger section strikingly similar to the patterns seen in the COCORP lines in the Harde man basin. The pre-Ellenburger strata of Montague County are represented by a series of truncated wedges (Figure 1) that strike nearly perpendicular to the Muenster Arch and dip in a northwesterly direction. The wedges are interpreted as a truncated, progradational sequence of metasediments and igneous flows that dip into the heart of the aulacogen toward its deepest part. The basin depocenter is believed to coincide with the plutonic intrusions of the Wichita-Amarillo uplift and the Marietta basin (Webster, 1980). The Proterozoic basin fill of Montague County is inferred to contain a metasedimentary sequence interbedded with igneous flows and intrusions (dikes and sills) of mafic composition. The hydrocarbon-bearing potential of this layered sequence is unknown.

Seismic data also reveal a structurally attractive and thick (+/- 1,100 meters) Ellenburger section in parts of Montague County (Figure 1). In the southern Oklahoma aulacogen the Arbuckle (Ellenburger) sequence exceeds 2,500 meters in thickness. Some of the most prolific reservoirs of the Arbuckle occur at depths ranging from 300 to 900 meters below the top of the sequence. Such is the case at Healdton, Springer, and S.E. Hoover fields (Gatewood, 1978a, 1978b, 1978c), and at Cottonwood
Creek field (Shirley, 1988). In most of north Texas, Ellenburger penetrations are not very deep. In Montague County, Ellenburger tests rarely exceed a depth of 75 meters below the formation's top. It is quite conceivable that reservoir-quality strata may be present in the deeper portions of the Ellenburger, still untested by the drill bit. A handful of deep penetrations in the county have confirmed the favorable structural picture seen seismically and established the presence of reservoir-quality rocks deep within the Ellenburger section, but have failed to encounter the necessary source rocks and the indigenous potential for sourcing invoked by Gatewood (1978a, 1978b, 1978c) in the area of southern Oklahoma. Probably the greatest potential for finding deep Ellenburger pay in north Texas lies in areas where major faulting juxtaposes Carboniferous-age source rocks against these deep Ellenburger reservoirs. Based on the seismic sections seen by the author, this is more likely to occur in Clay County than in Montague County.

Seismic Data And Its Importance Regarding Past Discoveries And Future Exploration

Virtually every oil field which has been found in Montague County and other portions of north Texas has a strong structural component discernible on seismic data. Such is the case for the 2.4 MMBO field shown in Figure 2 and the 300 MMBO field seen in Figure 3. Commercial reserves remain to be found in the Carboniferous strata. Stratigraphic pinchouts seen in Figure 2 may also set up additional prospects. The structurally complex zone directly west of the Muenster Arch is still another area of exploratory interest. In summary, a variety of traps remain to be tested within this mature county and in other areas of north Texas. Future discoveries will largely depend on state-of-the-art seismic data for accurate prospect delineation.

Conclusions

North Texas is an excellent example of a mature petroleum province that has yielded abundant hydrocarbons, and where opportunities still exist for finding commercial reserves by applying state-of-the-art technology and innovative concepts for frontier-type plays.

An understanding of that history and the resulting fault pattern is critical to future exploration. Since past discoveries are almost invariably related to structural features which are seismically discernible, future exploration success will depend on utilization of state-of-the-art seismic data.

Potential frontier play concepts involve the hydrocarbon-bearing potential of the deep Ellenburger, similar to the deep Arbuckle pay of Oklahoma. Recent deep wells drilled in Montague County affirm the presence of structure and reservoir, but the indigenous source rock potential is yet to be established. Probably the best opportunities for deep Ellenburger discoveries in north

Fig. 3 - Seismic expression of a 300 MBO oil field.
Texas lie where faulting juxtaposes Carboniferous-age source rocks against the Cambro- Ordovician reservoirs.

I am thankful to CONOCO, Inc. for allowing me to use as illustrations some of their proprietary data which I purchased in the Montague County area.

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Robert G. Font, CPG-3953, is presently president of Geoscience Data Management. He is the former executive vice-president of Strategic Petroleum, Inc., area geologist with CONOCO, and professor of geology at Baylor. Font has a Ph.D. from Texas A & M and 20 years of professional experience.

Title Of European Geologist Update

As of February 24, 1994, there have been fifty-two AIPG Members to request an application for the Title of European Geologist. As of this date, AIPG Headquarters have sent seven Fellowship and Validation (Chartering) applications on to Europe for processing. Three of these are in the final stage of processing.

After you have been approved as a Charter Geologist, you can send the second part of the application, (the REGISTER portion which needs to be sent in triplicate) directly to Europe. This is a separate part, but the final stage of the application. If you have not received this part of the form, you may request it from AIPG Headquarters. Send a copy of your acceptance as a Chartered Geologist to AIPG Headquarters to keep your file updated.

AIPG Headquarters sends the Information to Europe as soon as it is received, along with your updated AIPG dossier. The time frame, as we understand it, usually takes several months for the process to be completely finalized. Applications are reviewed once a month. If you have any questions contact Lorita Dill at AIPG Headquarters.
The Demise Of The Oil Industry In North America In The Year 2000?

Or Is There Any Hope?

William Carruthers Gussow, CPG-0203

The Twentieth Century saw the oil industry in the United States, Mexico and Canada grow from small independent ventures to discovery of practically all the existing oilfields in North America. It set an example to the rest of the world on how to explore for oil. Geological exploration, seismic methods and exploration drilling excelled. However oil production methods and oil recovery have fallen far behind. Today, oil recovery averages only 30% of the original oil in place (OOIP) - on a world average - and many oilfields in the United States were abandoned after only 10% of the OOIP was produced. The oil recovery record is unbelievably poor and is the worst problem facing the oil industry in the world today. Already, major oil companies in North America are slashing employees and holdings, and are moving to other parts of the world. Management and accounting advisors see no hope for the future. Is this the right decision? Is there any hope? Improved oil recovery is the only answer!

I will admit that the cheapest way to produce oil is to drill a well into a new discovery and allow the oil to flow to the surface. This involves no production costs whatsoever. Many uncontrolled wildcats could form gushers hundreds of feet into the air. The oil is forced to the surface by natural reservoir pressure and by natural water drives. Unfortunately, such production only results in 30% recovery of the OOIP. When production rate declines, it can be speeded up by using a secondary water drive. However, recovery is still only about 30% of the OOIP. Secondary recovery methods rarely result in improved oil recovery, and tertiary methods are very expensive and uneconomical.

What is the problem? The production engineers say the oil they leave in the ground is "immovable" oil, and rightly so. Most of the oil in abandoned oilfields is in a discontinuous phase and as such cannot flow to a well. For oil to be produced, it must be in a continuous phase. "Immovable" oil is man-made! In Nature there is no such thing as immovable oil. Just look at any gas cap in any oilfield and there is no oil whatsoever left in the gas cap. All the oil is displaced downwards by the gas. Also, there is no oil left in downdip gas fields - all the oil is displaced updip beyond the limit of gas flushing (See Figure 1).

Now what are the production engineers doing wrong? Obviously, they are following the original production methods of displacing and producing the oil by natural (primary), secondary, and tertiary water drives. They are trying to displace the oil by water, a heavier fluid. Nature tells us that they should be using a lighter fluid - a gas.
The above observations are substantiated by lab models. We found that if you produce oil by water-drive you can only recover 30% of the oil. If you produce the oil by gas injection, recovery is 100%, and furthermore, if you switch from water-drive to gas injection, you can easily recover all the 70% of the oil that was left after abandonment by using water-drive.

The answer to the production problems of the oil industry becomes obvious! (1) Any kind of water drive must be discontinued. Water-drive of any kind should be prohibited by law. (2) All oil production should be converted to gas drive methods. (3) It is most important to maintain the original oil/water interface, or to restore it (Figure 2). I am so positive that this is the right answer to our problems, that I predict that we still have at least 100 years of oil production left in the United States and North America.

Natural gas, nitrogen, carbon dioxide, flue gas, etc., are all suitable for gas injection. However, these cost money and require pipelines. To date, there has not been a field test. I propose that we use air. This is free. Any bacterial contamination would be eliminated by heat of compression. Also, any possible combustion due to oxygen content should not last long, because any carbon dioxide formed would form a layer of CO₂ above the reconstituted oil column, and burning would cease.

Gas injection must be made into the top of the oil accumulation, and oil must be produced from the bottom of the oil column.

Some engineers may claim that this method will require a long time - even geological time - for oil recovery. However, we can make some valuable observations. In California, in the L.A. Basin, many oilfields were produced by gas-cap expansion, supplemented by gas injection. Oil recovery was far better than known by water-drive methods, and was as high as 65% in some fields. Unfortunately, natural waterdrive was also permitted and used, and hence prevented total recovery. If the original O/W interface had been maintained, and any waterdrive prevented, it is predicted that recovery would have been close to 100%. The Hawkins Woodbine Field in East Texas is a similar example, with reported recovery as high as 57% of OOIP (SPE 2972).

Another observation is the recovery of attic oil in the Gulf Coast Area, by injection of flue gas. This worked in short order with total recovery.

In conclusion, a U.S. Patent was issued in just one year, on a Priority Right. Patent rights are held by Res- urrection Oil Corporation, Vancouver, British Columbia, V6C 1B6/CA, and Equus Petroleum Corporation. I am indebted to both these organizations and to John Patterson and Art Klimchuk for their professional support and encouragement. Finally, the situation is not nearly as hopeless as the current literature* would make you think.

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Editor's note: Many geologists, myself included, would not agree with Mr. Gussow's statement that gas injection will result in 100% oil recovery. However, he seems to have impressive evidence that gas injection results in significantly higher recovery than with water drive. I'm sure that Mr. Gussow would welcome comments of our readers.


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Development Of The ASBOG National Geologist's Exam

Phyllis M. Garman, CPG-3228

During 1992 and 1993 the Association of State Boards of Geology (ASBOG) conducted test development and validation workshops to develop a national examination for geologists. This effort was initiated by the Arizona Board of Technical Regulation and followed with an agreement for co-operative participation between ASBOG and Arizona.

The workshops have been led by Jack L. Warner, Ph.D., psychometrician and examination consultant, and Steve P. Warner, Ph.D., psychologist. Participants are professional geologists representing the ASBOG member states (Arizona, Arkansas, Georgia, Oregon, South Carolina, North Carolina, Virginia, and Wyoming) and representatives from professional geological societies --NGWA/AGWSE, AIPG, AEG, AGI, AASG, AIH, and AAFP. Other states whose boards are interested in becoming members of ASBOG but have not joined at this time have also been represented. These are California, Texas, Florida, Tennessee, Delaware, Indiana, Idaho, and New York.

Participants in the development of the national exam are experienced geologists from across the United States. They are termed "Subject Matter Experts" and all have contributed to this effort by donating many hours. The first step in the process was to establish a guideline of "What do geologists do?" This is the Job Task Analysis, which consists of specific job tasks performed by professional geologists. This listing is the blueprint that has guided the exam content.

The examination consists of two parts --Fundamentals of Geology (FG) and Principles and Practice of Geology (PPG). Until enough examinations have been given and an appropriate statistical data base has been established, the exam results will continue to be evaluated by the Subject Matter Experts under the psychometrician's guidance.

The examination is valid. It meets, and is scored under, accepted psychometric standards. Reciprocity (and temporary permission to practice within another state) will be made easier for geologists in the states whose registration boards accept the ASBOG exam. Arizona, Wyoming, and South Carolina have already used the examination to test their candidates for registration.

During 1994 ASBOG plans to update the exam blueprint by conducting a professional geologist task analysis survey on a more extensive base. Survey forms will be sent to selected geologists in all states to solicit information on the types of tasks they routinely perform and the portion of their time spent on each. ASBOG will take over the responsibility of the exam this year. It will be administered in the participating states in April and October.

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BAD NEWS - WE GOT SOME OIL
Improving Performance Of Earth Science Organizations

Tom H. Warren, CPG-7833

Introduction

Organizations involving earth scientists are experiencing unparalleled change, intense competition, increased customer expectations and impatient shareholders.

Change is experienced through mergers, acquisitions, and break-down of traditional structure. Improved performance is demanded by globalization of oil and mineral industries. Oversupply of crude oil and difficulties in replacing produced reserves are requiring creative problem solving and increased operating efficiencies for lower finding and development costs.

Internal and external clients and customers are demanding increased quality, selection, and service along with lower product price. Shareholder expectations for short-term results make achievement of long-term efficiencies very difficult. Environmental concerns and intense competition for Federal cleanup projects are requiring improved organizational performance.

Traditional methods of work and organization, including processes, structures, team organization, and employee attitudes and training will not be adequate to meet today’s challenges. In today’s professional environments, business methods, operations, and organizations must be streamlined. Yet, many of the organizations in which geoscientists work have not changed the manner in which work is approached in over 50 years.

An AIPG Member who recently presented a paper on a modern management method, Total Quality Management (TQM), at a geological study group, found an almost complete lack of knowledge of this subject. Yet, it will be necessary for earth scientists to have a working knowledge of such methods as TQM when these methods are adopted by the organizations in which they work.

This article will survey four methods to improve performance. Applications of these methods to earth science organizations will be discussed. Topics will include: 1) Total Quality Management, 2) Business Process Reengineering, 3) Team and Employee Performance, 4) Needs of Earth Science Organizations and 5) Designing a Program for Your Organization.

Total Quality Management (TQM)

Total Quality Management (TQM) involves a major paradigm shift from quantity to quality (Walton, 1988). TQM was formulated by Dr. Edwards Deming, a physicist and statistician, influential in reconstruction of Japanese industry following World War II. Methods developed by Dr. Deming are believed to be the prime force behind success of Japanese organizations. Ironically, Dr. Deming’s work was not “discovered” in the U.S.A. until the 1980’s.

Under TQM, the organization strives for continuous improvement also occur: 1) Costs, repairs, hassles, and reworks decrease, 2) productivity increases, 3) costs are lowered, and 4) business increases. TQM is particularly appropriate when gradual, continuous improvement is targeted and when a good organization and team structure are already in place.

In geoscience organizations, TQM involves: 1) defining quality, 2) defining individual and organizational missions and directions, 3) analyzing and improving the manner in which work is done, 4) developing meaningful statistics concerning productivity, 5) analyzing and changing artificial...
organizational barriers, 6) improving team performance, 7) building better team relationships with geoscience professionals and with other associated disciplines and contractors, and 8) defining and improving relationships with "customers" and partners for prospects, work, and services.

**Business Process Reengineering (Redesign) (BPR)**

Business Process Reengineering (BPR) calls for "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures or performance, such as cost, quality, service, and speed" (Hammer and Champy, 1993). BPR theory asserts many if not most organizations are in a time of crisis (recognized or unrecognized) and that radical change will be required for survival in the 1990's. One natural gas company headquartered in Colorado is installing a BPR program in response to increased competition caused by current deregulation by the Federal Energy Regulatory Commission.

BPR differs from TQM on two principal points: 1) BPR calls for radical change; TQM calls for continuous improvement, and 2) BPR has broader objectives of improvement in cost, quality, service, and speed while the primary objective of TQM is quality (with increased productivity representing an important by-product).

Specifically, BPR calls for: 1) Avoiding fragmentation and segmentation of work in technically oriented organizations, and 2) Redesigning processes and organizations from the viewpoint of output product. BPR leads to less specialization and to integrated team approaches.

BPR is preferred over TQM if substantial organizational changes are needed. In Geoscience organizations, BPR can be a rallying point for change, team recomposition, and improvement of work processes.

**Team Performance**

In the past, team cooperation has been inhibited by hierarchical and technical forms of organization. "Handoffs" of work from department to department were a particular source of trouble because departmental priorities conflict with task and product needs.

In many organizations, efforts are being made to improve team performance through programs that: 1) redesign team structure 2) target improved interaction, understanding, and trust among team members and 3) increase self direction of effective cross-disciplinary work teams.

For example, cross-discipline teams are now being formed in the oil industry from geologists, geophysicists, land representatives, and engineers (Greene, and Rees, 1992). Team members may be self-directed or be led by a captain who coordinates activities. The captain could also double as a team member. Teamwork of this type demands highly motivated, well trained, experienced generalists who clearly understand other member's roles.

**Employee Performance**

Surveys indicate employee morale and productivity are at an all-time low in organizations in which geoscientists work. Preliminary results of a survey conducted by the author indicate morale is rated at an average of 3 and productivity at an average of 4 on a scale of 1 to 10 with 10 being excellent. A survey by Shearson Lehman indicates 82% of Americans are unhappy in their jobs (Smith, 1993).

All modern management methods and work environments demand highly trained, motivated employees who are self-directed and take responsibility for personal productivity.

TQM and BPR primarily emphasize non-people oriented aspects of productivity, cost, quality, service and speed, leaving a gap in dealing with low employee morale. Clearly, employees need help dealing with change in and demands from the organizations in which they work. Major management systems, installed at great expense, may fail because employees lack sufficient confidence and training to make tradeoffs necessary to improve personal and team performance.

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To combat these problems, one major oil company is developing an in-house career counseling program. Other companies are conducting programs which attempt to revitalize morale and performance by helping employees deal with change and develop skills for self direction.

Needs of Earth Sciences Organizations

Complex nature of geologic work must be considered before selecting and installing a program to improve performance. Effective work output involves left and right brain activities, including logic, analysis, reason, concepts, details, the "big picture", and creative problem solving. Much geoscience work involves investment of large amounts of professional time and capital. Tangible results are difficult to measure in the short term.

Working environments must be structured to encourage increased uses of new technologies involving three-dimensional seismic surveys, improved computer data bases, modeling systems, mapping systems, new borehole logging device, and the SEM (scanning electron microscope). These devices and methods are essential for looking at opportunities, problems, and concepts in new ways (Masters, 1990). The highly technical and specialized nature of this work will require increased team integration and cooperation.

Old style, highly controlled, rigid, hierarchial systems are stifling to creative problem solving. Hassles between departments in traditional, segmented organizations are a further hindrance to effective geoscience work.

The goal of a new organizational system or program should be to free the professional geoscientist to do analytical and creative work and to interface effectively with other technical disciplines. Form of the organization should be fitted to the nature of geological work, proper and customized application of TQM, BPR, and/or cross Discipline Work Teams offer significant hope for meeting these objectives.

Designing A Program For Your Organization:

Designing a performance enhancement program can be a very difficult and frustrating task. Stories abound of short-term, unsuccessful attempts to install "canned" or faddish programs.

The following parameters are recommended to design an effective program for your organization:
1) Avoid "canned" methods. Conduct an analysis of your needs, goals, and strategies so a customized program can be designed (using relevant parts of appropriate systems).
2) Decide which aspects of the organization need radical change (BPR) and which need continuous improvement (TQM) or adopt a customized combination of these methods.
3) Assess organizational strategy and ascertain that the chosen program reflects actual not just tacit goals and objectives.
4) Be sure you understand the expected outcome of the program. Check uses of methods in similar organizations.
5) Go for long-term results. Beware of programs which tout "quick fixes". Once you decide on a program, stick with it. Faddish shifting of management programs causes employee confusion and distrust.
6) Change must begin at the top. Leader of the organization must grow beyond old behavior and methods for effective organizational improvement to occur.
7) Communicate aggressively and often to convince all levels of employees that the program is "here to stay". Take steps to educate, motivate, and include employees in the program.
8) Develop an attitude as expressed by Louisiana Land and Exploration Corporation (L.L.&E): "If it ain't broke, lets improve it". This attitude is a part of L.L.&E's customized "Commitment to Excellence Program".
9) If you use an outside consultant to design and install your program, choose a firm that is knowledgeable in technical aspects of geoscience work.

References:
Smith, Kerri, 1993, New Year Brings New Challenges: Rocky Mountain News, January 3. p 7-C.

Tom Warren is an AIPG Member who lives in Golden, Colorado and is the owner of a management consulting firm.
Design Hydrology and Sedimentology for Small Catchments

C.T. Haan, B.J. Barfield, and J.C. Hayes

This book provides the basic information and techniques required for understanding and implementing design systems to control runoff, erosion, and sedimentation. It will be especially useful to those involved in urban and industrial planning and development, surface mining activities, storm water management, sediment control, and environmental management.


An Introduction to Mining Seismology

Slawomir Jerzy Gisowicz and Andrzej Kikko

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This volume comprehensively describes the modern methods and techniques used to monitor and study seismicity and rockbursts in mines. Key case histories from various worldwide mining districts clearly illustrate and skillfully emphasize the practical aspects of mining seismology. Intended as a handbook for geophysicists and mining and rock mechanics engineers working at mines, this text will also serve as an essential reference tool for seismologists working at research institutions on local seismicity not necessarily induced by mining.


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Nonlinear Water Waves

Lokenath Debnath


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ENVIRONMENTAL CASE HISTORIES FOR CIVIL ENGINEERS AND GEOLOGISTS

Gerard Shuirmann and James Sloossen

Hively: Comments On AIPG And Being A Section Officer

Roger Hively, CPG-8467,
Secretary of the AIPG Colorado Section

One task of an officer of the Colorado Section of AIPG is to provide some comments for publication in this newsletter. I am attempting to determine what it is that I could say that would be of interest to our membership, and therefore be worthy of publication.

As an independent geologist, I currently find myself focused on an interesting and currently quite unusual task for the general membership of AIPG, that of supervising operations and doing wells site geology at a wildcat exploratory drill site in the Powder River basin. With the roar of draw works and light plant motors in the background, I think back on how I came to this work. I realize there may be comments that I might make which would be of some use to the membership.

Perseverance
There is a fine line between perseverance and stupidity; I believe that I have straddled and crossed that line many times in recent years, although at times such as this when my personal activity is at a high level, it is always preferable to consider oneself perseverant.

Flexibility
This trait took some time to acquire for me. My education, training and experience prepared me for one thing: to be an explorationist in the oil and gas industry. This was my identity and my destiny. At the point in time when explorationists were no longer needed, I refused to accept my fate, and struggled to maintain my presence as an independent. I consequently suffered for my inflexibility. I realized that I was not being successful, but I refused to give up. My ego and self esteem were destroyed, considering that a move away from my profession would mean that I had failed in my career. I felt that my continued presence in the oil and gas industry resulted from my own lack of resolve and indecision about where to turn. Finally, I lowered my expectations and looked for anything that might fulfill the desperate need for steady income. I was finally learning to accept that my career as a geologist, and specifically an oil and gas explorationist, was over.

It was in that frame of mind that I happened on the chance to become involved in my current project, the exact activity that I had resigned myself to forget about. The point is that as AIPG members, we all have traits which allow us to survive in turbulent times in our profession. We are educated, resourceful, and we should not think that our expertise lies only in one limited area. Pursue a wide variety of options, accept whatever comes, attack it with the vigor of genuine interest, and keep in mind that the road may eventually lead you to where you want to be, although not necessarily along the most direct path. You may even find your goals changing along the way.

I would like to make one final comment with respect to the Colorado Section of AIPG and the benefits that are afforded to members. This organization has a wealth of talent and expertise among its members. As my involvement in the board of the Colorado Section has increased I have seen tremendous effort put forth in dealing with political issues which affect all geologists. Not all members may realize that AIPG specifically and exclusively is the geologic organization which may approach political and legislative issues affecting our profession, AIPG represents the interests of the geologic profession in this arena. Through AIPG, all members have the opportunity to become well aware of the political issues which may affect them and their livelihood. We may even have the opportunity to guide those issues. Members, allow the AIPG to increase your awareness, be a forum for your individual political opinion, and an avenue for your political activity.

STATE NET

UNITED STATES 28899
AGENCY: Department of the Interior/Minerals Management Service
TOPIC: ENERGY
SUMMARY: Governs the establishment of financial responsibility for offshore oil facilities and gas facilities with concurrent gas condensate production, and requests comments from interested parties.
AGENCY CONTACT: William S. Cook, Chief, Inspection and Enforcement Branch, (703)787-1610
CITATION: 30 CFR 253
PROPOSAL DATE: 02/29/94
COMMENT DEADLINE: 02/29/94
HEARING DATE: 11/30/94
MESSAGE: EXTENSION OF COMMENT PERIOD.

UNITED STATES 30596
AGENCY: Environmental Protection Agency
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL
SUMMARY: Proposes to add new sites to the National Division, Office of Emergency and Remedial Response, U.S. EPA, 401 Main Street, S.W., Washington, D.C. 20460 (800)424-9346
CITATION: 40 CFR 100
PROPOSAL DATE: 01/18/94
COMMENT DEADLINE: 02/17/94
MESSAGE: PROPOSED RULE

ALABAMA S 322
AUTHOR: Little
INTRODUCED: 01/13/94
SUMMARY: Provides for regulation and licensure of geologists; provides for Board of Licensure for Geologists.
STATUS: 01/13/94 INTRODUCED.

ARIZONA H 2490
AUTHOR: Cumminskey
INTRODUCED: 01/26/94
SUMMARY: Enacts the Arizona Mining Act; requires mines to file reclamation and environmental protection plans and creates a commission to help the director of the state Department of Environmental Quality to enforce compliance with requirements for cleanup and closure; sets forth financial assurance requirements for miners, inspections, permit revocations and administrative and permit fees.
STATUS: 01/27/94 INTRODUCED

ARIZONA H 2229
AUTHOR: Eberhart
INTRODUCED: 01/11/94
SUMMARY: Provides that the State Board of Technical Registration, which regulates Architects, Assayers, Engineers, Geologists, Landscape Architects and Surveyors, can impose a $5000-per-violation civil penalty on anyone who holds himself to be qualified and registered when he is not.
STATUS: 01/12/94

ARIZONA H 2231
AUTHOR: Eberhart
INTRODUCED: 01/11/94
SUMMARY: Provides that an individual registered as an Architect, Assayer, Engineer, Geologist, Surveyor, or Landscape Architect who performs per contract is entitled to payment from another registrant who is the principal professional with whom the individual has contracted; allows the Board of Technical Registration to impose a $1000 fine on a registrant who makes a frivolous claim of nonpayment.
STATUS: 01/12/94

ARIZONA H 2269
AUTHOR: Eberhart
INTRODUCED: 01/12/94
SUMMARY: Provides that the State Board of Technical Registration contract out its examination services.
STATUS: 01/12/94 INTRODUCED

CALIFORNIA HR 35
AUTHOR: Katz
INTRODUCED: 01/24/94
NEW AMEND: 01/24/94
SUMMARY: Pertains to the 1994 Northridge Earthquake.
STATUS: 01/24/94 INTRODUCED

CALIFORNIA S 1370
AUTHOR: Rogers
INTRODUCED: 02/02/94
SUMMARY: Requires the Seismic Safety Commission, the State Architect, and the Strong Motion Office of the Division of Mines and Geology of the Department of Conservation to encourage private and public investment in earthquake hazard mitigation technology.
STATUS: 02/02/94 INTRODUCED

COLORADO S 26
AUTHOR: Schroeder
INTRODUCED: 01/12/94
SUMMARY: Continues until a certain date the functions of the State Board of Registration for professional engineers and professional land surveyors. Changes certain exemptions from licensure under the laws regulating engineers. Adds limited liability companies to the list of nonnatural persons which may perform engineering or land surveying work if there is a licensed engineer or land surveyor in responsible charge of such work. Makes other related provisions.
STATUS: 01/12/94 INTRODUCED

FLORIDA 13191
AGENCY: Department of Transportation
TOPIC: BUSINESS AND CORPORATIONS
SUMMARY: Includes American Institute of Certified Planners (AICP). Planning services and Right of Way services under this process on contracting for professional services; concerns architects, engineers, landscape architects, land surveyors, and transportation planners.
AICP NOTE: Not Geologists?
AGENCY CONTACT: James C. Meyers, Operations and Management Consultant Florida Department of Transportation, Office of the General Counsel, 605 Suwannee Street, Mail Station 58, Tallahassee, FL 32399-0458
CITATION: FAC 14-74.001, .0011, .0022, .003, .004, .0051, .0052, .0053, .0071, .008, .010 through .020 Qualifications, Selections
PROPOSAL DATE: 12/17/83

FLORIDA H 739
AUTHOR: Hawkins
INTRODUCED: 02/04/94
SUMMARY: Revises the manner in which small property interests in oil and gas exploration and production operations are regulated; creates a method for the Department of Environmental Protection (DEP) to administratively designate the operator, defined as the entity who has the right to drill and produce a well as lessee for revenue accounting proposes in situations where owners cannot be located or are unknown to the operator; provides for the placement of monies in the Petroleum Exploration & Production Trust Fund.
STATUS: 02/04/94 PREFILED

GEORGIA S 503
AUTHOR: Walker
INTRODUCED: 01/24/94
SUMMARY: Relates to the Regulation of professional engineers and land surveyors, changes the provisions relating to the powers of the State Board of Registration for Professional Engineers and Land Surveyors; provides an effective date.
STATUS: 01/24/94 INTRODUCED

GEORGIA H 1310
AUTHOR: Johnson E
SUMMARY: Relates to torts in general, so as to provide for immunity for architects and engineers providing volunteer design services for nonprofit organizations; to provide an exception; and for other purposes.
STATUS: 01/13/94 INTRODUCED

HAWAII S 2109
AUTHOR: Matsuura
SUMMARY: Relates to geothermal resources; relates to royalties on ores.
STATUS: 01/25/94

HAWAII S 2391
AUTHOR: Matsuura
SUMMARY: Establishes a groundwater monitoring program.
STATUS: 01/25/94
TODAY IN WASHINGTON

F. B. "Ted" Mullin, CPG-1716

Tempis fugit - Here it is March already. It has been a hazardous place to live lately with earthquakes, mudslides, and tornados on the west coast, quakes in Wyoming, a killer cold wave back east, and floods in the mid-west. The Denver Rocky Mountain News even reports of ground shaking around Milwaukee attributed to the prolonged cold spell.

Do not despair, your government will take care of you. Speaking of which---the Federal Registers are just blooming with all sorts of goodies. Some things never change.

Vol. 58, No. 244, 12-22-93 7 CFR Part 443, Hybrid Seed Crop Insurance Regulations. To qualify for crop insurance and were prevented from planting you must provide written notice within three days after (2) the date you stop planting within the late planting period on any unit that may have acreage eligible for prevented planting coverage. Uh Huh!!


Vol. 59, No. 11, 1-18-94, pgs 2652-2656 Part II, Environmental Protection Agency. Sediment Quality Criteria; Notice. This document calls for comments for sediment quality criteria to be used to assess the extent of sediment contamination for the NPDES Program, Great Lakes Program, Superfund Program and others.

"The NPDES program also intends to develop guidance on the procedure. EPA hopes that such a method will be sufficiently sophisticated to be reliable and defensible, yet require minimal data points and scientific extrapolations so that it can be routinely applied in a regulatory context." Sounds about normal to me, a line between two points makes for easy extrapolation. That's called economy of scale.

For further information contact: Mary C. Reiley, Sediment Quality Criteria Program, Office of Science and Technology, Mail Code 4304, 401 M Street, S.W., Washington, DC 20460, (202) 260-0648.


Interagency Memorandum of Agreement Concerning Wetlands Determination for Purposes of Section 404 of the Clean Water Act and Subtitle B of the Food Security Act.

This Agreement recognizes the SCS as the lead agency in wetlands delineations on agricultural lands and sets the policy and procedures to be used in the determination of wetlands jurisdiction for both Section 404 and Subtitle
B of the Food Security Act (also known as the Swampbuster program).

For further information contact: The EPA Wetlands Hotline, (800) 832-7828


APPLICATIONS MUST BE RECEIVED ON OR ABOUT APRIL 14, 1994

For further information contact: Mary Burkett, U.S.G.S., Office of Procurement and Contracts, Mail Stop 205C, 12201 Sunrise Valley Drive, Reston, Va., Virginia 22092 and ask for a copy of Announcement 8064, or phone John Sims, (703) 648-6722.


For further information contact: James J. Lichtenberg (513) 569-7306.

Last But Not Least

The February 7, Rocky Mountain News in Denver carried a short article that some of the residents in the Milwaukee area have been disturbed by the earth shaking locally. Local "scientists" (quotes mine) have attributed the shaking to the prolonged cold spell. I have checked with Jack Jacks, CPG-6905, a local geological shaker and mover in Milwaukee, and he pleads innocent. His only comment was "Earth Shakenly Cold, eh? That about sums it up!"*
With the beginning of a new legislative year and a new committee on State Affairs and Registration, I have asked the Chairman of that committee to present a guest column. This will serve as his introduction to our members. —William V. Knight, CPG-0153

— GUEST COLUMN —

Introduction To AIPG's State Affairs & Registration Committee

Robert G. Font, CPG-3953

Dear AIPG Colleagues:

I recently accepted an invitation from our president, Russell G. Slayback, to head AIPG’s "State Affairs and Registration Committee". Since then I have communicated frequently with Bill Knight, who has kept me well-informed on matters pertinent to this task. Bill has been extremely helpful, and I certainly commend him for his effort and thank him for his support. I am also very fortunate to have David G. Rensink and Robert N. Braunstein join me in this enterprise.

In case you are pondering about the duties of this committee (and I find myself learning daily about the subject), I have outlined below the inherent responsibilities of our group as defined by the Institute:

"Charge: Monitor state-level actions which may impact the practice of geology, especially as they pertain to some form of licensing, registration, certification, or definition of geologists; maintain close liaison with the officers and appropriate committees of each Section; monitor the work of the Association of State Boards of Geology, providing assistance and technical support as requested and as appropriate; and maintain close liaison and coordination with the National & International Affairs Committee."

I wish to express, in very emphatic terms, that this committee will always welcome any suggestions our membership may have regarding the attainment of these goals. In fact, I personally encourage you to share your ideas with us. You may always reach me (via fax) at 214-516-4725, or send me information (via CompuServe E-Mail) at 72263,1036.

The subject of "registration" is becoming crucial to our profession across the nation. Thus, it is one we can not afford to ignore. Philosophically, I have always felt that "peer review" is the best way to judge professional credentials and competence. It is precisely for this reason that "certification" through AIPG is such an honor and privilege. Problems arise, however, when we execute professional services which impact people outside of our profession and, by such actions, become accountable to the "general public". In these situations, "state registration" has become the cardinal criterion to evaluate professional proficiency. Consequently, our "right to work" and "professional expert status" may center on whether or not we are "registered". Coupled with this are questions concerning reciprocity between states, exemption of certain professional disciplines, and evaluations through examination versus peer review. Personally, I advocate widespread reciprocity, since geologists tend to be an ambulatory group. Similarly, I discourage discipline exclusions, since I believe in consolidating our profession rather than fragmenting it. Finally, I maintain that an individual's work and ethical history must be valued as the paramount gauge of professional mastery.

The AIPG, as an organization, has the opportunity to help formulate and establish valuable standards concerning professional geological practice throughout our country, as well as internationally. I, for one, intend to do my part and help in any way I may. The same applies to many individuals and dedicated professionals, including the members of this committee. Our future work will reflect these efforts.

Executive Director's Itinerary
(subject to change)

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

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Mining Law Reform And The Unsuitability Debate

Debra W. Struhsacker, CPG-8259

Unsuitability Provisions In The Rahall Bill

Unsuitability will be one of the many complex issues considered during upcoming discussions in Congress of mining law reform. The Rahall bill (H.R. 322) includes elaborate unsuitability provisions which allow federal land management agencies to declare an area unsuitable for mining. The Rahall unsuitability proposal would give regulators enormous discretionary authority to prohibit mining at specific sites, and the general public unprecedented intervention power over proposed and existing mining projects. In contrast, the more moderate mining law reform bill, the Craig bill (S. 775), maintains the status quo unsuitability review process contained in the existing environmental permitting process.

The Rahall bill would require the Secretaries of the Interior and Agriculture to identify specific areas of public lands which may be unsuitable for mining. The bill directs the Secretaries to perform a suitability review of federal lands under their jurisdiction in conjunction with the land use planning process. Before the U.S. Bureau of Land Management or the U.S. Forest Service could evaluate a mining Plan of Operations, an unsuitability review would have to be completed. Public review and comment would be a component of all unsuitability reviews. The review standards for determining unsuitability focus on environmental resources including water quality and water supply, cultural resources, riparian areas and wetlands, wildlife habitat, and "other resource values as the Secretaries may consider".

The unsuitability review would be an abstract exercise to judge the general suitability of an area for a generic mining project, and would produce federal land use decisions dictating whether mining is a permissible use of the land. This exercise would not evaluate the impacts of a specific mining project at a selected site, nor would it consider detailed environmental data.

Rahall's unsuitability review process would impose irreconcilable demands upon regulators by requiring abstract and prospective unsuitability decisions without having a project on the table, or the benefit of specific environmental data. This process is internally inconsistent because the mandated unsuitability review standards are project- and resource-specific, and require knowledge of project location, design, and proposed mitigation and reclamation. This inconsistency would create unresolvable problems for federal land managers. A similar unsuitability review process mandated for coal resources has been controversial and problematic. Applying the coal unsuitability review process to hard rock mining will replicate unworkable and misguided public policy.

What Are Unsuitability Proponents Trying To Achieve?

Some anti-mining ideologues wish to include unsuitability in mining law reform legislation as a method of thwarting mining projects. They see Rahall's unsuitability proposal as a powerful tool to obstruct proposed mining projects, and to intervene against existing projects.

There are, however, unsuitability proponents who are not categorically opposed to mining, but who are philosophically committed to the idea that regulatory agencies should have the authority to declare an area unsuitable for mining. Proponents also argue that it would be in everyone's best interest to identify up-front those areas which are unsuitable for mining. Mining interests would then avoid areas identified as unsuitable.

Land Withdrawals - Public Policy Based On Today's Guess About Tomorrow's Needs

There are numerous land use decision mechanisms for withdrawing lands and declaring an area categorically unsuitable for mining or other development. For example, wilderness areas, wildlife refuges, wild and scenic rivers, and national parks and monuments are established through land use decision processes for designating areas unsuitable for mining and restricting other uses. These processes have already withdrawn over 263 million acres of public land, and may withdraw additional acreage in the future.

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Land use decisions frequently precipitate complex policy debates due to their subjectivity and longevity. In contrast to environmental decisions which are typically based upon an applicant's demonstrated ability to comply with a specified standard, land use decisions consider subjective factors such as aesthetics and quality of life issues. Moreover, these decisions are usually abstract because they do not address a specific activity at a specific site, and they have long-term implications.

Land withdrawals exclude land in perpetuity from development, and make judgments today about society's needs tomorrow. These long-term land use decisions reflect a presumed prescience about future societal conditions and requirements; the accuracy of these predictions remains to be seen.

The Mine Permitting Process Is An Unsuitability Review

Rather than relying on long-term land withdrawals, land use restrictions can also be achieved through existing permitting mechanisms which perform unsuitability reviews based upon environmental criteria. The permit review process denies permits to projects which are unsuitable by carefully examining a proposed project within the context of the environmental conditions at the project site, and making an unsuitability judgment based on the specific project design and site conditions.

The concept of unsuitability is intrinsic to federal and state environmental protection regulations and permit requirements. Proposed mining projects must obtain federal and state permits which require detailed environmental studies. These permits stipulate stringent requirements to protect air quality, ground water and surface water quality, cultural resources, biological resources, threatened and endangered species, and human health and safety. The public is given a chance to review and comment upon these permit decisions. Projects which cannot meet the environmental protection requirements are denied permits, and are thus deemed unsuitable.

Additionally, on federal land, the BLM and U.S. Forest Service evaluate mining Plans of Operations by preparing either an Environmental Assessment or an Environmental Impact Statement. During this evaluation, these agencies frequently require modifications of the project proposal, such as changes to the project layout or operating schedule, in order to address environmental concerns. This constitutes an unsuitability review in which the agencies determine whether the project proposal is unsuitable for the site. In response to this unsuitability review, the agencies require changes to make the project suitable for the site-specific environmental conditions. Public involvement is an important component of this evaluation.

Fundamentals of Stochastic Modeling of Flow and Transport in Porous Formations

Colorado School of Mines
June 13-17, 1994

Instructors: Prof. G. Dagan (Tel Aviv University) and Dr. Y. Rubin (University of California, Berkeley)

Foundation of stochastic theory and stochastic modeling and application in solving field problems; includes exercise-solving, use of computer codes, analysis of field applications, and discussion of the most recent and future developments.

For more information contact the IGWMC.

Future Unsuitability Discussions - Capturing The High Ground

Unsuitability provisions in the Rahall bill would produce land use decisions based upon little or no specific project or environmental data. The process is designed to prohibit mining in selected areas, and would create a powerful tool for anti-mining activists. For this reason, the mining industry cannot tolerate the Rahall unsuitability review process.

Some unsuitability proponents see unsuitability as an environmental issue rather than a land use issue, and want a mechanism to preclude mining in areas which may
be unsuitable. Discussions with this group should emphasize that the federal and state permit decision processes for mining projects include de facto unsuitability reviews. Within the context of a specific permit decision, regulatory agencies have the authority to require a project to be modified in order to address environmental concerns and to comply with environmental standards. Projects which cannot meet proscribed environmental standards are not approved.

Future discussions of unsuitability and mining law reform must discriminate between unsuitability as a method of thwarting mining, versus unsuitability as an environmental protection issue. To address environmental concerns, the mining industry should emphasize the unsuitability provisions in current environmental regulations and permit requirements. We should advertise our support of project- and permit-specific unsuitability reviews which address special and legitimate environmental concerns. We should aggressively promote mining as a technically skilled and sophisticated industry committed to environmental stewardship, and demonstrate how environmental protection technology allows us to develop environmentally responsible mining projects in settings with special environmental concerns.

Modified and reprinted with permission from Mining World News

Debra Struhsacker is an environmental permitting and government relations consultant specializing in mining issues.

USGS Quadrangle Topo Maps For Digital Delivery

MJ Systems has entered into an agreement to market Land INFO's digital mapping information and services to the Oil and Gas industry. The digital map product line is based on the 1:24,000 scale USGS 7.5 - minute topographical quadrant maps. The QUAD product is comprised of full color scanned raster images of the topo maps which have been processed and compressed to allow for distribution on 3.5" floppies. The raster images are color corrected and stored in a TIFF (Tagged Image File Format) file format using LZW compression.

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MEMBERS IN THE NEWS


Leonard J. Billingsley, CPG-6256, a geologist who specializes in ground water environmental matters, has been selected as the Oklahoma Corporation Commission’s outstanding employee in November. At an award presentation, Jay Edwards, general administrator, cited Billingsley for his “demonstrated excellence as a team member, making contributions beyond those required by individual job responsibilities.” Billingsley, who lives in Norman, has worked nearly four years in the Fuel Division's Fuel Storage Department. The department regulates above-ground and underground petroleum products storage tanks, including remediation of land and water contaminated by leaking tanks. Billingsley is chairman of the department’s risk assessment task force. Billingsley received a degree in geology from Vanderbilt University, Nashville, TN, in 1975. He worked as an oil and gas environmental geologist in Oklahoma for several years. Before joining the Corporation Commission he also worked as an environmental consultant in the New York City area and as an environmental geologist for solid waste for the Commonwealth of Massachusetts. Billingsley is a member of the American Institute of Professional Geologists, the American Association of Petroleum Geologists, the Association of Groundwater Scientists and Engineers, and the Oklahoma Society of Environmental Professionals.

Gary D. Davis, CPG-7241, is pleased to announce that he has accepted the position of Manager of Exploitation with Central Resources, Inc. He will be responsible for the evaluation of producing property acquisitions, generating drilling opportunities, and for initiating further development and utilization of company reserves. Mr. Davis holds degrees in geology, an MBA degree, and is a registered and certified professional geologist. Central Resources, Inc. is a privately-owned operating and producing company with wells in western Nebraska, Colorado, New Mexico, West Texas, and Wyoming. It employs 23 people and maintains field offices in Sidney, Nebraska and Midland, Texas in addition to its headquarters in Denver, Colorado. Mr. Davis formerly served as a consultant to Central Resources, Inc. on behalf of Conquistador Ventures Ltd. He will continue his involvement with the consulting firm which engages in energy investment and business consulting. For additional information please contact Gary Davis at (303) 830-0100.

ATEC Associates, Inc. announced that Stephen L. Garrison, CPG-6146, PE, RG, has been appointed as Assistant Regional Manager for the Northeast Region. Mr. Garrison brings over 20 years of experience with expertise in the management and coordination of multi-discipline investigative and engineering design projects, geotechnical engineering, hydrogeology, contaminated soil and groundwater cleanup, engineering geophysics, construction materials engineering and construction quality control testing and inspection. He will be located in Columbia, Maryland.

The Mining Foundation of the Southwest, located in Tucson, Arizona held its annual American Mining Hall of Fame Awards Banquet on Dec. 4, 1993. Walter Heinrichs, CPG-0688, was among the awardees, one of the two recipients of a Medal of Merit. Mr. Heinrichs, who was born in Arizona in 1919, graduated as a Geological engineer from Colorado School of Mines in 1940 with a major in geophysics. After several positions in the oil industry and government, he entered the mining industry in the 1950’s and has been active there ever since. He became a charter member of AIPG in 1964.

Stanley S. Johnson, CPG-3472, State Geologist, Virginia Division of Mineral Resources and Anthony S. Scales, CPG-6989, Geologist Senior, Virginia Division of Mined Land Reclamation are recipients of the Virginia Department of Commerce and Trade Quality Performance Individual Award for professional Leadership for 1993. This award is presented to individuals in recognition of contributions to the effectiveness and efficiency of state government, recognizing their voluntary participation in professional and community organizations resulting in the improvement of the practice of their professions. Both were nominated due to their work through the American Institute of Professional Geologists, and Stan also for his contributions to numerous other professional organizations. Stan is a recipient of The Martin Van Couvering Memorial Award and The Presidential Certificate of Merit (on two occasions), and Tony has been reelected to a second term as President of the Virginia Section. They received their award from Virginia Department of Commerce and Trade Secretary Cathleen A. Magennis at a ceremony held in Richmond, VA on November 17, 1993.

James R. Muhm, CPG-2598, recently sent us an article from the October 23, 1993 edition of The Colorado Leader concerning archaeological excavations in four previously unknown Mayan towns. The article quotes Dr. Peter Dunham, an archaeologist from Cleveland State University, as stating that one of the sites contained “deposits of two minerals, hematite and leonite, that were used by the Mayans to stain houses and pottery...leonite is a yellow stain, he said.” Mr. Muhm suggests that perhaps the Mayans also used other previously unknown minerals to alter their appearance...”granite made things purple, limesite was used to make them green, and bananaite made them look long and slender.”

On November 17, 1993 the California Board of Registration for Geologist and Geophysicists (Board) appointed John G. Parrish, CPG-3326, as Executive Officer. Prior to this appointment, Dr. Parrish had worked for over 20 years in the petroleum industry in a variety of technical and managerial capacities both domestically and internationally. He is a California Registered Geologist and a Registered Environmental Assessor. Dr. Parrish holds a Bachelor of Science in Geology from the University of Redlands, a Master of Science in Geology from the University of Houston, a Master of Business Administration from California State University at Bakersfield, and a Ph.D. in Marine Geology from the University of Wales, United Kingdom. He is an active member of several professional organizations, and is a Certified Petroleum Geologist by the American Association of Petroleum Geologists and Certified Professional Geologist by the American Institute of Professional Geologists.

Stone Environmental Sciences, Inc., Hampstead, New Hampshire announces that Timothy Stone, CPG-7282, Vice President and a registered geologist, was granted licensure as a Massachusetts Licensure Site Professional (LSP) by the Board of Registration of Waste Site Cleanup Professionals as part of the revised Massachusetts Contingency Plan. The revised regulations and the LSP licensing program are intended to streamline waste site cleanups by allowing LSPs to render waste site cleanup opinions with Limited Massachusetts Department of Environmental Protection involvement. As of October 1, 1993, responsible parties are required to obtain the services of an LSP in most cases where waste site cleanups are necessary, such as those related to a petroleum storage tank release. For more information call (603) 329-4016.

Jane M. Willard, CPG-6979, president of EnPro Assessment Corp., St. Paul, Minneapolis, has been appointed to the University of Kansas Alumni Advisory Board in the Department of Geology.
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, business, 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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NEW CANDIDATES FOR CERTIFICATION

MO - HANDLEY, Steven J., CFC-0076 325 W. Essex Ave., Kirkwood, MO 63122. (314) 426-0880.

IN MEMORIAM

John A. Noyes, CPG-5080, October 29, 1993, Columbus, OH. Austin A. Sartin, CPG-6461, November 21, 1993, Shreveport, LA. Memorials may be made to the Austin A. Sartin Endowed Geology Fund, Centenary College, P.O. Box 41188, Shreveport, LA 71134-1188.

Raymond B. Stroud, CPG-1710, October 21, 1993, Russellville, AR.
Field Trips

Flagstaff, Arizona was chosen as the site for the 1994 Annual AIPG Meeting because it has excellent facilities and because it is near the Grand Canyon and other spectacular geologic features. Attendees can, therefore, enjoy some of Arizona’s very best geology and scenery, in addition to participating in the technical, professional, and spousal activities. Three all-day field trips are being offered: (1) Grand Canyon -- South Rim; (2) Meteor Crater, Painted Desert, and Petrified Forest; and (3) Oak Creek Canyon, Sedona, Verde River Valley, and Jerome.

Each trip leader is fully familiar with the local geology, geography, and history. The leaders will also provide non-technical information that will be of interest to non-geologist spouses. There will be many photo opportunities.

If you are planning to attend the meeting and are interested in going on a field trip, please complete and return the form below, if you have not already responded.

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3. Meteor Crater, Painted Desert, and Petrified Forest
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