February 1978

BULLETIN

HOUSTON GEOLOGICAL SOCIETY

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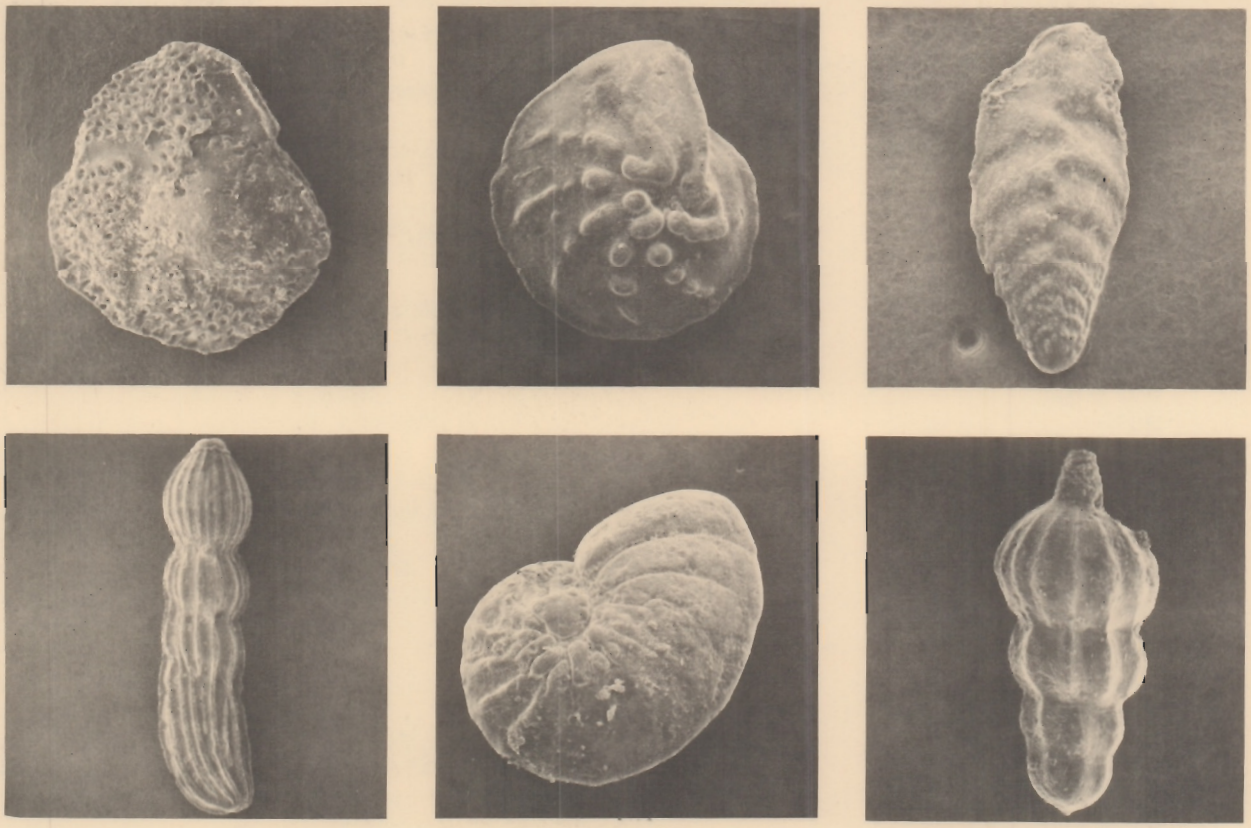
Number 6



HGS FEBRUARY CALENDAR

February 4, 1978 (Mardi Gras Ball)
Houston Club, Texas Room
Announcement inside.

February 6, 1978 (Evening Meeting w/HAPL)
Stouffer's Greenway Plaza Hotel, Ballroom
T. D. Cook, Shell Oil Company, Houston
"Exploration History of the South Texas Lower Cretaceous Carbonate Platform"

Social hour—5:15, Dinner—6:30, Meeting—7:15
Admission by prepaid ticket only. No tickets will be sold at door. (See notice inside for details.)

February 16-17, 1978 (Continuing Education)
Exxon Building Auditorium
Dr. John K. Sales, SUNY, College at Oneonta
"Model Studies of Geologic Structures Applied to Hydrocarbon Exploration"

February 22, 1978 (Noon Meeting)
Holiday Inn—Medical Center (Tanglewood Room)
W. H. Roberts III, Gulf R&D, Houston
"Design and Function of Oil and Gas Traps"
Luncheon and Meeting—12:00 Noon
Reservations (telephone only, **223-9309**) must be made or cancelled by 4:00 PM Friday, Feb. 17 (Monday is holiday).

HOUSTON GEOLOGICAL SOCIETY
Suite B-1, 806 Main Street
Houston, Texas 77002
223-9309

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PRESIDENT'S COMMENTS

By the time you are reading this column, you should have received the Houston Geological Society 1977-78 membership directory. With the extensive changes in telephone numbers in the downtown area and with companies moving into new office buildings all over town, an up-to-date business directory of HGS members was sorely needed, and it is hoped that this directory will adequately fill that need.

One of my goals when I took office was to publish and distribute to the membership an accurate, up-to-date, and free membership directory. I asked Clyde G. Beckwith with Continental Oil Company if he would assume the responsibility for this proposed directory. He answered in the affirmative, and he has put in many hours of labor on this project. In addition to evenings and weekends, he has even worked on the directory during vacation time. That the directory is on your desk at all is due to Clyde's persistent and unflagging effort over a period of months. Those who helped Clyde bring the directory to you are Irving L. Snider and Darrell D. Rogers with Newmont Oil Co., James E. Scott, Jr., with North American Royalties, J. Scott Burnworth with Continental Oil Company, and Mrs. Troy Chambers (Clyde's sister-in-law, who is not even a geologist). The next time you see any one of these, be sure to thank them for their dedicated effort.

You are no doubt wondering why the publication of the membership directory turned out to be such a time-consuming chore. As Maria said in "The Sound of Music," let's start at the very beginning. The 1976-77 Executive Board voted to computerize the HGS membership roll, the *raison d'etre* being that this action should facilitate the publishing of membership directories and avoid the long time lag experienced in the past with manual compilation of the data. Since this action was taken near the end of the administrative year, the actual implementation of this project had to be accomplished by the current administration. Clyde Beckwith has been involved since the inception of this project.

After computerizing the 1976-77 membership roll of 2867 members, we were able to obtain a computer printout card on each member. This card, listing the essential directory data, was included with the 1977-78 dues notice with the request to proofread the card, note and correct any errors or make any necessary changes, and return the card with the dues payment. Here is where the carefully designed system began to fail, requiring the aforementioned extra work from Clyde and his committee. Many members failed to return the card, others did not carefully check the card to catch all errors, others wrote illegibly or used abbreviations unintelligible to a key-punch operator. The net result was that the directory committee realized that it had to check all the cards and attempt to find and correct all the errors. A considerable amount of ingenuity and man hours went into this effort. For those who did not return their card, the committee had to go to last year's card file, retrieve the old card, and make out a new computer card. It is obvious that much of this tedious work could have been avoided if each member had corrected his own card and returned it with the dues payment. However, that is water over the dam for this year, and I write about the difficulties for two reasons only: (1) to give the directory committee their just due and (2) to hope that this year we will all do better.

Our aim is to get the computerized membership system to a low-maintenance/high-accuracy level. To accomplish this goal will require the cooperation of the entire membership. Now that you are aware of the problems, I am confident that every member will cooperate in the future.

DEAN GRAFTON

SOCIETY CALENDAR FOR MARCH

March 6, 1978 Houston Oaks Hotel (Joint meeting w/GSH)	Dr. Elliot C. Morris, USGS, Flagstaff, Arizona "Viking "Viking View of Mars" (Admission by prepaid ticket only.)
March 16-17, 1978 Exxon Auditorium	Dr. Fred A. Donath, University of Illinois, Urbana "Structural Analysis of Fault and Fracture Systems"
March 29, 1978 Holiday Inn—Med. Ctr.	R. S. Bishop, Exxon Prod. Research, Houston "Shale Diapirism and Compaction of Abnormally Pressured Shales in South Texas"

NOTICE! ADVANCE TICKETS REQUIRED FOR FEB. 6 & MAR. 6 MEETINGS

Admission to the February 6 and March 6 evening meetings will be **by prepaid ticket only**. Because these are joint meetings with other groups and we expect large attendances, we msut use this system. Tickets (Feb. mtg. $10.50; Mar. $13.50) may be purchased at HGS meetings or ordered from HGS, Suite B-1, 806 Main Street, Houston, TX 77002, by February 3 and March 3 for the respective meetings. **Send a check and a stamped, self-addressed envelope with your order.**

MARDI GRAS BALL, FEBRUARY 4

The HGS Auxiliary will be mailing invitations in January for the Mardi Gras Ball (Dance-Breakfast) to be held February 4 from 8:00 to 12:00 midnight. The ball will be held in the Texas Room of the Houston Club, with dancing to the music of E. C. Holland and his orchestra. Tickets are $35 per member couple and $40 to guest couples. If you do not receive an invitation or wish further details, call Pat Hefner at 468-9495.

NUCLEAR ENERGY MILESTONE PASSED

According to Federal Power Commission data, nuclear power plants produced 12% of U.S. electricity during the first 6 months of 1977. This exceeded hydro generation, which totaled 10.7% of the nation's electrical output, and moved the nuclear output close to that of gas, which provided the nation with 13.2%.

The current scorecard on nuclear reactors shows 67 with operating licenses, 78 with construction permits, 14 reactors with Limited Work Authorizations, 58 reactors on order, and 6 letters of intent and/or options.

EVENING MEETING—FEBRUARY 6, 1978

T. D. (TED) COOK—Biographical Sketch

Born in Kentfield, California, Ted Cook completed his early education and junior college training in 1941. After service with the armored infantry in the 13th Armored Division in Europe, he completed his undergraduate work in geology at The University of Utah in 1948. Two years further study at the University of California (Berkeley) resulted in a Master's degree in paleontology.

Ted joined Shell Oil Company in 1950 as a micropaleontologist at Ventura, California, where he worked on Eocene sections in the Santa Ynez Mountains. In 1953 he transferred to Corpus Christi and began study of the Tertiary and Cretaceous of South and Central Texas. In 1955, as Division Stratigrapher, he worked on the early studies of the reef-trend exploration. After short assignments in Miami (researching recent carbonate sediments) and in Houston, he returned to Corpus Christi as Division Geologist. Similar assignments followed in Houston in both the onshore and offshore divisions, and in 1969 he was assigned to Head Office as Senior Staff Geologist. There he began work on a series of continent-wide stratigraphic maps which eventually led to the recent publication of the *Stratigraphic Atlas of North and Central America*, which he edited together with A. W. Bally.

Assignments in the International Region led to regional maps of the Mesozoic of South America and the lands around the Mediterranean and the Middle East, and to basin analyses in those areas. In 1976 he was named Manager of Stratigraphic Services for Shell, the position he now holds.

Author of several short geological papers and editor and leader of numerous geological-society field trips, he also edited AAPG Memoir 18, *Underground Waste Disposal and Environmental Implications*.

Ted is a member of GSA and HGS and a former vice-president of CCGS. He is also former president of Southwest Tennis Association and current president of Houston Tennis Umpires Association.

EXPLORATION HISTORY OF THE SOUTH TEXAS LOWER CRETACEOUS CARBONATE PLATFORM (Abstract)

The search for hydrocarbons in reservoirs of the Lower Cretaceous of south-central Texas has been continuous for more than 60 years. Accumulations have been found in significant quantities in only four areas: (1) the very shallow fault traps high on the San Marcos arch in Caldwell and Guadalupe Counties, (2) a fault trend stretching across central Atascosa County, (3) a fault trend extending from southeastern Atascosa County to southern Gonzales County, and (4) a narrow, elongate band extending across the entire area known as the "Stuart City reef trend."

Reservoirs which contain the hydrocarbons were deposited in a myriad of environments, all related to a broad carbonate shelf covered by an extremely shallow sea. The sea deepened dramatically at the shelf margin parallel with the reef trend. Dolomites contain the accumulations in the fault trends, and porosity and permeability are reasonably good. Few limestones in the reef trend were extremely porous initially, and late cementation diminished porosity further.

Oil is the dominant hydrocarbon in the shallow fields, is less dominant in the other fault trends, and is nonexistent in the reef reservoirs. Proved ultimate recovery for the fault trends is about 350 million bbl of oil and 1.5 Tcf of gas. Reserves for dry gas in the reef-trend reservoirs are difficult to estimate because of highly variable reservoir conditions, but should fall between 1 and 1.5 Tcf.

Intensity of exploration decreases from late Early Cretaceous to older rocks. The Sligo limestone still holds the promise of success, but lies at considerable depths over much of the area. Edwards and Glen Rose rocks are more densely explored, but there are ample opportunities for new plays even in these beds. Geologists who examine cores and cuttings, determine depositional patterns, understand modern carbonate sedimentology, and study patterns of diagenesis will have an advantage in developing new concepts for exploration.

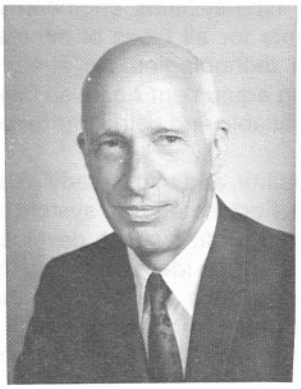
HOUSTON GEOLOGICAL SOCIETY AAPG-DELEGATE NOMINEES

The AAPG members listed below have agreed to stand for election to the AAPG House of Delegates for a 3-year term commencing July 1, 1978. They are all HGS members in good standing, and those elected will represent the HGS membership in the House of Delegates, as well as review all applications from this area for membership in AAPG. Eleven will be elected and the remaining will be alternates. The election will be conducted by the Association with your ballot being mailed to you from Tulsa in March. Results will be announced soon after April 1, 1978.

1.	Chester A. Baird	Dow Chemical Co. U.S.A.
2.	Clyde G. Beckwith, Jr.	Continental Oil Company
3.	Thomas M. Burke	Transco Exploration Company
4.	Ralph A. Davis	Michigan Wisconsin Pipeline Co.
5.	Kenneth N. Durham	Pogo Producing Company
6.	William F. Howell	Cypher Energy Corporation
7.	James R. Jackson, Jr.	Exxon Co. U.S.A.
8.	Donald W. Lane	Consultant
9.	Donald W. Love	Getty Oil Co.
10.	Gene B. Martin	Atlantic-Richfield Company
11.	Robert L. Musslewhite	Coastal States Gas Producing Co.
12.	Stephen H. Ogier	McCormick Oil & Gas
13.	Merton M. Osborne	Trunkline Gas Company
14.	B. Cochran Phillips	Phillips Petroleum Company
15.	James A. Ragsdale	Watson Oil Corporation
16.	Anthony Reso	Tenneco Oil Company
17.	Theresa F. Schwarzer	Exxon Production Research Company
18.	Walter C. Sullivan	Daniel Oil Company
19.	Don G. Tobin	Shell Oil Company
20.	Kenneth W. Toedter	Natomas N.A.
21.	Warren M. Trimm	Tenneco Oil Company
22.	James A. Wheeler	Consultant

NOON MEETING—FEBRUARY 22, 1978

W. H. (BILL) ROBERTS III—Biographical Sketch



Bill Roberts began life in Moorestown, New Jersey. He attended Amherst College, Wyoming University, and finally Colorado School of Mines for a geological engineer's degree under F. M. Van Tuyl, with extra work in geophysics under Carl Heiland. During World War II he controlled air traffic for the FAA and served as an engineer in the Maritime Service. For the next 12 years Bill worked up and down the Rocky Mountains from Albuquerque to Edmonton for Union of California, National Petroleum Corp. Ltd., and Gulf Oil. He has 26 years with Gulf, including 8 years at the research center in Pittsburgh. He has been in Houston 12 years with the Houston Technical Services Center of Gulf Research and Development Company.

Bill's interest in basinal hydrology and the fluid mechanics of oil and gas deposits has been sharpened by field observations in many parts of the world. He believes that it is most important to understand how traps work—that there are vital common denominators of entrapment which are easily observed but commonly overlooked. He looks for the resurrection of seepology, creekology, and surface geology.

THE DESIGN AND FUNCTION OF OIL AND GAS TRAPS (Abstract)

It is in *traps* that oil and gas are found, and thus traps should yield the most positive information. If we can understand well what is going on in the traps, that should enable us to look back along the migration trail with special insight as to what has been happening. That insight could even extend all the way back to the "source."

This study concludes that traps are the most logical places for hydrocarbon (HC) mixtures to be put together as distinct oil and gas fluids. It follows that traps are not just passive receivers or containers of HC mixtures put together elsewhere. Effective oil and gas traps of different well-known styles have a very important feature in common: structurally and stratigraphically, they are designed to discharge waters from depth. Thus they function as active focal mechanisms to gather and process feedstock waters carrying HCs and other organics. It is a forced-draft system. The concept adds an exciting new dimension to the anticlinal theory. It honors all factual observations around oil and gas deposits.

Very simply, the most important function of a trap is to leak water while retaining HCs. The water can leak because the enclosing membranes and cover are water-soaked, like a wick. The HCs and other organics are separated from the waters as they pass through the trap. The separation is caused by abrupt changes in pressure, temperature, and possibly salinity; these are related to the basic change in direction of feedstock (water) movement from lateral to upward. Coalescence of HCs makes bubbies or globules which cannot move easily like water. The ultimate composition of a trapped HC mixture depends on the residence times of the various components, which in turn depend on (1) what the water carries, (2) what the trap retains, and (3) the pore-volume exchange rate.

WHAT IS "REASONABLE PROFIT"?

Thomas A. Murphy, Chairman, General Motors Corporation, says, "In my view, many labels have been attached to the word 'profit', such as reasonable, fair, and equitable, which reflected a misunderstanding of the nature of profit itself. To be specific, I view profit as a resultant of the complex of activities carried on by a business.

"Profit varies from one year to the next depending upon general economic conditions, the acceptability of the products in the market, and the ability of the enterprise to produce those products efficiently.

"I would underscore the fact that our market economy requires that each business must compete for customer favor both in terms of price and product. If it is successful in this competitive effort it earns a profit and if it is successful it can generate the resources for growth. Obviously, no business can maintain itself unless its earnings are adequate to attract investment.

"There is one further consideration and this is the risk factor. A company may generate above-average earnings, but when consideration is given to risk its above-average earnings may be no more than is necessary to sustain the investment. (Italics added. Ed.)

"Put in other words, a 'high' profit relative to some average of all profits may well be inadequate for growth when risk is considered. If, as I believe, profits are a resultant of the operation of the business, then it follows that descriptive labels such as reasonable, fair, or equitable have little or no meaning." Reprinted with permission from *Exxon USA*.

PRICE SCHEDULE—HGS MEETINGS

Houston Club
HGS-Auxiliary Dance-Breakfast
Members $35/couple
Guests $40/couple

Stouffers Hotel-Greenway Plaza
Dinner (No sales at the door) $10.50

Continuing Education
Preregistration $20
Registration at the door $25
Students $10

Holiday Inn-Medical Center
Luncheon $6.50

RESERVATIONS—223-9309

Please make reservations for Monday evening meeting by the preceding Friday; for Wednesday noon meeting by the preceding Friday (Monday, Feb. 20, is a holiday).

GUEST COLUMN

THE IMPACT OF NATURAL RESOURCES ON SOCIETY

by Michel T. Halbouty, Consulting Geologist and Petroleum Engineer, Independent Producer and Operator, Houston, Texas.

Minerals are closely associated with man's material and intellectual development, but large-scale application of minerals in human life, with the exception of clay and stones, is relatively recent. In the earliest days of modern civilization, precious stones were emphasized rather than the more practical treasures of the earth's crust.

Scientific study of minerals was hardly known before the nineteenth century. The father of modern mineralogy was a German who called himself Georgius Agricola, but whose real name was Georg Bauer. He lived from 1494, two years after Columbus claimed the discovery of America, until 1555, about the time of the first application of geophysics. Since then, natural resources have strongly influenced the development of our society, the progress of our country, and the exercise of freedom.

Yet our society—our form of government, the intelligence of our people, their willingness to try something new, and their ability to get the most good from what they have—has had a great impact on the use and supply of raw materials. In turn, those resources, used in the best interests of this country, have brought us to our present standard of living.

When America was founded, with its small population and its vast, undeveloped territory, its natural resources were thought to be unlimited. It was thought to be a self-sufficient world: that a people could ever consume the immeasurable bounties of nature here seemed incredible.

Poor, homeless, and unwanted millions streamed onto our shores from every part of the earth, relentlessly pushing westward and populating all of the land we could buy, barter, acquire by treaty, or accept into statehood until we had expanded from Maine to Hawaii and from Florida to Alaska. Gradually we improved the status of our citizens, increased per capita consumption, and provided the American family with not only the necessities and conveniences, but also the comforts and luxuries of life until we are now wondering if our resources can withstand the assault.

Today that question is foremost in the nation's mind. It supersedes questions of war and peace, poverty and crime, because it involves our very existence.

We are now largely dependent on foreign supports for our over-all mineral supplies. In petroleum we have reached the dangerous 50 percent dependency. Also, about 75 percent of our most needed 20 important hard mineral commodities come from overseas.

To reverse this trend, if it is indeed possible, we must update our technology in exploration and think far beyond the scope of our present ideas. We must learn to explore the extreme depths, improve our mining technology, learn to recycle scrap and waste more efficiently, and learn to substitute some of our abundant materials for those in short supply. In addition, we must not only look to, but exploit, the sea for new sources.

Besides being an almost exclusively American industry for its first 75 years, petroleum has made the use of other minerals far more effective than they have been elsewhere. In addition to technological progress in oil and gas exploration, drilling, and production, mine-systems engineering must come up with new concepts for all types of mineral needs. And these systems and technologies are already appearing. Tunneling and drilling equipment not even imagined a few years ago is now available and being improved dramatically each day.

New ideas in extraction, mobility, and use already exist in varying stages of development. Fortunately, our system of government and the opportunity to profit by such developments do not make it necessary for all the ideas to be born in this country. The free-enterprise system has brought the best minds, inventions, and ideas of the world to our country when it was feared they would founder in other environments.

In the petroleum industry, for example, we are indebted to France for the electrical log, to Germany for the seismograph, to an Englishman for the art of distillation, and to the Chinese for the birth of drilling ideas.

This brain-power immigration is still going on, although it has slowed in recent years. One reason could be that America has projected an unfortunate image, whether deserved or not, in many foreign countries. This is a matter that needs considerable attention.

Today our advanced society is worried whether it can continue the manner of living to which it has been accustomed. It has seen the end of finding the easy oil and gas, ore, and other mineral resources by simple methods of exploration. In this land of growing demands, our dependency on imports from parts of the world where these minerals are now more abundant has become critical.

The first reaction of some people to this situation is to turn to the government with a loud "What are you going to do for us?" which starts the bureaucratic monster working to fulfill this cry of need. Then the government starts gnawing away man's freedoms, blunting his ingenuity, ambition, and hope in the process; and providing more socialistic answers and greater confusion to the problem. We have almost reached that point. In fact, we might have passed it had not many of our scientists, with inspiration and determination, become aroused enough to do something about it.

We do not lack the physical resources to find an adequate supply of all minerals—especially petroleum. But, to do so, we must have leaders with vision and daring, scientists and technologists who are willing to risk doing something different. Geology, geophysics, geochemistry, and possibly a variety of new sciences will be given new tasks, including use of underground nuclear explosives, in-situ leaching of copper, stimulation of petroleum production, and new techniques as yet unimagined.

The answers will be found in education and research. The needs of our people are great and growing. This is no time to sit on our hands and dream. It is time to think—time to get up and work. We will have to search for new mineral and petroleum supplies by utilizing our knowledge to create new ideas and probe in areas we have feared to tread.

Thus, it is apparent that the responsibilities of those of us engaged in the study of the earth are beyond comprehension—in fact, the challenges are staggering!

If we fail, a civilization could die!!!

FEDERAL LAND WITHDRAWALS— A POLICY STATEMENT

Edd R. Turner, President, AAPG

In a recent departure from custom, the Executive Committee of the American Association of Petroleum Geologists adopted a policy statement, which, in addition to confirming its support of the American free enterprise system, voiced the following recommendation:

> "The Executive Committee is of the opinion that much of the country's most highly prospective areas for oil, gas, and other mineral production exists on federal lands. It is the Committee's recommendation that governmental processes should be expedited whereby all federally controlled areas, offshore and onshore, be made available for judicious energy mineral resource exploration and development."

The current conflict between sound geological practice and present unsound government restrictions prompts the comments that follow.

Most of the federal lands suitable for mineral, forestry, and agricultural development are in the western states and Alaska. Present production in these areas and the extensive continental shelf lands off our coasts indicates a potential for future major mineral development. The assurance of reasonable access to the surface of federal lands is essential to exploration for energy minerals. Of the 877,000,000 acres designated as federal domain, 546,000,000 acres, or 62 percent of the total, are either closed to, or are so burdened by restrictions as to preclude, exploration and development of energy minerals.

This growing problem of restrictive federal land management is not one solely for the petroleum and coal industries. Other industries adversely impacted by land restrictions include mining, forestry, farming, grazing, real estate, and recreation.

Under active consideration at present in Congress is H.R. 39, Alaska National Interest Lands Conservation Act, which if passed would withdraw over 140,000,000 acres from mineral, forestry, and agricultural activity. Many of the areas covered by this bill are so remote that they stand for the most part in frozen, pristine isolation. *But is isolation and withdrawal what we want?* The 140,000,000 acres listed in H.R. 39 have not had a mineral assessment, and none is planned. There just might be a life-sustaining mineral wealth on these lands that should be developed.

Restrictions on land usage, withdrawing millions of acres from production or possible future production, can only lead inevitably to an eventual deterioration in life style since each citizen must be maintained by the product of so many acres, currently estimated at over 20 tons of mineral production per person per year. And no matter what any of us thinks he can do to control population growth, the fact remains that the number of people in the United States and the world will continue to increase. The lives of these people will depend upon intelligent environment management. And use! *Please bear in mind that federal lands benefit no one unless they are allowed to be used.*

It is almost a bureaucratic scandal that so little is known about our land withdrawal program. Although I am told an inventory of withdrawn federal lands is in current preparation, at this time there is no central record of withdrawn lands nor of the reasons for their withdrawal. It would appear that in some instances withdrawn areas have become essentially bureaucratic fiefdoms jealously guarded by local agencies from whom permission to enter such domains on camping or hiking expeditions can require as long as six weeks to obtain.

Moreover, permits to drill wells on leased lands are rarely issued in less than 90 days, and leasing of federal lands in some western states has been delayed for years pending environmental impact statements. Record keeping in various local agency offices has been at best haphazard, and revocation or restoration of withdrawn lands to general use is tied up in a processing morass with a considerable backlog of applications, many over five years old.

Is there any wonder that these deplorable conditions prevail if we take into consideration that the federal bureaucracy has expanded in recent years to the extent that today *there are 23 departments and agencies that administer 112 land-oriented programs!*

When our country was younger, when our population was smaller, when there was an abundance of usable land, restricting land use was not an important survival concern. It *is* now!

Petroleum geologists serve a multiple role in this country that is at least traditionally conceived to be a capitalistic democracy. As professionals our training qualifies us to advise; as members of an industry our experience equips us to inform; and as citizens our birthright entitles us to speak out on matters that relate to energy and environment.

We now speak out, advise, and inform that federal land management programs as they exist today are archaic, inefficient, and detrimental to private sector efforts to resolve the energy crisis. These programs must be geared to maintain an expanding population, to assure a robust economy, and to preserve American free enterprise as a way of life.

APGS NEWS

The APGS, meeting in San Antonio for its annual convention, adopted the following resolution:

> WHEREAS, the U. S. Geological Survey has established an international as well as American reputation as a scientific and professional organization of the highest order; and,
>
> WHEREAS, Dr. Vincent McKelvey has served as Director of the U. S. Geological Survey with dedication and distinction, and in close relationship with the practice of the geological sciences throughout the United States; and,
>
> WHEREAS, the enforced resignation of Dr. McKelvey for political purposes marks a shocking intrusion of politics into the functioning of a first-class nonpolitical organization of previously impeccable standards; and,
>
> WHEREAS, the unwarranted and arbitrary replacement of Dr. McKelvey will not only be highly detrimental to the morale and efficiency of the Geological Survey, but will lessen the credibility of

the incoming Director and of the impartiality of the Survey's future conclusions;

NOW THEREFORE be it resolved, that the Association of Professional Geological Scientists place itself on record as deploring the treatment of Dr. McKelvey, and the implied possibility of the prostitution to political purposes of as respected an organization as the U. S. Geological Survey.

Texas Section President Burt Hamric announced that president-elect A. Wayne Wood, San Antonio, would assume the presidency of the Texas Section on January 1, 1978. Hamric also announced that newly-elected officers of the Texas Section are William L. Fisher, Austin, president-elect (1979); James Stewart Pittman, San Antonio, editor-Texas Section Newsletter; Jim Tune, Dallas, executive committeeman; Charles Worrel, San Antonio, executive committeeman; Otto J. Buis, Ft. Worth, secretary-treasurer.

CARBON DIOXIDE— ENVIRONMENTAL-EFFECTS RESEARCH

A select scientific advisory Study Group to the Department of Energy (DOE) has recommended extensive research into the environmental effects that could be expected in the event that a drastic increase in atmospheric carbon dioxide (CO_2) levels should take place in the near future. Noting that a doubling of atmospheric CO_2 levels may occur in 50-75 years, the Study Group suggests specific projects to:

1. Improve methods for predicting world climate patterns and estimating the environmental and social consequences of climate changes. The Study Group says: "Whereas certain regions of the globe might benefit from the ensuing climatic changes, dislocation of the currently existing climate and weather patterns to which we have become accustomed could likely cause serious regional economic and agricultural disruptions." Reducing uncertainties about climatic effects "could ease considerably the decision-making process for energy system planning."

2. Accurately determine past levels and predict future concentrations of CO_2 in the atmosphere.

3. Determine how the biosphere (that zone of the earth which contains all organic materials) will respond to increased levels of CO_2 and as-yet-undetermined climate changes. A major uncertainty is whether the biosphere contributes more CO_2 to the atmosphere than it absorbs.

4. Evaluate the effects of increased CO_2 levels on the oceans and marine life, and the processes by which oceans absorb CO_2 from the atmosphere, inasmuch as these processes may influence the nature and extent of climatic changes.

The DOE has established an Office of Carbon Dioxide Effects Research and Assessment, under Acting Assistant Secretary for the Environment James L. Liverman, to organize and direct the DOE's CO_2 research program.

A Carbon Dioxide Scientific Directorate has also been established to develop and direct the DOE portion of an overall national CO_2 research and assessment plan. This Directorate consists of 12 scientists representing the various disciplines required for study of the CO_2 question. Dr. Lester Machta of NOAA is serving as Interim Science Director while a search for a permanent director and supporting staff goes on.

The Study Group? Oh, yes. They will continue to serve as an advisory group to the DOE.

"OUR IDEAS FIND OIL" FIRST CALL FOR PAPERS AAPG-SEPM 1979 CONVENTION

The Technical Program Committee for the Houston meeting in 1979 will receive titles and abstracts for consideration until October 1, 1978. Members and others sponsored by members are eligible. Detailed instructions will be mailed to all members at a later date. Author candidates are urged to submit abstracts early to one of the following Technical Program Chairmen.

AAPG—William H. Roberts III, Gulf R&D Co., Box 36506, Houston, TX 77036

SEPM—John E. Warme, Dept. Geology, Rice University, Houston, TX 77001

EMD—R. J. Tondu, Getty Oil Co., 6750 W. Loop South, Houston, TX 77401

POSTER SESSIONS—Wallace G. Dow, Getty Oil Co., 3903 Stoney Brook, Houston, TX 77063

The theme of the 1979 meeting is "Our Ideas Find Oil." The thrust of the technical program comes from the acceptance of our responsibility to increase fuel and energy-mineral supplies. That responsibility requires the acknowledgment and testing of worthy new ideas, and the intelligent use of every available technique and device. The AAPG technical sessions will be organized under four major headings as follows:

Fossil Fuels and Near-Term Substitutes
The Exploration Record
Exploration Frontiers and Techniques
Professional Affairs

The Research Committees of the AAPG and SEPM will convene symposia on "Exploration of Interior Basins" and "Dolomitization," respectively. Another special feature will be a joint SEPM-AAPG symposium to summarize the first decade of the Deep-Sea Drilling Project. The Energy Minerals Division (EMD) of AAPG is planning special sessions for coal, oil shale, uranium, and geothermal-geopressured energy.

Field trips and short courses are planned by each program group.

POSTER SESSIONS

Poster sessions at the meeting will receive equal status with the verbal presentations. Displays will be grouped according to subject, abstracts will be published in the *Bulletin*, and all participants will be judged for the General Chairman's Award, an equivalent of the Matson Award given for lectured presentations. Poster displays will be located in the center of activity in the main convention hall between technical exhibits and regular session rooms.

Each poster display will be assembled for one full day with the author present for a specified 1½-hour period. Poster sessions offer a very special opportunity for interaction between the author and the observer, with each benefiting through discussion and exchange of ideas. This is your chance to innovate and create. Ride the wave of the future and participate in next year's poster sessions.

USGS—SCIENTIFIC OBJECTIVITY

Dr. V. E. McKelvey, Director of the USGS, in an address before the Northwest Mining Association Convention in Spokane, Washington, stated that, because of changing and increasing responsibilities, it is imperative that the USGS continue its century-old commitment to scientific objectivity. He emphasized that the Survey's two basic missions, scientific research and fact finding, and that which is essentially regulatory, "require objectivity, impartial execution, free of either advocacy or policy-making responsibilities. We have a responsibility to develop and disseminate information about the Earth and its resources in terms that will be useful to those charged with the making of public policies. But we never recommend, much less establish what these policies should be." McKelvey said it was important to emphasize the Survey's non-advocacy role because of evolving relationships between the Federal government and the extractive mineral industries, and because of the Survey's greatly expanded roles in such areas as mineral land appraisals and assessments and the supervision of mineral leases on Federal lands.

The Bureau of Land Management and the Forest Service are each required to review roadless tracts of 5000 acres or more to determine their suitability for designation as wilderness before 1990. BLM estimates 36.5 million acres will be so identifiable, and the Forest Service may add another 10 million acres to the 40 million acres already mandated for mineral-resource appraisal. In addition, the Alaska Natives Claims Settlement Act directs Congress to set aside up to 80 million acres of "national interest" lands in which development will be prohibited or severely restricted. The Bureau of Indian Affairs requires field studies on nine Indian Reservations, and the Department of Defense has asked that studies begin of land withdrawn for military use. Not all of the above lands require mineral surveys prior to withdrawal, but lands subject to potential withdrawal for wilderness areas total approximately 248 million acres.

Dr. McKelvey cited two legislative possibilities that could affect existing relationships between the extractive industries and the Survey—the Survey Mining Control and Reclamation Act of 1977 and the Administration's proposed legislation to replace the General Mining Law of 1872.

McKelvey said, "Looking to the future, the geographic frontiers have long since been traversed and prospected for obvious signs of mineralization. But, while the boundaries determined by geography have been reached and partially explored, the ones determined by human ingenuity are at best only dimly perceived, if sighted at all."

DYNAMIC GEOLOGY

Of ever-increasing concern in communities which have pumped large amounts of groundwater for many years is what happens when you stop pumping because of adequate surface storage of water. Some communities, according to the USGS, are finding that water tables are returning to more natural levels. This results in flooded basements and foundation damage (Louisville, Ky.; Brooklyn, N.Y.), damage to sewer lines (St. Louis, Mo.), and potential triggering of landslides (Fairfax County, Va.).

NINTH INTERNATIONAL CONGRESS OF CARBONIFEROUS STRATIGRAPHY & GEOLOGY

For the first time in its 50-year history this Congress will leave Europe. The IX-ICC will take place from May 10 through June 1, 1979, with the opening Plenary session in Washington, D.C., and the Technical sessions in Urbana, Illinois. Field trips are scheduled for various parts of the United States beginning May 10, 1979, from Pittsburgh, Pennsylvania. These trips immediately follow the American Mining Congress Coal Convention being held in Pittsburgh May 6 through May 9, 1979.

Pre-Meeting Trips

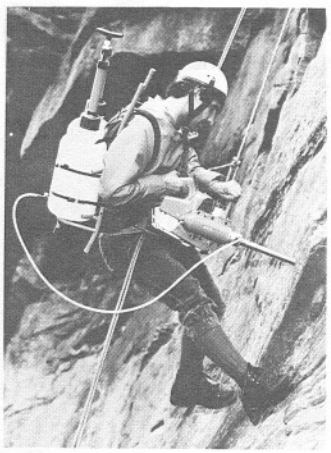
1. Pennsylvanian strato-type—West Virginia, southwest Pennsylvania; 5 days.
2. Coal geology of northern Appalachians; 5 days.
3. Mississippian of northern Appalachians; 7 days.
4. Transect from Pittsburgh to Illinois Basin through Eastern Ohio and Kentucky; 7 days.
5. Carboniferous basins—southeastern New England; 3 days.
6. Carboniferous of southern Appalachians; 5 days.
7. Mississippian of Indiana; 3 days.

Post-Meeting Trips

8. Type Mississippian region; 5 days.
9. Illinois Basin; 5 days.
10. Nebraska-Kansas; 7 days.
11. Arkansas-Oklahoma; 7 days.
12. Carboniferous of New Mexico; 7 days.
13. Grand Canyon, Arizona; 7 days.
14. Great Basin—Utah and Nevada; 7 days.
15. Northern Rocky Mountains—Montana, Wyoming, Idaho; 7 days.

For information contact Ellis L. Yochelson, Secretary-General, IX-ICC, 1979, Museum of Natural History, Washington, D.C. 20560.

THE COMPLEAT GEOLOGIST



It is not the policy of the *Bulletin* to advertise products of commercial concerns without first apprising them of our established modest advertising rates and arriving at an understanding beneficial to both parties. However, this one was accompanied by the photo you see to the left. The physical predicament the model is pictured in caught our attention and made us glad, once again, that THE FORCE that guides each of our destinies pointed us down the road toward the study of the geology of the subsurface of this planet Earth. What it is is a "Lightweight Petrol-Powered Core-Drill for taking rock and concrete samples." The drill weighs 29 lb and the two-water-bottle backpack for the mud system adds another 53 lb (full). For further information write Winship Technical Exports, Ltd., 2 Lyndon Grove, East Bolden, Tyne & Wear NE 36 ONP, England. They call it PSI Geo-drill.

CONTINUING EDUCATION

Dr. John K. Sales will give the fourth Continuing Education Program of the 1977-1978 year on "Model Studies of Geologic Structures Applied to Hydrocarbon Exploration." The two-session lecture will be held on Thursday and Friday, February 16 and 17, 1978, in the Exxon Building Auditorium. Doors will open at 12:30 PM on Thursday, and the Friday session goes from 8:30 AM until noon. Costs are $20 if preregistered, $25 at the door, and $10 if a student. Preregistration blanks were attached to the January *Bulletin* and should be mailed, with checks, to the Houston Geological Society, Attention: Vicki King, 806 Main Street, Suite B-1, Houston 77002.

Dr. Sales received his B.S. from Syracuse University in 1956 and his Ph.D. from the University of Nevada in 1966. He worked with Mobil Oil in the Casper, Wyoming, Division as an exploration geologist from 1966 to 1968 and joined the Earth Science Department of the State University of New York, College at Oneonta, in 1968. He is presently Associate Professor and Chairman of the Department and continues periodic consulting with several oil companies.

Dr. Fred A. Donath will present the March Continuing Education program entitled "Structural Analysis of Fault and Fracture Systems." It will be held in the Exxon Auditorium on March 16 and 17 at the usual times.

HGS MEMORIAL SCHOLARSHIP FUND

The Board of the HGS Memorial Scholarship Fund acknowledges contributions to the fund from the following individuals and companies:

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AAPG—OKLAHOMA CITY APRIL 9-12, 1978

Group space has been reserved for AAPG members planning to fly to the 1978 annual meeting. Group fares are not applicable at this time. As there is no meal service on these flights, all seats have been reserved in economy class in order to give you the best possible airfare. All flights are via Continental Airlines: **Round-trip airfare is $140. Reservations are needed by March 7, 1978.**

HOUSTON TO OKLAHOMA CITY

Date	Flight	Depart	Arrive
April 7	431	7:00 PM	8:05 PM
April 8	451	10:25 AM	11:30 AM
	443	2:25 PM	3:30 PM
	431	7:00 PM	8:05 PM

April 9 Same flights, same times

OKLAHOMA CITY TO HOUSTON

April 11	452	9:15 PM	10:17 PM
April 12	420	2:45 PM	3:50 PM
	452	9:15 PM	10:17 PM

April 13 Same flights, same times

Requests for additional information and reservations should be directed to **Connie**:

Travel Unlimited, Inc.—AAPG Flights
P. O. Box 25187
Houston, Texas 77005 713/526-3161

HGS THANKS ENTERTAINMENT SPONSERS

The HGS wishes to thank sincerely the following contributors to the HGS Entertainment Fund for 1977-78. In addition, a special thanks is in order for **Milchem Inc.**, who again provided the preparation of the food for the successful October Shrimp Peel. We would also like to thank those members, wives, and friends who assisted in the preparation and serving of the refreshments.

The Analysts
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NEW PUBLICATIONS

The USGS announces the first in a series of planned studies of important oil and gas regions of the world with the publication of the 136-page report "Petroleum Geology of the West Siberian Basin and a Detailed Description of the Samotlor Oil Field," by J. R. Clarke, O. W. Girard, Jr., J. Peterson, and J. Rachlin. It has been reproduced as Open-File Report No. 77-871 and may be purchased by sending $24.50 (make checks to USGS) to Open-File Services Station, Branch of Distribution, USGS, Box 25425, Federal Center, Denver, Colorado 80225 (303/234-5888). A microfiche is available for $4.00.

A practical guide to the use of earth-science information to reduce damage on flood-prone lands has been published by the USGS and issued as Professional Paper 942, "Flood-Prone Areas and Land-Use Planning—Selected Examples from the San Francisco Bay Region, California," by A. O. Waananen, J. T. Limerinos, and W. J. Kockekman (of USGS), and W. E. Spangle and M. L. Blair (of William Spangle & Associates). Price: $2.20 from Branch of Distribution, USGS, 1200 South Eads Street, Arlington, Virginia 22202.

URANIUM GEOLOGY AND EXPLORATION SHORT COURSE

A 3-day short course in Uranium Geology and Exploration is to be offered twice, March 15-17, and May 24-26, 1978, by Dr. Richard H. De Voto of the Colorado School of Mines. The course covers: (a) the geochemistry and geology of uranium, (b) the mechanisms important in the generation of anomalous uranium concentrations, (c) the many geologic environments favorable for the formation of economic and subeconomic uranium deposits, and (d) exploration techniques and programs. Registration fee: $300.

For information regarding the course, contact the office of Continuing Education, Colorado School of Mines, Golden, Colo. 80401; Telephone 303/279-0300, ext. 321.

PROFESSIONAL NOTES

Kirby Cockerham is now with Tesoro Petroleum, Denver, Colorado (303/825-2000).

Dave Eggleston has recently joined Geomap Company, Houston, as Technical Representative (526-8899).

John T. Paxton has joined Entex Petroleum, Inc., as South Texas District Geologist (659-5111).

Gus B. Baker is opening an office in the Southwest Tower, Houston, for Energetics, Inc. (759-0306).

John D. Lomax announces new offices for Lomax Exploration Company in Suite 252 of the International Energy Building, 256 North Belt East, Houston 77060 (931-9276). This recently organized Texas corporation will conduct oil and gas exploration and drilling operations mainly in the Mid-Continent and Rocky Mountain areas.

Bob Barrel, a prominent New Orleans geologist and Division Manager for Davis Oil in New Orleans, was seriously injured in New Orleans on November 7, the innocent victim of a tragic shooting spree. This is to let Bob's many friends in this area know that he is now in Houston at the Texas Institute for Rehabilitation and Research, where he is undergoing treatment and therapy. He is receiving visitors and would greatly enjoy seeing and hearing from his friends in the geological community here. The hospital is located at 1333 Moursund in the Texas Medical Center. Phone is 797-1440.

Don R. Nolan has joined Intercoastal Operating Company, Houston, as a consulting geologist (659-8772).

I SAY—YOU SAY

Secretary of the Interior Andrus announced the granting of $87,900 to the American Arbitration Association to develop ways of pinpointing major energy-environment disputes and finding means of resolving them through arbitration, mediation, or other procedures. Secretary Andrus expressed his concern that conflicts between environmentalists and developers too often had to be settled in court, causing slowdowns in vital energy production. He says, "Adversary proceedings have an important place in our system of government, but excess litigation has detrimental effects. It makes administration extremely difficult. It is time consuming as well as costly."

The AAA is a public service, nonprofit organization aimed at the resolution of disputes of all kinds through the use of arbitration, mediation, democratic election, and other methods.

The 6-month project will enable the AAA to prepare a handbook outlining ways to identify, manage, and resolve energy-environment disputes. The AAA research team will identify five prototypical energy-environment disputes that primarily reflect the responsibilities and concerns of the Interior Department. Energy-environment disputes will be selected that are mature enough to be clearly identifiable, yet early enough so that crystallization of attitude has not yet taken place. The final report will evaluate whether an open planning process of collaborative problem solving, involving all parties with a stake in the issue, can build a consensus that will improve decisions on environmentally sensitive energy projects.

COORDINATING COMMITTEE ON NONFUELS MINERALS POLICY

President Carter has directed that a committee (see above) under the chairmanship of Interior Secretary Andrus develop for Presidential consideration a set of policy options for issues and problems related to nonfuel minerals. The review will be completed in 15 months.

The two basic objectives of the interagency study are: (1) to prepare for Presidential consideration a set of policy options, analyses, and recommendations on specific issues and problems related to nonfuel minerals; and (2) to develop, test, implement and provide for the continuing use of a policy-analysis framework which Federal policymakers can use to update and expand the analysis in this study as needed in the future.

The study will focus on the issues, problems, and conditions related particularly to those domestic and imported minerals considered most critical to the United States economy. The issues are concerned with (1) policy information and analysis required to support Federal decision-makers in developing, implementing, and monitoring minerals policy, including relevant laws and regulations applicable to minerals under consideration; and (2) the supply-demand data and analysis of specific minerals, including economic and evironmental factors, which are required to conduct policy analysis.

The following officials, under the chairmanship of Secretary Andrus, will participate with their agencies in conducting analyses and making recommendations in the areas of nonfuel minerals where they have a special expertise or responsibility: The Secretaries of State, Treasury, Commerce, and Energy, the Administrators of the EPA and of General Services, the Director of the National Science Foundation, the Assistant to the President for National Security Affairs, the Chairman of the Council of Economic Advisers, the Special Representative for Trade Negotiations, the Chairman of the Council on Environmental Quality, the Director of the Office of Management and Budget, and the Director of the Office of Science and Technology Policy.

Eight inter-agency working groups will identify and evaluate existing and alternative policy options, make recommendations, and suggest actions to be continued by particular Government agencies. They will concentrate on the following subjects with the agency in parentheses having leadership responsibility:

1. A policy-analysis framework to support nonfuel minerals decision-making (Interior).
2. The adequacy of government minerals data-collection and data-analysis capabilities to support policy analysis (Interior).
3. The adequacy of government capabilities for evaluating the mineral potential of Federal land prior to land-use decisions (Interior).
4. Domestic and foreign policy issues related to international interdependence (State).
5. Government tax, investment, and development finance policy (Treasury).
6. Government policies affecting domestic minerals supply (Interior).
7. Government policies affecting minerals demand (Commerce).
8. Government policies affecting minerals-related research and development (NSF).

The Policy Coordinating Committee, based on the working group's analysis, will submit options and recommendations on the following concerns to the President:

1. Whether the trends toward international interdependence and the politicization of certain minerals markets are increasing U.S. vulnerability to foreign supply curtailments and price manipulations;
2. Whether U.S. reserves, production capacities, and inventories are adequate to deal with possible supply/price interruptions, or with the economic and social consequences of such disruptions;
3. Whether the economic health of the domestic minerals industry is adequate, as reflected in energy costs and supplies, investment, transportation, manpower, and other factors related to the structure and vitality of the industry;
4. Whether land use decisions are based on adequate minerals information and analysis;
5. Whether current tax laws favor use of raw minerals over recycled minerals or encourage substitution and other conservation practices;
6. Whether current government regulations adequately protect the environment, health, and safety while not unduly affecting the supply and price of minerals;
7. Whether minerals policies adversely affect U.S. trade posture and balance of payments;
8. Whether existing government policy-analysis, data-analysis, and data-collection functions are adequate to support federal decision-makers responsible for formulating, implementing, and monitoring nonfuel minerals policies.

Coordinating the committee's work on behalf of the President will be Stuart E. Eizenstat, Assistant to the President for Domestic Affairs and Policy, with assistance from Interior Assistant Secretary Joan M. Davenport and Office of Science and Technology Policy Director Frank Press.

THE MOUNTAIN WEST— EXPLORATION FRONTIER

The Rocky Mountain Sections of the AAPG and SEPM announce their annual meeting to be held in Salt Lake City, March 19-22, 1978. A fine technical program is planned. Field trips are scheduled to the Uinta Basin, Basin and Range Province, Pineview Field, and the Great Salt Lake, and regional tours by air are planned of the Thrust-belt and Hinge-line regions. For more detailed information and preregistration forms, write: RMS/AAPG-SEPM, PREREGISTRATION REQUEST, P. O. BOX 8737, SALT LAKE CITY, UTAH 84108.

NOONTIME FREE MOVIES

The second in a series of geologic films sponsored by the Continuing Education Committee will be shown on Wednesday, February 15, 1978, between 11:45 AM and 1:45 PM. The film, "Consensus for Concern," documents the USGS's efforts and responsibilities in the supervision of oil and gas operations on the outer continental shelf. The film is 28 minutes long and will be shown 3 times. Location is the First City Bank Auditorium in the basement of the First City East Building on the corner of Dallas and Fannin Streets.

E. P. RALL

CONGRESSIONAL ISSUES

The Houston *Chronicle* reports the Houston Area Congressional delegation voting as follows on selected issues since the last *Bulletin*.

SENATE

1. *Social Security financing*—Approved 56 to 21 reform of the Social Security financing system to insure its solvency, increasing the tax rate and the taxable wage base for employees, employers, and the self-employed, starting in 1979.

	1
Tower, Rep.	N
Bentsen, Dem.	Y

HOUSE

1. *Government reorganization*—Defeated 357 to 34 a move to kill Carter's second government-reorganization proposal, consolidating the U.S. Information Agency and the State Department's Bureau of Education and Cultural Affairs into a new international communication agency.

2. *Amtrak*—Voted 256 to 141 an $18 million increase in Amtrak appropriations, effectively freezing its route structure until completion of a study next March.

3. *Korean bribery investigation*—Voted 366 to 2 an authorization of $20,000 to continue an investigation of alleged Korean bribery of U.S. officials.

4. *Legal Services Corp.*—Approved 236 to 110 a conference report on an authorization for a 3-year extension of the Legal Services Corp., an independent, nonprofit body providing legal assistance to the poor.

5. *Overseas bribery*—Passed 349 to 0 a bill introduced by Rep. Bob Eckhardt, D-Houston, prohibiting the bribery by U.S. companies of officials of foreign governments.

6. *Social Security financing*—Agreed 189 to 163, with one member voting "present," to the conference report overhauling Social Security financing.

	1	2	3	4	5	6
Archer, Rep.	Y	N	Y	N	Y	N
Eckhardt, Dem.	N	Y	Y	Y	Y	Y
Gammage, Dem.	N	N	Y	A	A	A
Jordan, Dem.	N	Y	Y	Y	Y	Y

DID YOU KNOW THAT. . . .

. . . if every gas-heated home were properly caulked and weatherstripped, we could save enough natural gas each year to heat about 4 million homes?

NEW MEMBERS DECEMBER 7, 1977

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FEBRUARY 1978

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1	2	3	4 HGS-AUX BREAKFAST-DANCE HOUSTON CLUB 8 p.m. 468-9495
5	6 HGS-HAPL MEETING T. D. Cook Stouffers Greenway Plaza 5:15 p.m.	7 U of H NOON SEMINAR	8	9	10	11
12	13	14 U of H NOON SEMINAR	15 HGS FREE MOVIE 11:45 a.m.-1:15 p.m. "CONSENSUS FOR CONCERN" FIRST CITY EAST AUDITORIUM	16 HGS John K. Sales Exxon Auditorium 1-5 p.m. S I P E S 11:30 a.m. LAMAR HOTEL	17 HGS John K. Sales Exxon Auditorium 8:30 a.m.-12 noon	18
19	20	21 U of H NOON SEMINAR	22 HGS MEETING W. H. Roberts Holiday Inn Medical Center 11:30 a.m.	23 MESOZOIC GEOLOGISTS NOON BRIAR CLUB	24	25
26	27	28 U of H NOON SEMINAR S P W L A EVENING MEETING				

BULLETIN
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COVER

Have you ever wondered what some of those paleo "markers" look like that you continually write on your logs? Thanks to C. C. Albers of Amoco we present, from left to right, top row first, younger to older: (1) Siphonina davisi (x151), (2) Lenticulina jeffersonensis (x66), (3) Bolivina perca (x124), (4) Marginulina vaginata (x53), (5) Nonion struma (x107), Nodosaria blanpiedi (x107).

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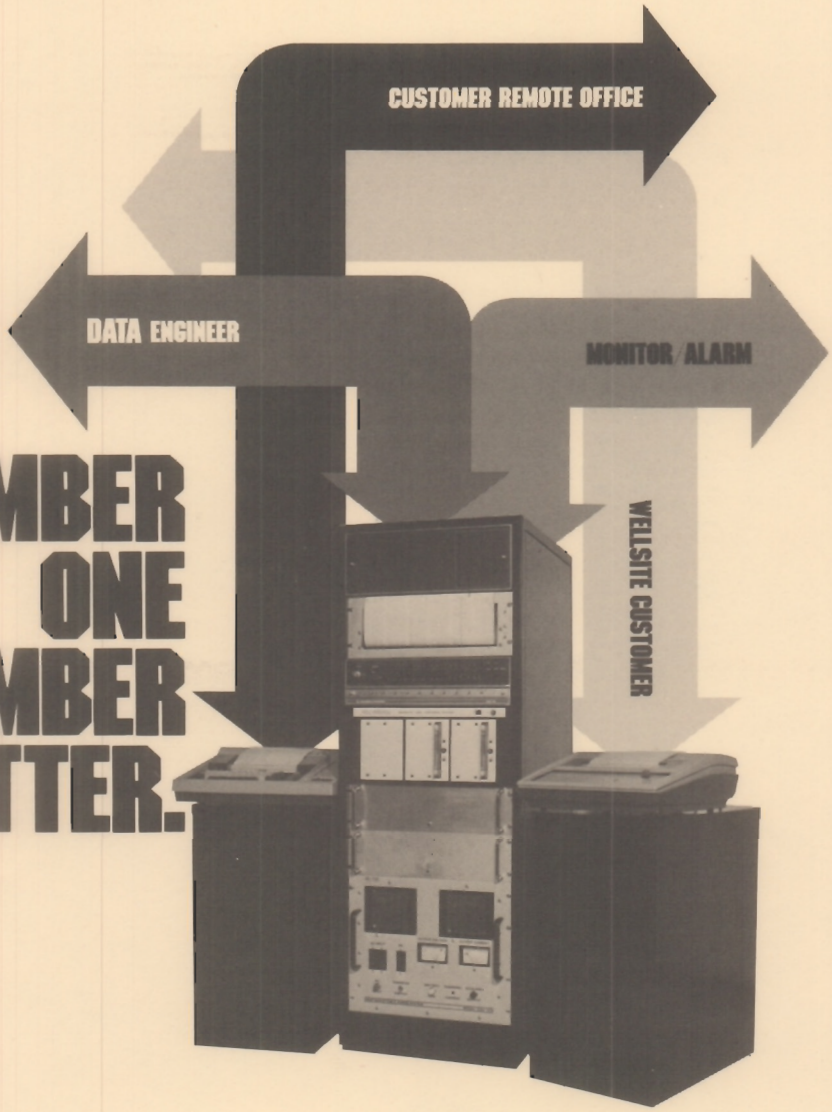

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