The Bulletin
Houston Geological Society

Volume 46, Number 9 May 2004

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about the cover: Medano Creek is a braided stream in Great Sand Dunes National Park. Sand in the dunes is eroded by the creek and deposited along the margin of the dune field in a series of well developed upper-flow regime bedforms. Photo taken during University of Houston Field Camp, 1986.
Photograph by William Dupré, PhD

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President's Letter

Around the Society

VOTE! In April, you should have received your Houston Geological Society ballot for the election of next year's officers. If you still have it, please mark your choices and mail the ballot back to the HGS office by May 7 so that it counts! Your vote is your voice in the future of the HGS. Don't let it go unheard!

AAPG Convention

The AAPG annual convention comes back to Houston in spring 2006, and I am proud to announce the AAPG Executive Committee named Charles Sternbach general chairman. Charles wasted no time building his team. Dan Tearpock and Deborah Sacrey have graciously accepted Vice-Chairman assignments. Robert Merrill will be the technical program coordinator. John Adamick will put together CEO programs. Congratulations! The HGS appreciates your efforts, dedication to the profession and volunteer spirit.

The AAPG annual convention comes back to Houston in spring 2006, and I am proud to announce the AAPG Executive Committee named Charles Sternbach general chairman.

State Board of Education

On the educational front, the first recommendation from the Earth Science Task Force Report—urging redesignation of selected Earth science courses to meet the science requirements for graduation from high school—was brought up for consideration to the State Board of Education (SBOE; see the recommendations in the October 2003 issue of the Bulletin, pages 35 and 37). Numerous letters endorsing the recommendation were sent to SBOE members from many geoscientists, and two dozen witnesses stood to present supporting testimony on Thursday, February 26. The witnesses included luminaries such as astronaut Jim Reilly, former USGS director Gordon Eaton, former UT president Peter Flawn, as well as HGS members Marsha Bourque and Stewart Chuber. Even so, the SBOE Committee of the Whole voted 7 for, 7 against, and 1 abstained. The next day, the recommendation was considered again by the SBOE during formal session and the vote was 9 for and 5 against. Ed Roy, Jr. (Trinity University), chairman of the Earth Science Task Force, and Marcus Milling, AGI executive director, reported that a great deal of behind the scenes work went on between Thursday and Friday. Two more readings and positive votes, one this month (May) and one in July, must occur before the recommendation is finally approved. Considerable opposition is expected at the next meeting. You should note that this is only the first of three Task Force recommendations for immediate action. There are five more recommendations that are considered long-term and require changes to the existing Texas Essential Knowledge and Skills (TEKS) and Texas Assessment of Knowledge and Skills (TAKS). Obviously, SBOE approval of the recommendations is going to take time and it will be a struggle. The HGS executive board stands in support of the Earth Science Task Force.

Directory

The next issue of the HGS/GSH Membership Directory is going to press within the next few months. For those of you who have changed addresses or other contact information since the last directory was printed, my plea to you is to make sure the HGS office has your new records. If you have updated your details through the HGS Website, fine, but the two databases are not yet connected! That will be remedied soon, but in the meantime, we need your help keeping both up-to-date. The Directory is one of my major networking and VRM (volunteer relationship management) tools, and I don't know how I would get along without it. I know many members use it as much as I do. For those of you working for companies that are potential advertisers, buying some page space does get you noticed!

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Guest Night

Linda Sternbach is putting together the final details for Guest Night, and she has plenty of news elsewhere in this Bulletin for the event's program: Martian Rocks and Mission Results. As I write this, there are reports of the Mars rovers finding evidence for surface water in the Red Planet's geologic past. I am sure we will get the inside scoop at the Guest Night talk from Dr. Gordon McKay of the NASA Johnson Space Center. As is tradition, a social hour and catered dinner under the dinosaurs will take place before the main program. Tickets are limited to the 400 or so seats in the Houston Museum of Natural Science IMAX theater. Please make your reservations early, as it is always a sell-out!

Meetings, Classes and Events

We have a few talks in June, but May is the last month to catch a full schedule of dinner and luncheon meetings. Kara Bennett also has the Continuing Education Committee regrouped and refocused with two petrophysics classes this spring (see page 67). The first is "Using Core Data in Formation Evaluation" on May 18 (see page 50). Finally, the HGS Tennis Tournament is Saturday, May 21. Ross Davis always organizes an enjoyable and entertaining event, and I guarantee tennis players a great time! ■

by ***Jeff Lund***
Chair of the APPEX Advisory Committee

Reply to Bulletin *Editor Diane Yeager, editor@hgs.org*

Why APPEX?

Why does AAPG (along with HGS and SIPES) bother to convene a prospect and property expo when we could all just go to the NAPE North American Prospects Expo?

The answer, I believe, is service to the membership and AAPG's effort to be a "lifetime career partner" to geoscientists who increasingly find themselves working as independent prospect generators or "free agent" consultants. It seems to be less and less likely that any geoscientist can depend on long-term employment security at oil companies or in the service sector.

The final phrase in the AAPG Constitution (Article II. Purpose) is "to advance the professional well-being of its members."

Providing a reasonably priced venue for geoscientists to present their professional work to the marketplace, combined with an informative Forum of speakers providing updates and insights on the current E&P business environment, is a significant value-adding service that directly contributes to the professional well-being of many members.

The underlying role of geoscience and the geoscientist in APPEX (AAPG Prospect and Property Expo) events cannot be over stated. The differentiating concept between APPEX and other forums is the direct contact APPEX provides between the prospect originator and the marketplace. An overwhelming amount of the world's oil and gas is found by the men and women of AAPG, and APPEX is AAPG's premier connection for explorers to link to capital. Connecting geoscientists with capital is vital to our industry and profession.

Indeed, the APPEX mission statement reads:
"Establish U.S. and International marketplaces for the exchange of oil and gas prospects and producing properties, which are driven by geoscience fundamentals as well as business opportunity."

The international component is fundamental. APPEX London is a viable and growing event that is exporting the prospect market concept to Europe, where, for example, the North Sea is experiencing a high level of renewed activity and opportunity for entrepreneurial geoscientists for whom that tradition had not existed. Other organizations have experimented, but APPEX London's geoscience emphasis is a differentiator. Perhaps APPEX Houston and APPEX London will evolve together and provide synergistic value, learning from each other and sharing new concepts in content and format.

AAPG's Annual Meeting and its International Conferences are a different animal. These are science and technology gatherings and are a primary means by which AAPG delivers on its other stated purposes of: "advancing the science of geology," "fostering the spirit of scientific research throughout its membership" and "to disseminate information".

AAPG's Annual Meeting and its International Conferences are a different animal. These are science and technology gatherings and are a primary means by which AAPG delivers on its other stated purposes of: "advancing the science of geology," "fostering the spirit of scientific research throughout its membership" and "to disseminate information".

NAPE, a highly successful, pioneering and more mature venue, has its own special flavor of networking, socializing and deal-making aligned appropriately with its primary sponsoring organization, the American Association of Petroleum Landmen. I believe that both APPEX and NAPE provide essential value-enhancing services to the sponsoring organizations, attendees and the greater energy marketplace. Both APPEX and NAPE are testaments to the robust creativeness of our industry and its dedicated professionals.

I believe that both events serve related but different aspects of the marketplace. Only history will tell us for sure if this is a correct interpretation, but APPEX and NAPE will continue to experiment with different approaches to

Commentary *continued on page 11*

Commentary continued from page 9

enhancing the value proposition each organization provides its members. Many of us will attend both events annually and be enriched professionally and personally by the experience.

To conclude, we need to remember that APPEX is an evolving effort to provide a service to AAPG members. It will change and develop, but the underlying driver is that APPEX differentiates itself by emphasizing the fundamental role that geology and geophysics play in E&P business transactions.

One thing is for sure: everyone in the energy industry owes a great debt of gratitude to the many professional staff members at the sponsoring organizations and the members, volunteers and participants who have created and made both APPEX and NAPE dynamic, successful and fun events!

Please plan to attend APPEX 2004 on September 14–16! ■

OOPS!

Our apologies to Matt Williams for omitting the last line of his biographical sketch on page 17 of the April *Bulletin*. His biographical sketch is printed below in entirety:

Matt Williams joined Southwestern in 1998 and is currently Staff Geologist, responsible for the Overton Field development. In addition he has developed projects in Louisiana, south Texas and the Permian basin for Southwestern. Matt previously had worked for Occidental Oil and Gas in International and Domestic Exploration and Production for which he was Chief Geologist of Occidental of Oman. In addition, he worked for ARCO Alaska and Tenneco Oil Company since beginning his career in 1983. Matt has a BS degree from Texas Tech University and a MS degree from Texas A&M University. He is a Texas Professional Geoscientist and a member of the AAPG, Houston Geological Society and East Texas Geological Society.

Tuesday, May 11, 2004

Environmental and Engineering Group
Dinner Meeting

Rudy Lechners Grill • Woodlake Square, Gessner at Westheimer
Social 5:30 p.m., Dinner 6:30 p.m.

Cost: $25 Preregistered members; $30 Nonmembers & Walk-ups

Make your reservations now on-line through the HGS website at www.hgs.org; or, by calling 713-463-9476 or by e-mail to Joan@hgs.org (include your name, meeting you are attending, phone number and membership ID#).

by ***Gerald R. Dickens, PhD***
Department of Earth Sciences and the Shell Center for Sustainability, Rice University, Houston, TX

Rethinking the Global Carbon Cycle with Gas Hydrates and Seafloor Methane Throughout Time

Prominent negative ^{13}C excursions characterize several past intervals of abrupt (<100 kyr) environmental change. These anomalies, best exemplified by the >2.5% drop across the Paleocene/Eocene thermal maximum (PETM) ca. 55.5 Ma, command our attention because they lack explanation with conventional models for global carbon cycling. Increasingly, Earth scientists have argued that they signify massive release of CH_4 from marine gas hydrates, although typically without considering the underlying process or the ensuing ramifications of such an interpretation. At the most basic level, a large, dynamic "gas hydrate capacitor" stores and releases ^{13}C-depleted carbon at rates linked to external conditions such as deep ocean temperature. The capacitor contains three internal reservoirs: dissolved gas, gas hydrate, and free gas. Carbon enters and leaves these reservoirs through microbial decomposition of organic matter, anaerobic oxidation of CH_4 in shallow sediment, and seafloor gas venting; carbon cycles between these reservoirs through several processes, including fluid flow, precipitation and dissolution of gas hydrate, and burial. Numerical simulations show that simple gas hydrate capacitors driven by inferred changes in bottom water warming during the PETM can generate a global ^{13}C excursion that mimics observations. The same modeling extended over longer time demonstrates that variable CH_4 fluxes to and from gas hydrates can partly explain other ^{13}C excursions, rapid and slow, large and small, negative and positive. Although such modeling is rudimentary (because processes and variables in modern and ancient gas hydrate systems remain poorly constrained), acceptance of a vast, externally regulated gas hydrate capacitor forces us to rethink ^{13}C records and the operation of the global carbon cycle throughout time. ■

At the most basic level, a large, dynamic "gas hydrate capacitor" stores and releases ^{13}C-depleted carbon at rates linked to external conditions such as deep ocean temperature.

Biographical Sketch

GERALD R. DICKENS, PhD, is Associate Professor, at the Department of Earth Sciences, and the Shell Center for Sustainability, Rice University, Houston, TX. He received his BS degree from the University of California, Davis in 1989 and went on to the University of Michigan to earn his MS and PhD in 1993 and 1996, respectively. In only a few short years he has become one of the world's preeminent researchers in paleoceanography, marine geology and low-temperature geochemistry (^{13}C, etc) as a result of his brake-through research on methane hydrate, Permo-Triassic deep-ocean warming and its relation to the one of the world's great mass extinctions. Over less than 10 years, Dr. Dickens has prepared more than 30 papers, made numerous presentation around the world and contributed chapters to books and other publications on the general subject. He is serving as a member of the Editorial Board, *Geo-Marine Letters,* Springer-Verlag, and *Geology*, for the Geological Society of America. He also serves as an Associate Editor for the journal *Paleoceanography*, published by the American Geophysical Union. He also serves as panel member on the Earth Systems History (ESH) Science Steering Committee of the National Science Foundation and as the 2002/2003 Distinguished Lecturer of the Joint Oceanographic Institutions. He guides and supports a number of graduate students on a variety projects and teaches courses in oceanography, paleoceanography and biogeochemical cycles.

Wednesday, May 12, 2004
Paradigm • 820 Gessner, Suite 400 • Houston, TX 77024
7:00 a.m. Breakfast

Make your reservations now on-line at www.gshtx.org; or use GSH 713-463-8920 or e-mail: Joan@hgs.org

GSH
Breakfast Meeting

by ***Alvaro Chaveste***
TraceSeis, Inc.
Houston, Texas

Ambiguity and Sensitivity of Rock Properties under Different Reservoir Conditions

One of the goals of seismic prospecting has been to determine petrophysical properties of the reservoir (such as lithology, porosity and pore fluid type) using remote measurements, yet little has been done to analyze the ambiguity and sensitivity of the seismic measurements to the petrophysical properties of interest. A likely reason for this is that AVO attributes, commonly used to reduce the risk in qualitatively determining petrophysical properties, cannot be easily related to physical properties of rocks given that the attributes' amplitudes give information about changes across interfaces with no significant information about the intervals above and below these interfaces. Furthermore, common practice has been to estimate two term AVO which results in two attributes related to changes of three physical properties of rocks (P- and S-wave velocity and density) across interfaces. Unambiguous estimation of the three properties (Vp, Vs and r) or their reflectivities is not possible with only two attributes.

The same rock properties used to analyze sensitivity and ambiguity through well log reconstruction can be obtained from seismic data by post-stack inversion of AVO attributes.

P- and S-wave velocities and density determine reflection amplitude as a function of offset, and their estimation (or attributes related to them) from seismic data is important given that reservoir properties in clastic reservoirs are related to these rock properties through effective media relations.The reconstruction of P- and S-wave velocity and densisty logs for different reservoir conditions through the effective media relationships allows for the ambiguity and sensitivity analysis of rock properties to different reservoir conditions. The same rock properties used to analyze sensitivity and ambiguity through well log reconstruction can be obtained from seismic data by post-stack inversion of AVO attributes. The resultant seismic data is a measure of rock properties of subsurface formations (not changes across interfaces) and can be related directly to well log data.

In this presentation examples of ambiguity and sensitivity analyses of rock properties are presented at both well log and seismic resolution and for the case of two and three term AVO analyses followed by post-stack inversion. ■

Biographical Sketch

Alvaro Chaveste received a BS degree in Geophysical engineering from Montana College of Mineral Science and Technology (Montana Tech) in 1982. In 1984 he joined Geophysical Services Incorporated in Mexico where he acted as assistant party manager of a vibroseis™ crew, area geophysicist and system manager for the first interactive interpretation system in Mexico. In 1989, when Halliburton acquired GSI, Alvaro moved to Halliburton Geophysical Services in Houston where he processed 2D and 3D seismic data. While at Halliburton, he was technically responsible for the SRS (Seismic Reference Services) group, which did borehole geophysics (VSP's synthetics, etc). In 1994, Western Geophysical acquired Halliburton where Alvaro became a group leader for the 3D processing group. During 1994 he accepted a position with The Andrew Group, where his responsibilities included the preparation and teaching of processing courses in Mexico and South America, consulting, and later Manager of Mexico's and Houston's processing centers. In 1999, after Core Laboratories acquired The Andrews Group, Alvaro was asked to be Manager of the Advanced Reservoir Geophysics Group. During his tenure at Core Laboratories, Alvaro implemented the methodology to reduce risk in the estimation of petrophysical properties through estimation of rock properties (LMR), as well as pore pressure prediction.

Monday, May 17, 2004

Westchase Hilton • 9999 Westheimer
Social 5:30 p.m., Dinner 6:30 p.m.

Cost: $25 Preregistered members; $30 Nonmembers & Walk-ups

Make your reservations now on-line through the HGS website at www.hgs.org, or by calling 713-463-9476, or by e-mail to Joan@hgs.org (include your name, e-mail address, meeting you are attending, phone number and membership ID#).

International Explorationists Dinner Meeting

by ***L.J. (Jim) Weber,*** *ExxonMobil Exploration Company, Houston, TX*
Coauthors: ***B.P. (Brent) Francis,*** *ExxonMobil Development Company, Houston, TX*
P.M. (Mitch) Harris, *ChevronTexaco E&P Technology Company, San Ramon, CA and*
Michael Clark, *ChevronTexaco, London, UK*

Sequence Stratigraphy and Reservoir Prediction of the Giant Tengiz Field, Kazakhstan

The super-giant Tengiz field of western Kazakhstan produces oil from an isolated Devonian and Carboniferous carbonate platform that extends over 160 km^2. Seismic and well data clearly show two principle regions within the buildup—platform and flank—that directly relate to reservoir quality and production characteristics.

The supersequence stratigraphic framework was developed through an integrated interpretation of seismic, core, log and biostratigraphic data. An initial broad Late Devonian platform was followed by punctuated backsteps during the Tournaisian and Viséan. The Serpukhovian is characterized by several kilometers of platform progradation. Drowning in the Early Bashkirian halted carbonate platform growth. Paleotopographic relief from the top of the Bashkirian platform to the basin floor approaches 1,500 meters.

On the platform, hydrocarbons are produced from Upper Viséan through Bashkirian grainstones and mud-lean packstones. Multiple porosity types are recognized, but matrix permeability is controlled primarily by intergranular porosity. Within the flanks, in-place, upper slope, microbial boundstone and transported lower-slope boundstone debris form thick and areally extensive mappable reservoirs. Late Viséan and Serpukhovian reservoirs have distinctive seismic facies and production/performance characteristics. Fractures contribute to non-matrix permeability in these boundstones.

Location map of the super-giant Tengiz field of western Kazakhstan which produces oil from an isolated Devonian and Carboniferous carbonate platform.

The coarse stratigraphic architecture was used to further subdivide the platform portion of the reservoir for better reservoir characterization and reservoir modeling. The temporal and spatial variability in reservoir quality of the platform, as shown by cross sections and maps, is directly related to stratigraphy. The reservoir is also partitioned based on geographic position along a platform-to-basin profile. Time-slice mapping of synchronous depositional facies provides the basis for predicting reservoir distribution and continuity. ■

Acknowledgments

This study was very much a team effort. The ExxonMobil "Tengiz team" is acknowledged for its hard work and many discussions of all aspects of Tengiz geology. Kevin Putney created porosity and isopach

International Explorationists *continued on page 21*

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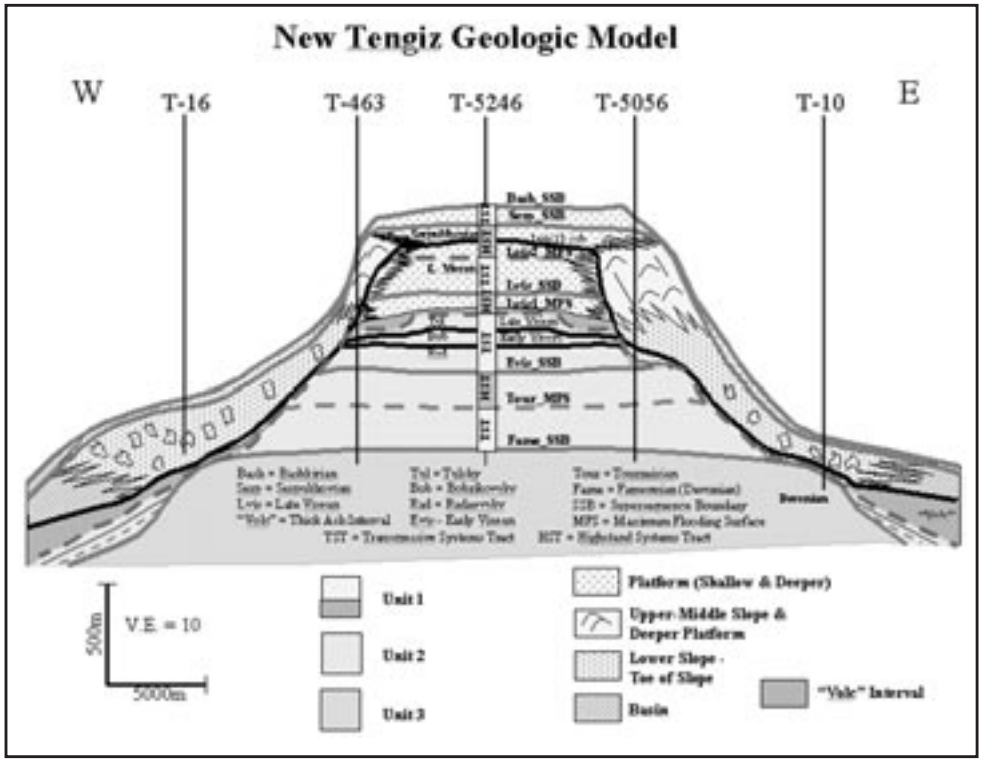
maps for the various reservoir layers, Steve Bachtel interpreted seismic cross sections and maps, and Tom Kane analyzed well production data. Ray Garber and Phil Bassant (ChevronTexaco) provided core descriptions, which were instrumental in our work. We warmly thank Jeroen Kenter (Vrije Universiteit, Amsterdam), Paul Brenckle (Consultant) and Tom Heidrick (TengizChevroil) for the many stimulating technical discussions in the core warehouse facility at Tengiz. Jeroen's knowledge of modern and ancient carbonate slope settings and Paul Brenckle's biostratigraphic data were invaluable to our studies.



Carbonate geological model for Tengiz field.

Also, we recognize the significant contributions of the following people from ExxonMobil (I. Mitchell, S. Perkins, L. Vaughn, B. Evans, P. Allred and J. Grillot) and TengizChevroil (D. Fisher, A. Azizi, P. Bateman, C. Brown, N. Dzhamikeshev, E. Furlin, J. Hohenberger, K. Nahm, O. Petrova, B. Robertson, L. Rowe and A. Tyshkanbaeva). We thank TengizChevroil and its shareholder companies (ChevronTexaco, ExxonMobil, Kazmunaigaz and BPLukArco) for support of our studies and permission to publish this paper.

Biographical Sketches

Jim Weber works for ExxonMobil Exploration Company as a carbonate stratigraphy expert, specializing in sequence/seismic stratigraphy and reservoir characterization. Jim has been employed in the oil industry for more than 15 years, working for both Exxon and Mobil in production, development, exploration and research organizations. Past work assignments include SE Asia, North and South America, the Middle East and the North Caspian region. His current work assignment involves new play identification in carbonate basins around the world. In a recent assignment, Weber worked with the Abu Dhabi National Oil Company to develop and instruct subsurface and field schools in the UAE and Oman. Dr. Weber received his PhD degree in geology at the University of Tennessee. He received his Master's degree from the New Mexico Institute of Mining and Technology. He completed a BS in geology from DePauw University. He is active in various geological societies, including SEPM and AAPG.

Paul M. (Mitch) Harris, a Carbonate Reservoir Consultant with ChevronTexaco Energy Technology Company in San Ramon, California, performs carbonate technical support projects, consulting, research and training for the various operating units of ChevronTexaco. His work during the last 25 years has centered on facies-related, stratigraphic and diagenetic problems that pertain to carbonate reservoirs and exploration plays in most carbonate basins worldwide. Mitch received his BS and MS degrees from West Virginia University and PhD from the University of Miami, Florida. He has published numerous papers, edited several books and is active in AAPG and SEPM. He has been a Distinguished Lecturer and International Distinguished Lecturer for AAPG, and was awarded Honorary Membership from SEPM. Mitch is also adjunct faculty at Rice University, the University of Miami and the University of Southern California.

Tuesday, May 18, 2003

HGS NorthSiders
Dinner Meeting

The Woodlands Conference Center • 2301 N. Millbend Drive • The Woodlands
Social 5:30 p.m., Dinner 6:30 p.m.

Cost: $28 Preregistered members; $33 Nonmembers & Walk-ups

Make your reservations now on-line through the HGS website at www.hgs.org; or, by calling 713-463-9476 or by e-mail to Joan@hgs.org (include your name, email address, meeting you are attending, phone number and membership ID#).

by ***Michael D. Talbott, P.E.***
Harris County Flood
Control District
Houston, Texas

Knowledge, Resources, Respect: Flood Damage Reduction and Our Community

Flooding is our natural disaster—it happened before the area was developed and it can still occur. This is not to say that we cannot reduce the risk of flooding. We can do that, we have done that and we continue to do that in a more innovative and effective manner than at any time in the Harris County Flood Control District's 67-year history.

Flooding is our natural disaster—it happened before the area was developed and it can still occur.

Items to be presented by Mr. Talbott include

- An overview of the area's drainage network and how it evolved
- How our knowledge of flood risk has evolved with experience and advances in technology
- An overview of proposed changes in the Federal Emergency Management Agency's Flood Insurance Rate Maps for Harris County
- What is being done to further reduce the risk of flooding
- How projects are being integrated with appropriate regard for "community and natural values." ■

FAMILY AND FRENDS ARE WELCOME AT THIS EVENT!

Bibliographical Sketch

MICHAEL D. TALBOTT, P.E., Director of the Harris County Flood Control District in Houston, Texas, has been with the district for 22 years. Under his direction, the district carries out its mission to devise the county-wide flood damage reduction plan, implement that plan and maintain the infrastructure. That mission is executed in the third largest county in the United States, with a population in excess of 3.5 million, which includes the City of Houston, the nation's fourth largest city. The district has jurisdiction over the primary stormwater facilities in the county, which consist of about 1,500 channels, totaling nearly 2,500 miles in length, as well as more than 40 regional detention basins and a 2.5 square mile wetlands mitigation bank. Mr. Talbott is active in a number of associations, local committees and task force groups relating to storm water planning and environmental management. Mr. Talbott is a licensed professional engineer with a Bachelor of Science in civil engineering from Texas A&M University and a Master of Business Administration from the University of Houston.

Monday, May 24, 2004

Westchase Hilton • 9999 Westheimer
Social 5:30 p.m., Dinner 6:30 p.m.

Cost: $25 Preregistered members; $30 Nonmembers & Walk-ups

Make your reservations now on-line through the HGS website at www.hgs.org; or, by calling 713-463-9476 or by e-mail to Joan@hgs.org (include your name, email address, meeting you are attending, phone number and membership ID#).

North American Explorationists
Dinner Meeting

by ***David M. Thomas, III***
and ***Huaibo Liu***
Tom Brown, Inc.
Midland, Texas

Upper Ordovician Montoya Sequence Stratigraphy and Chert Porosity in the Southeastern Delaware Basin, West Texas

The Upper Ordovician Montoya Group, of the southeastern Delaware Basin, was deposited approximately 450 million years ago on a carbonate ramp in a shallow marine environment as a 2nd-order sequence. Four formations—the Cable Canyon, Upham, Aleman, and Cutter—comprise four unconformity-bounded 3rd-order sequences within the Montoya: Sequence I of LST siliciclastics and carbonates, TST limestone/chert and a HST limestone, sequence II of TST limestone/chert and HST limestone, sequence III of TST limestone/chert and HST limestone and sequence IV of TST limestone/chert and HST carbonate. The LST and the HST are essentially chert free. The chert-bearing facies occurs in the TSTs where 20 to 60 percent of the rock is chert. The upper Aleman pay zones, the primary Montoya gas reservoir, contains a number of cyclic TST chert-bearing and HST chert-free limestones. Movement of the silica-bearing upwelling water from south to north resulted in early silicification that was influenced primarily by relative sea level and sedimentary facies. During TST deposition, the relatively higher partial pressure of CO_2 in the deeper water and the organic acid from decomposition of organic matter enhanced silicification. During HST grainstone deposition, high-energy waves, storm and tidal currents forced the near-shore, higher temperature, higher salinity/lower CO_2 content water deeper, resulting in chert-free facies. Three stages of silica diagenesis controlled the porosity evolution: first stage, dissolution of metastable matrix and bioclasts as the siliceous upwelling water began to replace the primary interstitial water enlarged interparticle pore spaces and created moldic porosity; second stage, silica precipitation on pore walls to form a silica rim that partially replaced the metastable grains resulted porous chert; and third stage, continuous silica precipitation completely filled the pores forming tight chert. Deposition during HST before completion of chertification protected remaining open porosity from occlusion by continued chert precipitation.

Three gas-reservoir intervals, Cutter, Aleman and Upham, have been drilled and reportedly developed. The reservoir porosity in the Cutter Formation in the northern portion of the study area occurs primarily in the dolomite that developed within the HST skeletal grainstone with some minor contribution from porous and fractured chert. The Upham reservoir tested in the southern part of the study area included porosity at the top of the HST grainstone and fractures in the transgressive chert. The upper Aleman is the primary Montoya pay and contains a number of high-frequency sequences and high-frequency sequence sets of TST chert-bearing and HST chert-free limestones. The reservoir porosity is predominantly from the chert. Reduced interparticle, moldic, small pore and micro porosities in the chert with some minor porosity developed in the dolostone and limestone provide the primary gas reservoir. The Aleman was developed using horizontal technology in the Block 16 area by Mobil, with the first horizontal well drilled and completed in 1999. Production to date has been approximately 88 BCF from 40 wells with peak production of 90 MMCFD and an estimated ultimate recovery of approximately 400 BCF. ■

Biographical Sketch

David M. Thomas, III serves as Exploration Manager of the Southern Region for Tom Brown, Inc. in Midland, Texas. He received his undergraduate degree from the University of New Mexico in 1977 and a Master of Science degree in geology from the University of Oklahoma in 1997. Prior to his employment with Tom Brown, Inc., Mr. Thomas served as a geologist for Pure Resources, Senior Staff Geologist for Mobil E&P U.S. Inc. and Senior Geologist for Conoco, Inc. in Midland, Texas. In Oklahoma, he was a Research Assistant at the University of Oklahoma and ran his own company, Trey Resources, Inc., for over 14 years.

Mass Wasting Along Highway 71

by ***Paul Britt***

This large slump was observed in a road-cut on the south side of Highway 71 about halfway between LaGrange and Columbus during a recent drive back from Austin. The feature is about 150 feet in diameter. The fault scarp at the top has about 5 feet of throw, and the toe has about 3 to 4 feet of rise. It's a good small-scale example of the gulf coast faulting that we deal with every day. (*Snapped with Paul's camera phone and emailed from his phone.)*

Roadside Geology

Send your snapshoots of roadside geology—the things that make you say "Look at that!"—to the HGS *Bulletin*.
editor@hgs.org or HGS • 10575 Katy Freeway, Suite 290 • Houston, TX 77024

Members on the Move

Members who have recently changed jobs, received awards related to their careers, been elected to professional positions, or moved their homes are invited to update their member profile and notify the HGS Webmaster of the effective date. We will make a note here and refer them to your member profile.

This service is only available to current HGS members. Note that both members and non-members must be logged in to read the HGS Membership Directory on line.

Austin Exploration Inc. is pleased to announce that **David Bolger** has joined our company. Dave has several years of experience working in marine gravity, magnetics and seismic. He will be talking to companies about recording potential field data with seismic acquisition.

Dave is based in Ireland and will be active in Europe, Africa, Middle East, Asia, and Australia.

Wednesday, May 26, 2004

Petroleum Club • 800 Bell (downtown)
Social 11:15 a.m., Lunch 11:45 a.m.

Cost: $28 Preregistered members; $33 Nonmembers & Walk-ups

Make your reservations now on-line through the HGS website at www.hgs.org; or, by calling 713-463-9476 or by e-mail to Joan@hgs.org (include your name, email address, meeting you are attending, phone number and membership ID#).

HGS General
Luncheon Meeting

by ***Stephen A. Sonnenberg***
AAPG President

Meeting the Energy Challenges

Energy is essential to life. Low cost and abundant supplies of energy contribute to a country's standard of living and economic well being. The history of energy use in any country is one of diversity and transformation. The progression in the United States has seen various energy sources replaced or supplemented by other more efficient energy sources over time. Muscle power, fuelwood, wind and waterpower were the primary sources in our independence year, 1776. Fuel shortages, economic forces and westward expansion encouraged and led to finding other sources of energy such as coals. Petroleum got its start as an illuminant and became a premier fuel with the advent of gas and diesel engines. Nationwide electrification created demand for coal and petroleum-fired generation. Demand for natural gas increased as it replaced coal in household ranges and furnaces. Environmental issues surrounding power plants have put natural gas into a prominent role today. Most the energy in the United States today still comes from coal, natural gas, and crude oil (the fossil fuels). The demand for energy in the future coupled with environmental forces will continue the evolution in energy sources. Diversity and transformation will without a doubt continue.

The demand for energy in the future coupled with environmental forces will continue the evolution in energy sources. Diversity and transformation will without a doubt continue.

Energy is consumed in four broad sectors: residential, commercial, industrial and transportation. Demand is increasing from all these sectors. Many energy sources, including petroleum, nuclear energy, coal, hydroelectricity and renewable supplies such as wind and solar energy will contribute to future supplies. The natural gas industry will likely meet a large part of this demand. A few of the challenges facing the industry include the following: surviving in an evolving and volatile marketplace, sustaining science and technology progress, solving the "permission to do business" issues (e.g., surface land use conflicts, increasing legal and regulatory requirements, land access, etc.), environmentally responsible development, and human resource shortages. Meeting these challenges will require human ingenuity and cooperation amongst competing forces in a dynamic marketplace. ■

Biographical Sketch

Dr. Stephen A. Sonnenberg specializes in sequence stratigraphy, tectonic influence on sedimentation and petroleum geology. A native of Billings, Montana, Sonnenberg received BS and MS degrees in geology from Texas A&M University and a PhD degree in geology from the Colorado School of Mines. He has over 20 years' experience and is the Exploitation Manager, Northern Division for Westport Resources in Denver, CO.

Steve is currently the President of AAPG and has served as president of several organizations including the Rocky Mountain Association of Geologists and Colorado Scientific Society. He also served on the Colorado Oil and Gas Conservation Commission from 1997 to 2003 and was the Chair of the Commission from 1999 to 2003.

He is the recipient of the Young Alumnus Award, Outstanding Alumnus Award and Mines Medal from the Colorado School of Mines; Distinguished Achievement Medal from Texas A&M University; distinguished service awards from AAPG and RMAG; and honorary membership awards from RMAG and the Colorado Scientific Society.

Gov. Rick Perry Announces Grant to Texas Energy Center: $3.6 Million from Texas Enterprise Fund to Bring New Jobs, Employers to State Press Release from the Office of the Governor Rick Perry

For Immediate Release
March 15, 2004

AUSTIN – Gov. Rick Perry today announced that the Texas Energy Center has received a $3.6 million grant from the Texas Enterprise Fund (TEF) to help bring additional jobs and employers to the state.

Based in Sugar Land, the Texas Energy Center represents a consortium of private companies and public sector entities working together to further develop Texas's potential as a national and international leader in energy-related innovation and commerce.

"This commitment of Enterprise Fund money not only will lead to the creation of new, high-paying jobs in Texas but also will help expand Texas' reputation as a leader in the development of new and cleaner energy technologies and resources," Perry said.

"This commitment of Enterprise Fund money not only will lead to the creation of new, high-paying jobs in Texas but also will help expand Texas' reputation as a leader in the development of new and cleaner energy technologies and resources."

The TEF grant will be used to help defray initial rental costs of companies that move to the Energy Center. Other public entities that have already provided economic support for the Energy Center are Texas A&M University System's Texas Engineering Experiment Station, the City of Sugar Land and Fort Bend County.

The future of Texas energy technology.

The Texas Energy Center, which is patterned after the highly successful Texas Medical Center, is an emerging cluster of leading research organizations, large energy companies and top universities assembled to produce vital, global energy solutions. Specific areas of focus for the dynamic Texas Energy Center are ultra-deepwater, petroleum exploration and production applications; advanced natural gas technologies; clean coal, hydrogen and next generation "zero emissions" power plants; advanced automotive fuels and infrastructure (including low sulfur gasoline, clean diesel, biofuels, natural gas, hydrogen and hydrogen blends); fuel cells; and wind power.

As with other Texas Enterprise Fund grants, the agreement contains safeguards to protect the state's investment. The Energy Center has committed to creating 1,500 new jobs in Texas by 2009 and to maintaining these jobs until 2019. The Energy Center also has committed to investing at least $20 million in new construction at its Sugar Land headquarters. Failure to meet these commitments would result in the Texas Energy Center repaying funds to the state.

Perry successfully urged the Texas Legislature in 2003 to appropriate $295 million to the Texas Enterprise Fund to help Texas create new jobs and grow its economy. This is the fourth project funded with TEF money.

In June, the state committed $50 million to enhance engineering and computer science programs at the University of Texas at Dallas. The investment played a key role in Texas Instruments' decision to build a new $3 billion research and manufacturing plant in Richardson. The state also committed $1.5 million to Maxim for a new semiconductor facility in San Antonio that will likely create 600 new jobs over the next three to four years. Last month, Perry announced a $35 million grant to Vought Aircraft Industries, Inc. The Vought expansion will bring 3,000 new jobs to Texas by 2009, making it the largest announced job gain in the nation so far this year. ■

Contact: Kathy Walt or Robert Black 512-463-1826

2003–2004 Outstanding Student Awards

These outstanding students were selected by the geology department faculty of their respective universities. The students were presented a check and a commemorative plaque at the April General Dinner Meeting.

Outstanding Student Award

Wesley D. Crawford, Jr.
The University of Texas

Wesley is a senior at the University of Texas at Austin majoring in general geology. He plans to finish his degree in December 2004. Wesley is a member of the American Association of Petroleum Geologists Student Chapter and the University's undergraduate geological society. In 2003 he won the R.L Folk/Earle F. McBride petrography award given at the University of Texas. He is currently working as an undergraduate research assistant in metamorphic petrology under Dr. William D. Carlson. After graduation, he plans to attend graduate school to study metamorphic petrology or structural geology.

Outstanding Student Award

Jennifer Rohrer
Stephen F. Austin State University

Jennifer is a graduate student in geology, having completed her BS degrees magna cum laude in both geology and chemistry at Stephen F. Austin. She is currently working on a thesis project in geochemistry, studying solubility rates of arsenic in the Weches Formation in Nacogdoches area lakes. She is a member of AAPG, GSA, Sigma Gamma Epsilon, the SFA Cycling Club, and the Chemistry Club. She has been President and Secretary of the Chemistry Club and is currently Vice President of Sigma Gamma Epsilon. As an undergraduate, Jennifer was involved in two research projects concerning purification of clays to determine heats of hydration and determination of combustion energies of different types of coals. She has been a general chemistry laboratory instructor for three and a half years and has helped organize very successful blood drives in Nacogdoches. She received the 2001–03 Welch Scholarship, 2002–03 Geology Faculty Award, 2003–04 Shreveport Geological Society Scholarship, 2003 M.J. Deuth Award, 2003 Houston Geological Society Undergraduate Scholarship and 2002 Chemistry Club Scholarship.

Outstanding Student Award

Kevin Davis
Rice University

Kevin received a BS degree in chemistry from the University of Virginia in 1997, where he also majored in biology and minored in environmental science. Kevin then entered the School of Earth & Atmospheric Sciences at Georgia Tech and received a MS degree in Geochemistry in 2000. His first paper, "The Role of Mg^{2+} as an Impurity in Calcite Growth," was published in the journal *Science*, and won the Gold Award for Student Research by the Materials Research Society. Kevin also received the "Best Master's Thesis Award" from the Georgia Tech Chapter of Sigma Xi. He has also received awards from the Mayo Educational Foundation of the Southeast Federation of Mineralogical Societies, the Geological Society of America and the Mineralogical Society of America. After two years of research at Virginia Tech, Kevin came to Rice University in 2002 as a President's Fellow. He recently won the Outstanding Student Paper Award at the fall meeting of the American Geophysical Union. After Kevin completes his PhD program he plans to pursue a tenure-track research position and work with the next generation of earth scientists.

Outstanding Student Award

Saleh Al-Dossary
The University of Houston

Saleh Al-Dossary earned a BS from New Mexico Tech and an MS from Stanford University, both in geophysics, and is currently completing his PhD in geophysics at the University of Houston. Between his MS and PhD studies, Al-Dossary worked for Saudi Aramco in the Dhahran geophysical research and development group, where he was a contributor to attribute and edge-preserving smoothing developments. Saleh's studies focus on fracture detection using curvature analysis. Saleh has received awards from both Saudi Aramco and from the University of Houston. **Outstanding Student Awards** *continued on page 43*

2003–2004 Outstanding Student Awards continued from page 41

Recently, he received the Best Student Paper in Geosciences at UH for the 2003 academic year for his presentation "Fracture-Preserving Smoothing." He had three abstracts accepted for the SEG 2003 meeting in Dallas and is currently working to finish two papers for the journal *Geophysics*. Saleh is expected to finish his PhD studies this summer. He is a student member of Society of Exploration Geophysicists (SEG) and the Houston Geological Society (HGS). Saleh has also been active in Geophysical Society of Houston where he just gave a talk titled "3-D Volumetric Multispectral Estimates of Reflector Curvature and Rotation."

Outstanding Student Award

Lauren Hassler
Texas A&M University

Lauren received a BS degree in geology from Appalachian State University in Boone, NC, and will receive a MS degree in geology from Texas A&M University this spring. Her focus at TAMU has been in structural geology and tectonics, studying the Chaochou Fault in southern Taiwan, where she analyzed structural fabrics, surface morphology and surface velocities to assess motion and uplift along the Chaochou fault throughout the history of orogen development. Taiwan is an example of an active, oblique arc-continent collision. Understanding the history of the Chaochou Fault, a major structural feature in Taiwan, will aid in understanding the development of the Taiwan orogen and mountain-building processes in general. She has presented her work at the Geological Society of America (in 2000) and at the American Geophysical Union (in 2002 and 2003). Her future plans are to attend law school in the fall 2004, with the intention of practicing in the field of environmental law. She is especially interested in water and natural resource law, oil and gas law, and international environmental policy.

Outstanding Student Award

Lynn Holik
Sam Houston State University

Lynn is a senior at Sam Houston State University majoring in geology and plans to complete her degree in December 2004. While at SHSU she has served as a member of the Student Advisory Counsel for the Department of Geography and Geology, whose members are chosen by the faculty in recognition of their contributions to the department. She works as a lab instructor and is a member of the Golden Key International Honour Society and the SHSU Association of Geology Students. She is currently the President of the Gamma Chapter of Gamma Theta Upsilon. Her undergraduate research project focused on the trace fossil Arthophycus. She has completed an internship at the Texas Research Institute for Environmental Studies (TRIES), and has worked on 3-D visualization techniques of geomorphic landforms in Death Valley, CA. In addition to being a full-time student, Lynn has a fulltime job with the Harris County District Attorney's Office and has two small children. After graduation, she plans to work in the field of environmental geology.

Outstanding Student Award

Shawn Miller
Lamar University

Shawn Miller is a junior at Lamar University majoring in geology. She has been named to both the President's List and Dean's List while she has been a student at Lamar. She is also a member of the Lamar University Geological Society. Shawn first attended Lamar in the spring of 1997, then entered the Delayed Entry Program for the Marine Corps. In the Corps she worked as an Airframer and Hydraulicsman on CH46E Helicopters and reached the rank of Sergeant in three years. She ran the Hydraulics Contamination Program, had two overseas deployments and received the Navy Achievement Medal. She participated in U.N.-led operations in Kosovo and in Operation Iraqi Freedom. Her active duty ended, after five years and eight months, in August 2003 and she then returned to Lamar University to continue work on her degree in geology.

GUEST NIGHT 2004, SATURDAY JUNE 19, WILL FEATURE NASA SCIENTIST DR. GORDON MCKAY ON THE TOPIC "RESULTS FROM SPIRIT AND OPPORTUNITY: TWIN ROVER GEOLOGISTS ON MARS"

*by **Linda Sternbach,** HGS Guest Night coordinator*

Everybody who remembers last year's exciting sell-out Guest Night program on lunar geology will want to sign up friends and family for this year's Guest Night program scheduled for Saturday night, June 19. Last year featured Apollo 17 astronaut Harrison Schmitt, who spoke on the moon's mineral resources and shared stories from landing on the moon in 1972. This year's program continues the topical space geologist theme, but the featured planet changes to Mars!

NASA has had incredible success since January 2004 landing and maneuvering the two rovers Spirit and Opportunity over vastly different areas of Mars. Right in our Houston backyard, the NASA Johnson Space Center, ARES program (Astromaterial Research and Exploration Science) is actively involved in analyzing the photos and readings from the 2004 Mars missions.

Dr. Gordon McKay will be presenting the latest analysis of the Mars rover science investigations at HGS Guest Night, Saturday June 19, Houston Museum of Natural Science. Dr. McKay is manager of the Astromaterials Research Office, part of the Space and Life Sciences Directorate. His office consists of a group of 14 PhD geologists, physicists and chemists. Their primary job is to improve our understanding of the origin, history and current state of our solar system through study of materials from space (web page: http://ares.jsc.nasa.gov). McKay received BA and MA degrees from Rice University and his PhD degree in geological sciences from the University of Oregon in 1977. His dissertation was "The petrogenesis of titanium-rich basalts from the lunar maria and of KREEP-rich rocks from the lunar highlands." From 1977 to 1979 he held a National Research Council Postdoctoral Research Associateship, studying the petrology and chronology of Apollo 14 soil. In 1980 he was hired as a staff scientist in the Solar System Exploration Division at the Johnson Space Center. In 1990 he became Chief of the Planetary Science Branch. He served as Acting Chief of the Earth Science and Solar System Exploration Division from 1999 to 2001.

See Guest Night registration form on page 18

Two members of his staff, Doug Ming and Dick Morris, have been onsite in California since January at the Jet Propulsion Laboratory (JPL), making sense of the data from the rovers. This team consists of about 30 scientists who evaluate and interpret data coming back from the rovers each day, formulate working hypotheses to explain that data, devise strategies to validate or disprove those hypotheses, prioritize rover science activities and ultimately put together the sequence of investigations that the rovers will undertake each Martian day (called a sol). They work 12–16 hours per day, 7 days per week, and, because they must work on Mars time, their work schedule shifts about 1 hour later each day. Dick Morris is also the Payload Downlink lead for the Moessbauer and Pancam instruments. He is responsible for validating science data returned from the rovers and for initial science product generation and preliminary interpretation for the science team. Ming has served throughout the mission as the lead for either the Geochemistry and Mineralogy or the Soil and Rock Physical Properties Science Team Groups. He is responsible for defining the science that will be conducted during the **Guest Night 2004** *continued on page 46*

Dr. Gordon McKay

Guest Night 2004 continued from page 45

sol for these science disciplines and then translating these science goals into specific observations and activities that the rovers will be commanded to perform.

Dr. McKay answered some email questions in March about the Mars rover mission and its preliminary findings:

HGS' questions in italics:

What were you doing the night Spirit landed on Mars and sent back photos?

Dr. McKay: I could not watch the landing on NASA TV. Instead, I flitted between the Webcast of NASA TV on my computer (not the best picture quality) and the live TV coverage on one of the news networks (with constant rather inane commentary by the hired expert covering up the technical comments about the progress of the entry, descent and landing by the people in the JPL control room). The landing was very suspenseful—I was practically holding my breath the whole time. Because I didn't have good TV coverage, I decided not to wait up for the first pictures. I knew it would be couple of hours until the airbags deflated and the lander unfolded. So, after Spirit landed and "checked in" safely, I turned in for the night.

First, as planetary scientists we are all absolutely thrilled with the information coming back from the rovers. These robotic vehicles are providing information in unprecedented detail from the surface of another planet.

How has the recent robotic missions to Mars impacted your department and your personal scientific investigations at Johnson Space Center?

Dr. McKay: First, as planetary scientists we are all absolutely thrilled with the information coming back from the rovers. These robotic vehicles are providing information in unprecedented detail from the surface of another planet. Of course it's too early to completely fathom the impact that the new data will make on our understanding of Mars—the science team has only had time to make preliminary interpretations of the raw data. There will be a long period of data crunching to get the most precise and accurate information about the composition and mineralogy of the rocks and soil. Also, as I write this, Opportunity has yet to venture out of its crater onto the plain, and Spirit has just reached the rim of Bonneville, so there are probably many new discoveries ahead.

However, the new information from Mars is sure to stimulate many investigations here on Earth. For example, we are already thinking about how we can combine the information from the rovers with our studies of Martian meteorites and our laboratory simulations of Martian processes to gain new information about Mars. For example, one major question is how do the basaltic rocks at the Spirit site compare with the basaltic Martian meteorites? If they are similar, then one might conclude that these basalts are common everywhere on Mars. If they are different, I would certainly want to conduct melting experiments to understand how each type might have formed. I am eagerly waiting for Spirit's detailed chemical and mineralogical analyses of those basalts.

Initial chemical and mineralogical information about the rocks in the outcrop at the Opportunity site also gives us ideas for future laboratory investigations. These rocks are nothing like any of the Martian meteorites currently in our collections, so we will have to be more imaginative in our studies. For example, these rocks may have been affected by evaporating brines, so we could do laboratory experiments on the effects of brines percolating through Mars simulant material and evaporating at the surface. As the science team releases new information, we are constantly discussing what we could do here at the Johnson Space Center to help interpret that information.

What are the important differences between the geological sites where Spirit landed and where Opportunity landed? Are the rovers finding the same rock results or are they very different?

Dr. McKay: The uniting theme between the two sites was that, prior to the landings, both sites were believed to have been affected by water. Spirit landed in Gusev crater, a broad depression believed to once have contained a lake. Opportunity landed in a small crater in Meridiani Planum, a broad plane that orbital evidence suggested abounds in gray hematite. This iron-rich mineral can form by chemical precipitation in lucustrine environments and can also form by hydrothermal alteration or even the thermal oxidation of volcanic materials without the presence of water.

So far, Spirit has not seen evidence for a lake in Gusev Crater. All rocks and soils (except for wind-blown dust) appear to be basaltic. The only evidence to date for water is in the form of white minerals found in cracks in one of the basaltic rocks, nicknamed Humphrey. The rock abrasion tool (RAT) drilled a shallow hole into Humphrey, and when the microscopic imager examined the bottom of this hole, it showed cracks filled with white material that the science teams have suggested crystallized from water percolating through the cracks. The water may have come from the magma that formed the rock, or may have interacted with it later. In any **Guest Night 2004** continued on page 49

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case, only a small amount of water was required to form these minerals.

In contrast, the evidence for water at the Meridiani site is much more exciting. Close examination of the outcropping bedrock layers has revealed an extremely high concentration of sulfur, probably up to several tens of weight per cent. This sulfur is in the form of salts such as magnesium sulfate (epsom salt) and jarosite (a hydrated iron sulfate). There are two principal hypotheses for the origin of these rocks. (1) They might have formed by direct sedimentation and chemical precipitation from a standing body of evaporating brine. (2) They might have formed by the chemical alteration of a pre-existing rock layer (for example, a pyroclastic deposit) through which brine might have percolated. Jarosite formation requires acidic conditions, and thus may point to the rock's wet history having been in an acidic lake or an acidic hot springs environment. In any case, these rocks are totally different from the basaltic rocks which we believe cover most of Mars. If they are chemical precipitates, they might be ideal for preserving any evidence of microbial life that might have existed on Mars. Such rocks would be the highest priority targets for returning samples to Earth for detailed study. The mini-TES (thermal emission spectrometer) instrument on Opportunity has also confirmed the presence of abundant hematite at the Meridiani site. It appears that the hematite is concentrated in the material above the bedrock layer, and is thus more abundant in the deposits out on the plain than in the materials within the crater where Opportunity landed. I'm sure we will learn much more about the hematite-rich material over the next few weeks when Opportunity leaves the crater.

Humphrey, a rock on Mars

Spirit has found evidence for alteration products deposited in cracks in Humphrey (see above). In addition, Spirit has found abundant olivine in the basaltic rocks, as well as magnetite. Depending on its abundance and composition, magnetite could indicate that the basaltic rocks at Gusev formed under more oxidizing conditions than most of the basaltic Martian meteorites.

What ideas about the geology of Mars have been completely changed by the results of the 2004 rover missions?

Dr. McKay: The jury is still out on this, but it's clear that the presence of water and probable sedimentary rocks at Meridiani is a major discovery. Even if the rocks turn out to have been originally pyroclastic deposits, that is still a major discovery. But, if they are water-lain sediments, that's huge. It has major implications for the habitability of Mars and the possibility that life could have existed.

Tell us about your role in the investigation of ALH84001, the meteorite from Mars that was announced to possibly have evidence of fossil life from Mars.

Dr. McKay: My primary interest in this sample has been in its mineralogy and petrology and in the origin and history of the carbonate globules within it. I conducted extensive petrographic studies of this sample using electron microprobes and SEMs. Based on these studies, I believe that the carbonates and associated silica were deposited by fluids percolating through fractures caused by shock events. Subsequent to carbonate deposition, the sample suffered at least one additional shock event that mobilized feldspar glass and fractured the carbonates. I have tried to leave questions of evidence for life within this sample to my brother, Dave McKay. ■

This year's HGS Guest Night, Saturday June 19, will be located at the Houston Museum of Natural Science, starting at 6:30 pm and continuing until 10 pm. Dr. Gordon McKay of NASA will speak in the IMAX theatre at about 8 pm. The night's activities will include a buffet dinner, Mars meteorite exhibits, free planetarium show and access to the HMNS science exhibits. Sign up on the HGS website using a credit card or use the fullpage ad in this issue on page 18 to send a check to the HGS office. The event is limited to 400 people and payment is to be made before the night of the event to hold you and your guests' places.

MARS METEORITE SAMPLES TO BE ON DISPLAY AT HGS GUEST NIGHT

*by **Linda Sternbach,** HGS Guest Night coordinator*

With all the excitement of the NASA rover missions to Mars, HGS members will want to attend Guest Night on June 19 for the "opportunity" to take a look at actual rock samples from the planet Mars that have been collected by NASA scientists, not on Mars, but from meteor falls in Antarctica. Several large samples of Mars meteorites that fell to Earth are going to be transported from NASA facilities in Johnson Space Center, in containers, to the Houston Museum of Natural Science to be on display, up close, for HGS members and guests to take a geologic inspection. The Mars meteorite display will be hosted by Astromaterials Curator at the NASA Johnson Space Center, Dr. Carlton (Carl) Allen. This will be a great opportunity to actually inspect some of the few Mars rock samples available in the world and ask questions to a knowledgeable expert. His Johnson Space Center group is responsible for the curation and distribution of NASA's extraterrestrial samples including the Apollo Moon rocks, Antarctic meteorites, and cosmic dust. During this decade NASA missions will collect samples of solar wind (Genesis) and a comet and interplanetary dust (Stardust), and NASA will collaborate on a Japanese mission to sample an asteroid (Hayabusa). During the next decade NASA will attempt to return samples of rock and soil from Mars. The JSC Astromaterials Acquisition and Curation Team is actively participating in these missions and has built an Advanced Curation Laboratory in which to design and test equipment and procedures to handle these new samples returned from space.

Dr. Carl Allen in Antarctica

Dr. Allen earned a PhD in planetary sciences from the University of Arizona, studying the interactions between volcanoes and ice on the Earth and Mars. As a Postdoctoral Fellow at the University of New Mexico, he researched formation mechanisms for Martian soil. Dr. Allen has demonstrated the extraction of oxygen from the soil and rock of the Moon. His current research is split between studies of bacteria in extreme environments and the unique requirements of a Mars sample return mission. His email contact is carlton.c.allen@ nasa.gov .

The following text comes from the JSC Astromaterials webpage http://curator.jsc.nasa.gov/antmet/antmet.htm

How Do We Know the Meteorites Are from Mars?

Over 30 meteorites worldwide have now been identified as Martian, based on unique chemistry. One meteorite, ALH84001, is ancient, 4.5 billion years, and is the only sample to tell us about Mars early history. Another meteorite in the Martian group (EETA79001) provided the key link to Mars, because it contained gases from the Martian atmosphere, which match those measured by the Viking spacecraft that landed on Mars in 1976. The other Martian meteorites are all geologically young, 180 million years to 1.3 billion years.

How Did The Meteorite ALH84001 Form on Mars and Get to Earth?

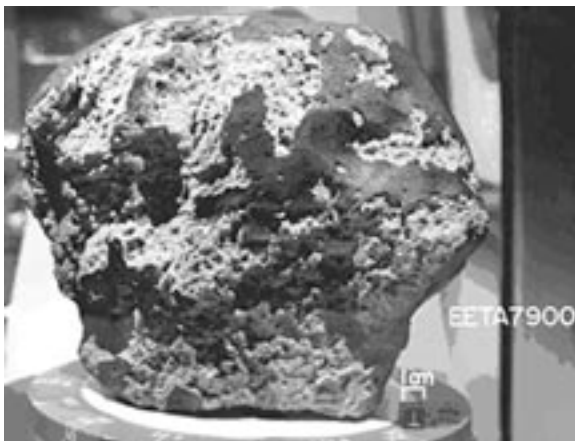
The meteorite cooled into solid rock about 4.5 billion years ago beneath the Martian surface. Subsequently, the rock was extensively fractured by impacts of meteorites into the Martian surface. Very early in Martian history, when Mars was likely warmer and wetter, a fluid is believed to have penetrated fractures in the rock resulting in the formation of carbonate mineral deposits estimated at 3.6 billion years old. Sixteen million years ago, an asteroid struck Mars, excavating and ejecting pieces of the rock with enough force to escape the planet. This particular piece of Mars wandered through space until it fell in Antarctica 13,000 years ago. To be ejected from Mars a rock must reach the escape velocity of 5 km/sec, which is more than five times the muzzle velocity of a hunting rifle. During impact the kinetic energy of the incoming projectile causes shock deformation, heating, melting, and vaporization, as well as crater excavation and ejection of target material. The Martian meteorites show low to moderate degrees of shock that appear to require a special mechanism to boost them to the escape velocity and eject them from Mars. The impact **Mars Meteorite Samples** *continued on page 53*

Mars Metororite Samples continued from page 51

and shock provide an explanation for why the Martian meteorites are all igneous rocks. Martian sedimentary rocks, and certainly soil, may not be sufficiently consolidated to survive the impact as intact rocks, which might later land on Earth as meteorites.

Antarctic Collection of Mars Meteorites

Antarctica is a very special place to collect meteorites. As many meteorites have been recovered in Antarctica as in the rest of the world combined. This remarkable rate of meteorite discovery is due to special conditions in Antarctica. Meteorites fallen on Antarctic ice are preserved for long periods of time. The meteorites are moved along by glacial ice, which concentrates the meteorites where the ice comes up against a rock barrier, and gradually erodes away. Dark meteorites, even small ones, are also easy to find on the ice. After collection, the meteorites are shipped frozen to the Antarctic Meteorite Processing Laboratory at NASA Johnson Space Center. It is a special clean lab similar to that which houses the Apollo Moon rocks. The meteorites are thawed in stainless steel glove cabinets containing nitrogen gas. This drives off all the water and ice that could otherwise rust the metal in the meteorites. The cabinets also keep the samples clean from many types of possible contaminants; therefore most samples are stored in these cabinets.



Large sample of Mars meteorite EETA79001, collected on Earth in Antarctica.

Curation of meteorites involves storing, describing, classifying, and announcing new meteorites for study, and later splitting them for distribution to investigators around the world. Most meteorites are described and split into smaller chips on flow benches using clean tools.

Identification of Martian Meteorites

Scientists use mass spectrometry to measure the age and isotopic composition of meteorites and other rocks. Meteorites (different compositions are called chondrites, achondrites, irons, and stony irons), to lunar and Martian meteorites, are indeed valuable assets in exploring the origin and history of the solar system. The young ages for several of these meteorites made more sense if the meteorites came from a large body like a planet rather than a small one like an asteroid. The clincher was measurement of noble gas isotopic composition of gases in dark glass in Antarctic meteorite EETA79001. The gases were the same composition as those measured in the Mars atmosphere by the Viking lander spacecraft, and distinct from gases on Earth and in other meteorites. An origin on Mars is thus very likely, and indeed widely believed, for this group of 12 igneous achondrite meteorites. However, this Martian origin is not certain, because we don't have documented Martian rocks for comparison.

Martian meteorites tell us about several processes occurring at various times throughout Mars' history. The story begins with Mars' differentiation into core, mantle and crust very soon after planet formation at 4.5 billion years ago. The oldest Martian meteorite crystallized from a magma soon thereafter. The younger Martian meteorites show us that igneous volcanism continued until at least 1.3 billion years and probably 170 million years. Impacts occurred on the surface throughout Mars' history. Studies of the lightest elements that make up the atmosphere tell us that Mars' atmospheric evolution was very different from Earth. Some of the lightest gases from Mars atmosphere were lost to space throughout time. Many of the Martian meteorites show some evidence of interaction with liquid water. Some have igneous minerals with a little water, but most have alteration products especially salts and clays) caused by weathering.

Don't miss seeing Martian meteorite samples from NASA at HGS Guest Night, Saturday, June 19, at the Houston Museum of Natural Science. Sign up using the HGS webpage or sign up sheet in this issue on page 19! ■

Oil and Gas Proven Reserve Reductions: A Geologist's Perspective

by ***Arthur E. Berman***

Introduction

In early January 2004 the Royal Dutch/Shell Group announced nearly a 4 billion barrel reduction in proven oil and gas reserves. In February El Paso followed with a 41% reduction in its reserves. In March Shell again reduced its reserve estimates another 250 million barrels in one Norwegian field alone. Now other companies including Husky and Forest are announcing cuts and surely we are only seeing the beginning of a trend that will likely continue at least through the end of 2004.

I have gotten calls from colleagues, family and investment analysts asking, "What does all this mean and how is it possible for proven reserves to disappear?"

Newspapers and petroleum industry journals have provided ample commentary on how this situation could have arisen ranging from executive deception and greed to the "artistic" nature of reserve estimation. A headline in the March 21, 2004 *San Jose Mercury News* proclaims "Estimates of oil reserves based largely on guesswork".

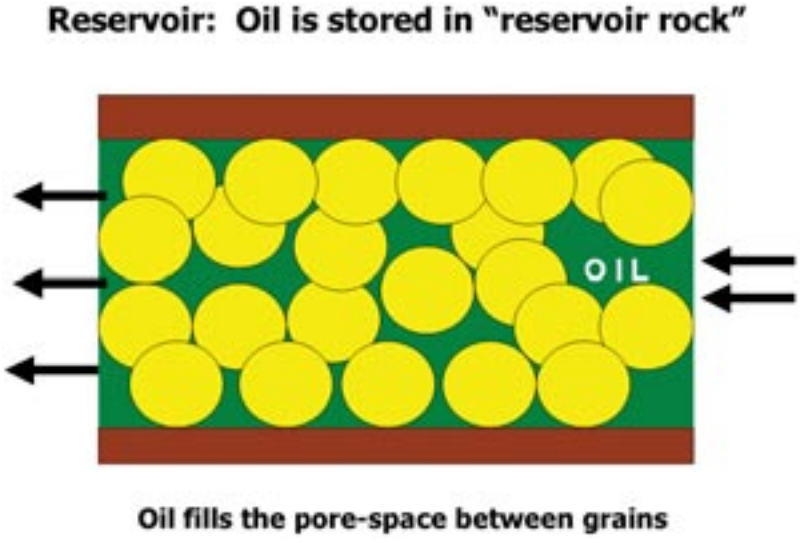
I have gotten calls from colleagues, family and investment analysts asking, "What does all this mean and how is it possible for proven reserves to disappear?" I have had conversations with a prominent New York City law firm planning a class action suit against Royal Dutch/Shell on behalf of its shareholders asking how they should understand the damage to their clients.

Published explanations by investment and industry pundits emphasize failure of SEC regulations, liberal interpretations of these guidelines by certain companies, the lack of qualified reserve certification analysts and outright deception and corruption on the part of industry executives.

I read a thinly disguised agenda into many of these commentaries. The most noteworthy is an article by Ronald Harrell, CEO of Ryder Scott Company, in which he makes a case for the need to certify reserve analysts to avoid recurrence of this kind of problem (*Oil and Gas Journal*, March 14, 2004). The implication is clear: don't use ordinary geologists, geophysicists and engineers for reserve studies because they will make mistakes; it should be a law that only companies like mine, Ryder Scott (and, unfortunately, our competition Netherland Sewell, Dames and Moore, etc.) be allowed to do this important work.

Right. That will give us the same confidence that companies like Arthur Anderson brought to the accounting world recently.

I write this article to present a perspective that, so far at least, I have not seen in the press. There are abundant technical causes for significant changes and re-interpretations of proven reserve estimates particularly in fields in early phases of development. My intent is not to apologize for the petroleum industry or to validate the claims that reserve determination is either an art or a science or that it is based on guesswork. My objective is simply to describe the factors that can and regularly do create revisions in resource assessments in the oil and gas business. I will add that the incorporation of modern seismic and petrophysical techniques into the process and methodology alone may be enlightening even to those who understand the technical aspects of a reserve certification.



Perhaps my discomfort with reports on the current reserve reduction issue (will some journal eventually call this "reserve-gate" so we don't get confused?) is symptomatic of an era in which journalists repeat press releases and information presented at press conferences as the truth. Apparently investigative reporting is out-of-fashion or is not judged to have a market.

Oil and Gas Proven Reserve *continued on page 56*

Oil and Gas Proven Reserve Reductions

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I have participated in reserve determinations where major changes in both oil and gas in-place and proven reserves have resulted solely from new technical information or interpretation methodologies. In these cases changes were made at staff, technical levels well in-advance of any executive direction for change or revision.

In the case of the Shell reserve write-down there is almost no data available to evaluate the cause of the "problem" largely because investigative journalism is not functioning to reveal this information. I have gleaned the following from the press:

1. Much of the Shell reductions come from two gas fields: Gorgon in Australia and Ormen Lange in Norway. Neither of these fields have yet produced a cubic foot of gas and partners in both fields like ChevronTexaco and ExxonMobil have taken a "what me worry?" public posture.
2. Another source of Shell's write-downs is from the Niger Delta region of Nigeria where Shell has been the main operator of oil production for decades. Shell's conduct is blamed by indigenous groups in that area for every sort of political, social and environmental abuse. There is some evidence that Shell's overstatement of reserves may have been to maintain the favor of the Nigerian government in its OPEC and national posturing.

Assuming that these are, in fact, the chief sources for Shell's reserve re-statements then we must evaluate two different causes for the changes. The Niger Delta situation seems to be less technical and more political and economic in nature. I have heard that there is a technical issue here in the estimation of reserve replacement but this is a separate issue in my opinion. The Gorgon-Ormen Lange situation seems more closely related to the reserve estimation question that has been emphasized in the press.

Oil and Gas Reserves Are Not Disappearing

I want to clarify an important but not necessarily obvious point in the reserve reduction debate of 2004: none of the reserve reductions announced so far suggest that any oil and gas has disappeared. The revisions announced by Shell and El Paso involve moving reserves from the proven category to the probable category; there are likely correlative shifts from the probable to the possible category as well but I have not seen discussion beyond the first order shift from proven to probable reserves.

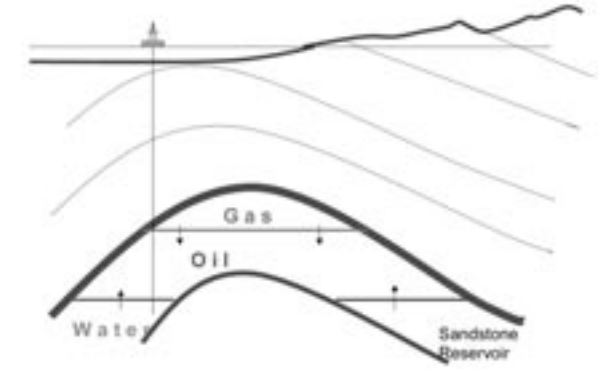
I will not complicate the issue or this article by discussing the finer points of definition that are used in the petroleum industry for these categories nor will I digress into the SEC's or any other regulatory agency's interpretation or use of those terms.

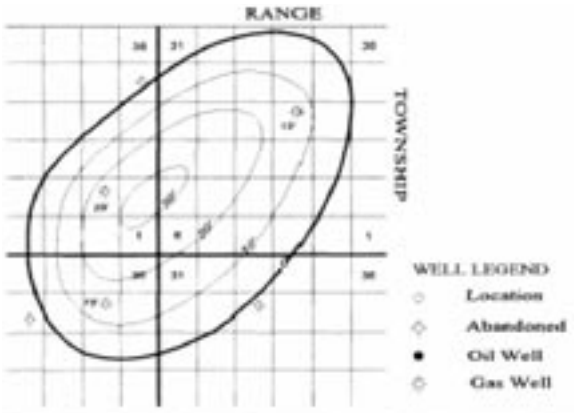
Proven reserves means what it says: the volumes of oil and gas assigned to this category have been directly proven by tests or reliable measurements in a well and reasonably extrapolated beyond that well using information from other wells.

What could cause volumes of petroleum to be moved from proven to probable? New information based on additional tests, measurements and production history. In the early stages of field development reserve estimation is based almost entirely on volumetric calculations. Simply stated this means the size of the reservoir container (gross rock volume) above an oil or gas/water contact reduced by the percentage of that volume not available for petroleum recovery.

Basic Concept I: Petroleum/Water Contact

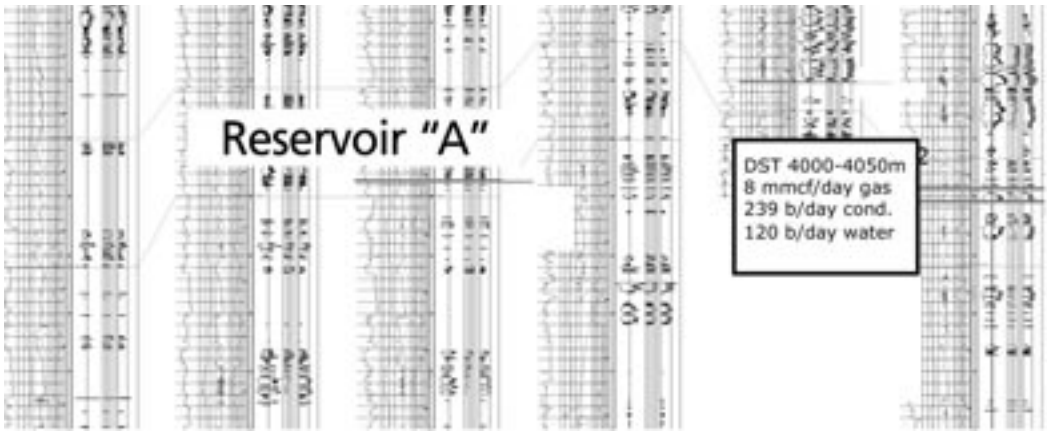
In the simplest case an oil or gas field is defined by a structural closure above a petroleum/water contact. If the petroleum/water contact is known then a gross volume above that contact can be simply calculated.





Mapped Gas Pool

In the case of Royal Dutch/Shell the big reserve reductions occurred in fields currently under development such as Gorgon (Australia) and Ormen Lange (Norway). In cases such as these many wells available for free water level determination are disposable exploration wells possibly drilled several years ago with limited tests. More recently drilled appraisal wells commonly have either drill stem tests (DSTs) conducted in cased hole and/or actual development wells with some production history.



Structural Cross-Section

In the structural cross-section only one well has a drill stem test in Reservoir "A".

Well #5 tested significant amounts of gas and condensate but also tested water. Has the gas/water contact been found in this well? Factors such as the salinity of the water and the predicted volume of water condensed from natural gas must be considered. In this particular case some of the tested water is interpreted as formation water though some of it is probably condensed water and water derived from formation invasion by drilling mud.

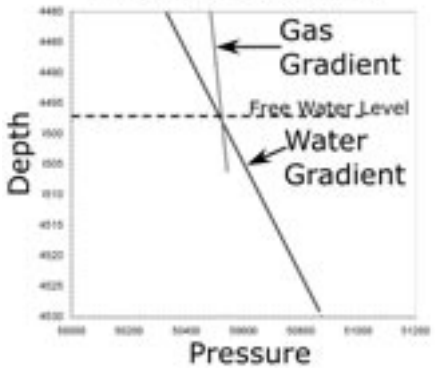
The gas/water contact is, therefore, interpreted to lie within the tested interval of 4000-4050 meters. Should the contact be placed at or near the bottom of the interval or somewhere higher? Every meter higher will reduce the gross rock volume across the closure. In an early stage of field development the contact will probably be placed near the bottom of the tested interval. Later tests or production might cause the contact to move either up or down. If the contact later is moved up, for example, 10 meters this could result in a 20% reduction in proven reserves for this reservoir. Suddenly the Shell and El Paso reserve reductions are placed in a context that makes them seem less extreme and, perhaps, less suspect.

Basic Concept II: Free Water Level

All petroleum accumulations have a transition zone some interval above and below the petroleum/water contact. This means that for some height above the petroleum/water contact a combination of, in this case, gas and water will be produced. somewhat higher above the contact water-free petroleum will be encountered and at some depth below the contact petroleum-free water will be encountered.

In order to accurately calculate the volume of recoverable, proven reserves in a given reservoir the *free water level* must be determined. The free water level and the petroleum/water contact are not the same. Furthermore, a free water level can almost never be determined by a physical formation test but must be determined by combining well pressure test data and capillary pressure test data taken from cores taken from the well. Without getting involved with the technical details it is obvious that this determination will be made from a relatively small number of intervals and samples that were taken from both the petroleum- and water-productive intervals of a well. This is virtually impossible to achieve in an exploration well and difficult even in a development well.

A Pressure-Depth Plot can be made with pressures derived from a combination of drill stem tests, pressure tests and production tests. Pressures from the gas interval should plot on a single pressure gradient and pressures from the water interval on another. The intersection of these gradient lines defines the free water level. The free water level may be definitive or not depending on the number and type of data points; it may support or not support drill stem or production test interpretations. An interpretation that integrates all data must be made but this may change as more information is gotten particularly as the field goes on production.



Pressure-Depth Plot

Assume that a reserve estimation is determined based on methods described for petroleum/water contact and free water level. Later additional or better pressure test or production history information will be gathered. If a production well prematurely produces water the free water level interpretation must be revised upward. If water is produced, say, after a year or so from a zone 10 meters higher than the free water level interpretation this will result in a 20% proven reserve **Oil and Gas Proven Reserve** *continued on page 58*

Oil and Gas Proven Reserve Reductions

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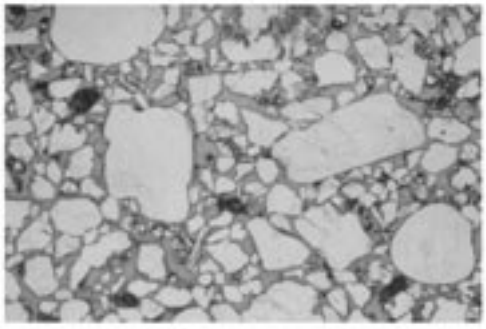
reduction for this particular 50 meter-thick reservoir based solely on water contact and free water level interpretation.

Basic Concept III: Petrophysics—Porosity, Water Saturation and Permeability

Everything described so far has dealt with gross rock volume, that is, the total volume of reservoir rock above the petroleum/water contact and free water level. Not all that volume contains petroleum and water of course. The rock only has space available for fluids between rock grains. This is called pore space.

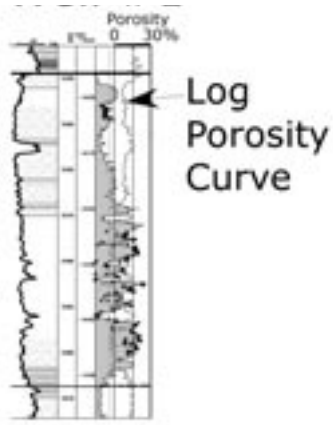


Photomicrograph of a Sandstone Reservoir Rock

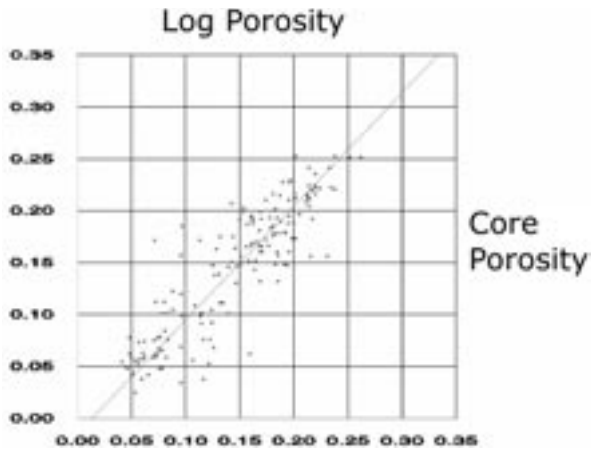
Unconsolidated sand on a beach, for instance, may have 35% pore space or porosity, the unit measure of pore space percent. Rock obviously will have less porosity due to burial compaction, cementation and other diagenetic factors.

Most porosity data available for a reserve estimation comes from wire-line logs that measure rock and fluid properties around the well bore. Porosity logs give a reasonable estimate of porosity based on certain assumptions including the density and mineralogy of the rock grains as well as the composition of fluids in the pore space.

Porosities measured from wire-line logs must be compared with and calibrated to porosity measurements taken from core samples over the same intervals of the well. Commonly only a few core porosity measurements are available for every 100 or more meters of log porosity. An adjustment is made to the log porosity based on comparison with corresponding core porosity measurements. From the cross-plot example the placement of a "best fit"



Well #1 Porosity Log



line through the data points is, as always, an interpretation. If the error range is 20% in a rock whose porosity averages 20% the affect on overall pore volume available within the gross rock volume may be +/- 4% of proven reserves.

Once porosity is determined the petrophysicist must then determine the percent of pore space that is filled by petroleum and water, respectively. This is called *water saturation*. Water saturation is determined more empirically than porosity, that is it is deduced from porosity and other petrophysical properties. In modern reserve determinations there is sufficient doubt about calculated water saturations that often this is calculated as a height function above free water level using capillary pressure data derived from cores. I have already explained the potential for adjustment in free water level so it is safe to say that at least an equal chance for adjustment in water saturation is possible with more test or production data.

A third and crucial petrophysical parameter is permeability, the ability of fluid to move through the pore spaces in a reservoir rock. Permeability determines how much of the petroleum stored in the reservoir pore space can be moved and economically produced. Since permeability is measured from core samples and cannot be determined from wire-line logs an empirical relationship between porosity and permeability must be determined by cross-plotting. This approach has all the inherent errors already explained in the example of cross-plotting log vs. core porosity. The correlation or transform between porosity and permeability becomes less reliable in lower porosity intervals of the reservoir which volumetrically may contain significant amounts of petroleum especially gas due to limitations of the wire-line tool.

The combination of porosity, permeability and fluid composition is used to determine a *recovery factor*, the percentage of petroleum in-place that can be reasonably and economically produced. Permeability has the most pronounced affect on recovery factor of all the factors. A change in assumed permeability that results

from more test or production data will have a one-to-one affect on recovery factor and therefore proven reserves. A 20% reduction, for instance, in overall average permeability will reduce proven reserves by 20% for that reservoir interval.

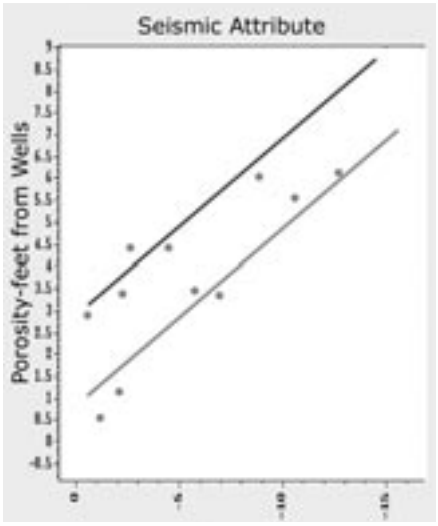
Basic Concept IV: Seismic Definition of Structural Closure and Fluid Contact

Almost no prospects are drilled today by major oil companies without some seismic data and few prospects are drilled without 3D seismic data. Advances in the acquisition and processing of seismic data have been spectacular during the past decade or so as computer technology has permitted increased imaging capability in the subsurface.

Early in the development of an oil or gas field seismic is used as the primary means to define structural closure and, therefore, volumetric calculation of reserves. Since seismic data is measured in the time domain an algorithm must be developed to convert time structure to depth structure. Initially this is accomplished based on a velocity model that takes into account the major, known vertical changes in geology that affect the travel and return time of seismic waves to and from the reservoir horizon. Lateral changes in velocity field are far more problematic. Velocity uncertainty is increased in areas with salt, shale or volcanic bodies in the sedimentary column as well as in the case of anisotropic reservoir and non-reservoir layers.

Typically as wells are drilled the seismic structure maps are "flexed" or mechanically manipulated to match the at-well values for reservoir tops and bases. As understanding of the petrophysics of both reservoir and non-reservoir rock improves the velocity model must become more sophisticated and complex in order to match the well data and predict development drilling locations. At some point in field development changes or surprises in petroleum/water contact, free water level, porosity, permeability and water saturation must be incorporated into the seismic model. Several generations of seismic processing and acquisition commonly occur in the life of an oil or gas field.

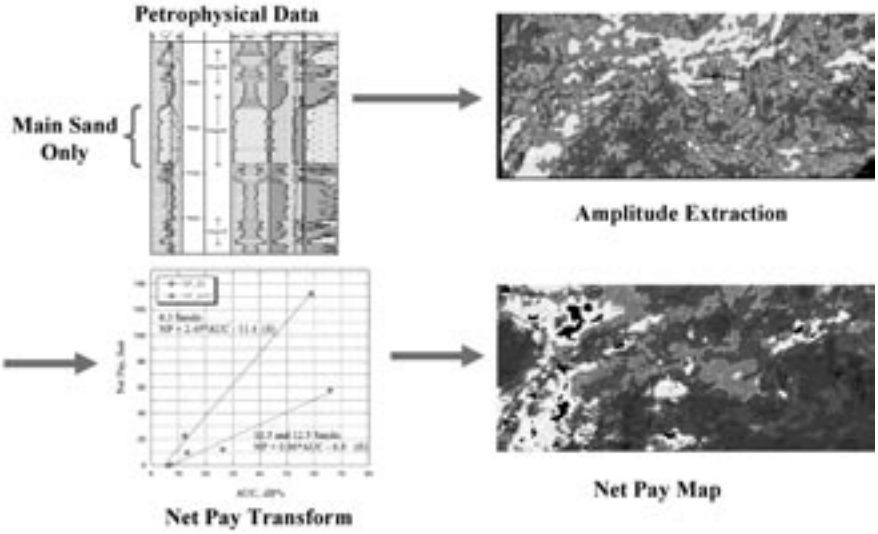
Seismic data is essential to carry reservoir and fluid properties from wells to areas between wells. As reservoir simulations and material balance calculations become more sophisticated with increased production history seismic interpretation is required to define reservoir compartments, baffles and seals as well as to provide direct imaging in some cases of direct fluid indicators.



Increasingly seismic attributes such as amplitude, impedance or coherence are used to predict and map fluid and reservoir properties in developing oil and gas fields. The process is similar to the geologic, petrophysical methods described previously. Seismic attributes are calibrated with rock properties measured in wells and correlated away from the wells.

Correctly calibrated well and seismic attributes such as amplitude or impedance allow conversion to net pay using rock property transforms. The reservoir distribution detail that can be accomplished away from well control greatly exceeds what could be done by facies and depositional environment mapping in the past. A liability is that, as in the example shown above, the calibrated reservoir distribution is less continuous than in the initial assessment. In this particular case the number of wells required to drain the field's reserves exceeds the economic limit; previously proven reserves must be moved into probable or even possible categories.

It is increasingly common to perform a seismic inversion that starts from petrophysical and lithologic well data and produces a seismic response to **Oil and Gas Proven Reserve** *continued on page 60*



Amplitude Extraction to Net Pay

Oil and Gas Proven Reserve Reductions

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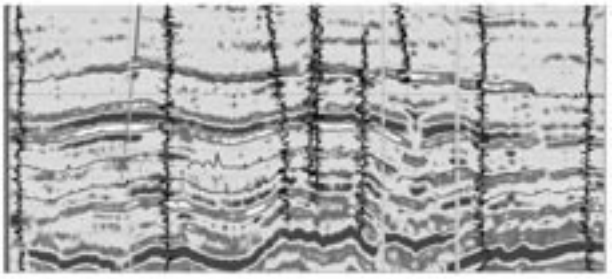
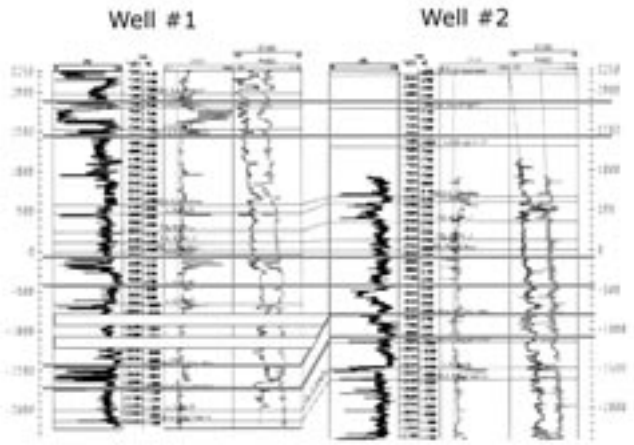


Seismic Inversion



Reservoir Zonation Using Sequence Stratigraphy

match those rock properties. Detailed reservoir zonation using sequence stratigraphy for correlation permits accurate seismic facies identification and time-stratigraphic interpretation of seismic data. This approach yields a far more realistic view of reservoir connectivity and continuity.

Well data by definition is sparser than seismic data and the geologic interpretation of structural and stratigraphic well information is almost always simpler than the seismic data can provide. As calibrated seismic imaging is used to map reservoir quality, fluid contacts and structural configuration much can change. A subtle variation, for instance, in the velocity model and resulting time-depth conversion can modify the gross rock volume under closure by significant amounts. Likewise seismic attribute and fluid content mapping often results in important revisions to net rock volume.

What It All Means

Most advances in sophistication of geologic and geophysical models in the early phases of field development result in downward adjustments in proven reserves. Later in the development and life of an oil and gas field this tendency is sometimes reversed. This is a subjective and personal observation and not a demonstrable truth.

I present this brief and incomplete overview of some of the factors that go into a modern field assessment to illuminate the many, purely technical factors that can affect changes in proven reserves. In the publicized case of Royal Dutch/Shell I cannot and should not speculate on the reasons and motives behind the recent downward revisions. My reaction, however, as a technical scientist is that we should exercise caution and restraint in evaluating announced reserve revisions until explanations are given that go beyond the purely reactive and speculative stage we now are experiencing. Ordinarily the considerations I have described would not become public information until the fields were rather fully developed and, even then, the presentation of this information would be given in the highly technical environment of engineering and geoscience conferences. Perhaps the controversy and reaction to the Royal Dutch/Shell and forthcoming proven reserve reductions will force some of this information into the public sector. ■

GeoJob + Lisitings

The GeoJob Bank is a truly awesome and useful feature of the HGS Website both for employers and for those members and web surfers who need a job. I think most job-seekers are familiar with the GeoJob Bank but perhaps don't know about or look often enough at the "GeoJob+ Listings" that can be found at the end of the current job listings but is better accessed as described below.

GeoJob+ Listings contains many valuable links to companies that have open positions but have not been submitted to our Website. They are added as the HGS's GeoJob Banker Mike Cline becomes aware of them. If you know of job positions please let Mike know at mikec@txresources.com

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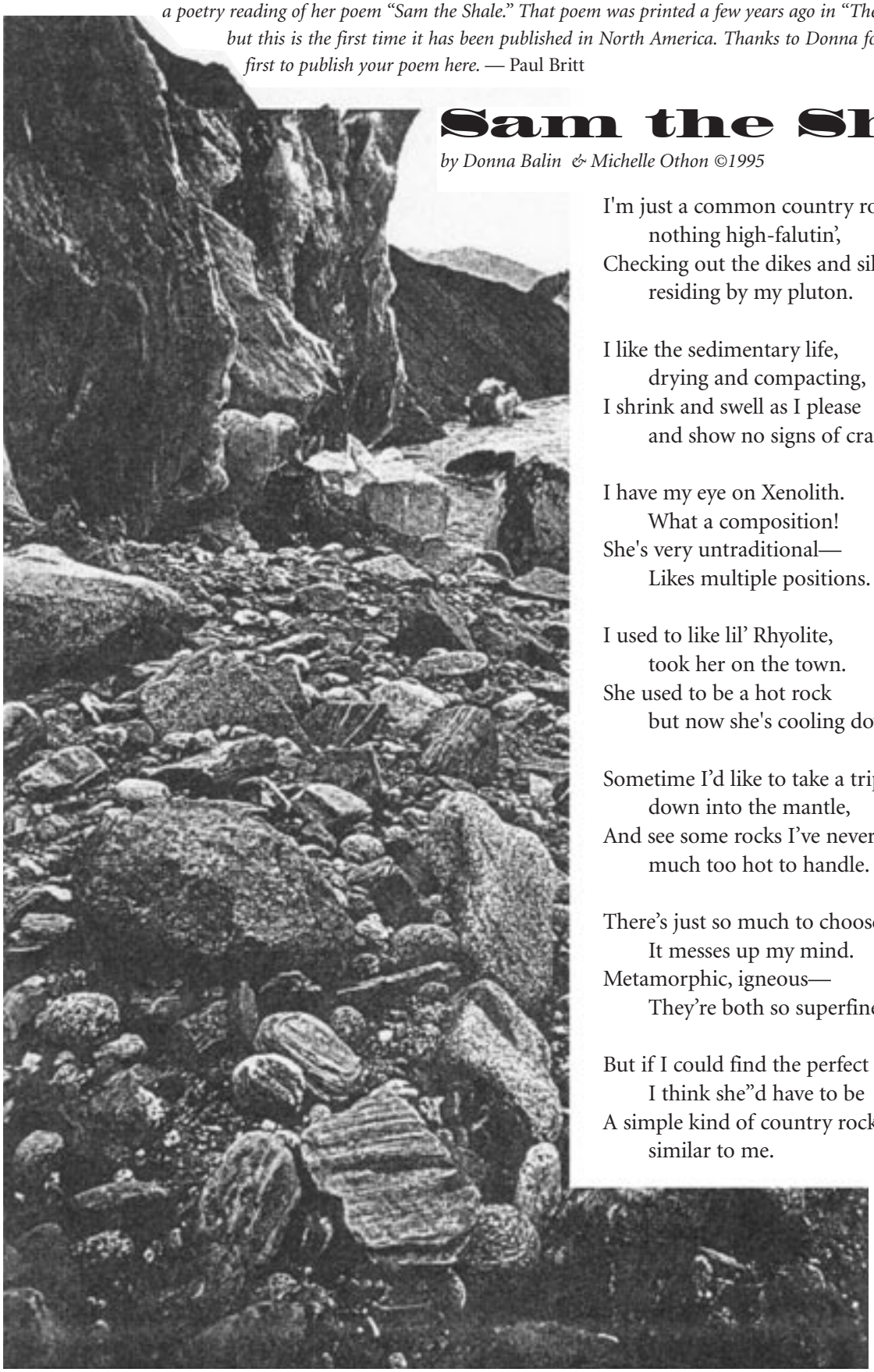
Click "Categories" on the GeoJob Bank Main Menu

Select either the specific job you are looking for (Geologist, Geophysicist, etc.) or click below on "To Search the entire Job Bank…" to see everything.

Several years ago, a group of us were in Austin for the annual SIPES Convention, and as is the occasional practice, we convened to a bar in the hotel after a long day of meetings and technical talks. One of the SIPES (and HGS) members from San Antonio, Dr. Donna Balin, was in attendance for this occasional event. Sometime into the evening, after an increasingly serious discussion of geology, petroleum, politics and such, Donna disclosed to all that she was also a poet. After retrieving a yellow oversized papier-maché cowboy hat from her car, she did a poetry reading of her poem "Sam the Shale." That poem was printed a few years ago in "The Edinburgh Geologist," but this is the first time it has been published in North America. Thanks to Donna for allowing us to be the first to publish your poem here. — Paul Britt



Sam the Shale

by Donna Balin & Michelle Othon ©1995

I'm just a common country rock,
nothing high-falutin',
Checking out the dikes and sills
residing by my pluton.

I like the sedimentary life,
drying and compacting,
I shrink and swell as I please
and show no signs of cracking.

I have my eye on Xenolith.
What a composition!
She's very untraditional—
Likes multiple positions.

I used to like lil' Rhyolite,
took her on the town.
She used to be a hot rock
but now she's cooling down.

Sometime I'd like to take a trip
down into the mantle,
And see some rocks I've never seen,
much too hot to handle.

There's just so much to choose from,
It messes up my mind.
Metamorphic, igneous—
They're both so superfine!

But if I could find the perfect rock,
I think she"d have to be
A simple kind of country rock,
similar to me.

Sam the Shale

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Sam the Shale continued from page 65

Biographical Sketch

Donna F. Balin received her BS in geology from the University of Texas at Austin and her PhD from the University of Cambridge in England. For her dissertation, she worked on Old Red Sandstone fluvial and eolian sedimentation in eastern Scotland. Donna is a consulting petroleum geologist in San Antonio (Balin & Associates) and presently holds the position of Visiting Professor in the Geosciences Department at Trinity University through May 2004. She recently served as Vice President of the South Texas Geological Society and currently serves on its Executive Committee. She is working with her husband, Andrew R. Scott, on two Department of Energy grants to evaluate the bioconversion of coal into methane. She has been a member of the Houston Geological Society since 1997.

Michelle A. Othon received her BS in geology from the University of Texas at San Antonio in 1996. As a student, Ms. Othon worked for the USGS in San Antonio, and then upon graduation, moved to Niskayuna, New York, to work for General Electric Global Research Center as a Materials Analyst in 1998.

Currently, Ms. Othon is working in the Electron Back-Scattering Diffraction group. Research interests include developing methods for visualizing residual plastic strain, identification of novel phases in diffusion multiple samples and grain size/texture analyses.

Ms. Othon's goal in life is to maintain her literary association with Dr. Donna Balin and continue writing "Geo-Poetry" to touch the lives of geologists throughout the entire galaxy. In her spare time, Ms. Othon is going back to her Texan roots and learning to play the banjo.

HGA *and* GeoWives **News**

HGA ANNUAL BUSINESS MEETING AND LUNCHEON

by ***Betty Alfred,*** *President*

May finds us completing a busy year for HGA with our annual business meeting and luncheon and style show presented by Stein Mart at the Junior League on Monday May 10th. It's a great way to end a successful year and I have been honored to be your President and have been touched by the warmth and friendship of so many. You have all been so gracious and I extend to everyone my sincere appreciation for your support.

My thanks to a great group of officers and all the efforts of these ladies:

Norma Jean Jones, first Vice-President, for her caring and meticulous planning of our parties.

Audrey Tompkins, second Vice-President, for collecting dues and organizing callers to encourage membership renewals and enlisting members.

Anne Rogers, third Vice-President, our SOS chairman for the HGA and supervisor of our news articles for the HGS *Bulletin.* Anne graciously hosted a board meeting for us.

Jennifer Biancardi, Secretary, has recorded our minutes for us and presented them in a timely manner.

Norma Jean Bacho, Treasurer, has kept good financial records and paid all our bills.

Gwinn Lewis did a terrific job preparing our yearbook, having our April board meeting and a Tea honoring Myrtis Trowbridge, our recipient of the HGA/HGA distinguished service award. Congratulations, Myrtis! We are proud of you.

Millie Tonn, Historian/Photographer, circulated at all our events busy filming her photo-shoots.

Lois Matuzak has done a top-notch job as Editor of the *Electic Log.*

Thanks to our Directors, **Margery Ambrose, Mary Jane Berryman, Lois Matuzak** and **Jan Stevenson** and to each of our party chairpersons and their committees.

Daisy Wood, who planned our always successful and popular Game Day.

Kudos to **Audrey Tompkins** for being the chairperson of Cinco Mas Bridge group and **Daisy Wood**, chairperson of the Petroleum Club Ladies Bridge group.

Join me in welcoming the lovely **Margaret Jones** as she assumes the responsibilities as our new President. We all wish her a wonderful year to come.

God bless you all,
Betty

GeoWives

Our social year has flashed by like the landscape from a moving train! Geowives has not even paused for breath and aside from our regular monthly programs we have held several play-readings. The last one hosted by Pat Burkman featured Paul Rudnick's "I Hate Hamlet" with Jim Wood and David Matuzak who were incredibly effective, Jim in the role of John Barrymore and David in the lead part of a [illegible] reluctant Hamlet. Pat Burkman also hosted the "Spring Fling Member Talent Show" on Sunday, April 25.

The May 17 annual luncheon and installation of officers at the home of indefatigable Anne Rogers will bring our social year to an end and …suddenly it will be summer!

We cannot end this report without blowing a kiss to Martha Lou Broussard who organized a superb day trip to Independence and Brenham—an event that was not only thoroughly enjoyable but highly instructive. Linnie Edwards gave Martha Lou a hand and the result was an outing that stimulated one's interest and pride in Texas history. We are already looking forward to Martha Lou's next year's day trip. Bravo, Martha Lou! Gracias, Linnie! That was the best March 13 ever.

A parting thought: With all the incredible happenings in our world of today…aren't we truly fortunate to be here, in the United States of America? Well, aren't we?

Your Prez,
Dolores Humphrey