Geophysical Society of Houston

VOL. 33, NO. 7 NEWSLETTER MARCH 1999

I N S I D E

GSH Meetings

Articles and Comments

Social Events

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GSH Joint Dinner Meeting w/HGS

Date: Monday Mar. 8, 1999
Place: Westchase Hilton, 9999 Westheimer
Time: 5:30 Social
6:30 Dinner

Reservations: Make or cancel reservations by March 4. Call (713) 917-0218 event code 5-0-1 or email reservations@hgs.org. You MUST include a name and a contact telephone number for every person for whom you are reserving or canceling a place. HGS members are requested to provide their HGS member number. This dinner will replace our technical luncheon meeting for the month of March.

About Geophysics, Geology, and Regional Hydrocarbon Systems - a discussion that contrasts the Gulf of Mexico with Northeastern Venezuela

A.W. Bally, Emeritus Professor, Dept. of Geology and Geophysics, Rice University, Houston TX

Comparing and contrasting the Gulf of Mexico with Northeastern Venezuela illustrates the importance of regional geology, based on the integration of old-fashioned surface geology with modern subsurface geology and interpretation of regional seismic reflection profiles.

The Gulf of Mexico and northern Venezuela both formed as Mesozoic passive margins connected with the North Atlantic, and were initiated by an Upper Triassic-Jurassic rifting phase that was followed by the deposition of widespread evaporites limited to the Gulf of Mexico. By Mid-Cretaceous times, the whole area formed part of the Tethys carbonate passive margin.

Important hydrocarbon source bed intervals were formed during the Jurassic and Cretaceous in the Gulf of Mexico. In Venezuela, however, the main source bed is the Upper Cretaceous La Luna formation, which is less prominent in the Gulf of Mexico.

Beginning with the Senonian, the Gulf of Mexico and Venezuela follow widely different plate tectonic evolutions, leading to a great variety of hydrocarbon systems and traps. Thus, the northern Gulf of Mexico develops into one of the world's largest petroliferous siliciclastic depocenters, characterized by complex growth faulting and some of the most spectacular salt tectonics ever observed. However, the western Gulf of Mexico is incorporated into the Paleogene and Neogene folded belt of the Sierra Madre in the north, the Neogene folded belt of the Sierra de Chiapas-Campeche in the south, and the uplift of the Mexican plateau. Both folded belts are conjugate to the west-dipping subduction zone that was active on Mexico's West Coast.

Northern Venezuela develops in an overall transpressional setting related to relative eastward indentation of the Caribbean plate. This process leads to the basement-involved compressional Neogene uplift of the Western Andes and the decollement folded belts of the Cordillera de la Costa and the Serrania del Interior. An eastward migrating Upper

Cretaceous-Paleogene-Neogene foredeep is associated with the relative eastward displacement of the Caribbean plate. Towards the Orinoco Delta, this foredeep merges with the preserved Atlantic margin. The northern Venezuela offshore is

GSH Joint Dinner continued on page 3

GEOPHYSICAL SOCIETY OF HOUSTON

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characterized by extensive transtensional faulting related to complex strain partitioning associated with the Bocono-El Pilar strike slip fault system and the boundary zone of the Caribbean and South American plates.

The comparison of the Gulf of Mexico with northern Venezuela illustrates that model earth systems of the future will have to link phenomena that occur at widely differing scales: this can be achieved with the help of integrated regional geological studies. In this context, the role of regional 2D and 3D reflection seismic surveys are the corner stones for an in-depth understanding of hydrocarbon systems.

This brings us to the important role of 3D regional seismic surveys. I believe that the future of regional tectonics will be completely re-cast as soon as regional seismic 3D surveys will become available for study to a larger community. Exposure to industry 3D data sets in a number of areas of the world leads me to conclude that discordantly superposed tectonic levels are ubiquitous. Typically, higher relatively brittle levels are separated frequently from discordant lower brittle levels by overall more ductile levels. Of course, in some cases, unconformities separate different tectonic domains, but more frequently, the discordant configuration of different levels appears to be due to vertical strain partitioning and/or the influence of paleostructures. In the long run, we are going to have to parlay seismic attributes into relative ductilities that respond to suites of different coeval stress orientations for each layer.

Furthermore, there is also a great need for (1) regional and supraregional time slices (i.e. composited mosaics of adjacent 3D surveys) and (2) regional seismic stratigraphic correlation sections connecting the structurally least disturbed portions of the sedimentary basins (and if possible, tied to deep wells). All these are necessary to insure common standards and a common language among competing and, often, interacting competitors.

The availability of practically unlimited number of time slices to great depths, often in excess of 4 or 5 kilometers, amounts to the equivalent of an unlimited number of geological maps, which need to be interpreted as maps. Thus, the ability to read geological maps is of critical importance. Unfortunately, I find the map-reading ability of graduate students often deficient, and wish our schools would do a better job in this area. Thus, in the training of students, the understanding of scientific principles must be complemented with renewed training and versatility in geologic map reading if we are ever going to fully exploit 3D seismic data sets.

Also, in the same context, seismic contractors will need to explore more aggressively joint projects with researchers in academia. Many operators in industry, due to their evident inability to forecast oil price fluctuations, are periodically economically overstaffed while remaining technically understaffed. Consequently, they are unable to fully exploit the scientific message - and with it a great part of the new play potential - contained in these huge but under-interpreted 3D seismic data banks. The will to cooperate with academia certainly exists on the industry side, but, unfortunately, a reasonable understanding of the industry's perspective and constraints is often lacking in academic institutions.

There is much talk about teamwork today, as if teamwork didn't exist before. There is also much talk about geological systems with dreams that go well beyond the exciting geographic information systems of today. Only teams can further develop these geological systems. Teams don't need dictators, but leaders akin to inspiring orchestra directors. Above all this, teams need steadily evolving institutions, and a modicum of staff stability and continuity. All of these are indispensable for both the development of geological exploration systems and creative teamwork.

Albert W. Bally is Emeritus Professor of Rice University. In 1952, he obtained his Ph.D. degree from the University of Zurich in Switzerland. His thesis project was in the Central Apennines of Italy. After a year of postdoctoral work at the Lamont Geological Observatory of Columbia University, he joined Shell Canada in Calgary. In 1966, he was transferred to Houston to become Manager of Geological Research at the Shell Development Company. He advanced to become Chief Geologist and Senior Exploration Consultant for the Shell Oil Company. Between 1981 and 1996, Dr. Bally was the Harry Carothers Wiess Professor of Geology in the Department of Geology at Rice University.

March Technical Breakfast

The March 1999 GSH Technical Breakfast will be held on **Wednesday, March 10 at the North Harris County College Administration Office, 250 N Sam Houston Parkway East** (directions can be found at the NHC website at http://wwwnhc.nhmccd.edu/public/gttc/index.htm). A complimentary continental breakfast will be hosted by NHCC/GTTC director David Byrne. Breakfast is served at 7:00 am, presentation begins at 7:30 am, Q&A at 8:15 am, meeting ends at 8:30 am. Mustafa Saribudak will present Integrated Geophysical Studies at an Oil and Gas Refinery in Central America.

ABSTRACT:

Integrated geophysical surveys were conducted at the Oil and Gas Refinery in Central America in conjunction with ERM Southwest. The geophysical surveys included magnetics, ground conductivity (EM-31 and EM-34), and time-domain electromagnetics (TDEM) soundings. The scope of work for the geophysical surveys was limited to 3 major oil companies. The purpose of the geophysical surveys was as follows: 1) to delineate faults and fracture zones; 2) to detect and map lateral changes in conductivity, which may provide information on the horizontal distribution of conductive and non-

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conductive layers; and 3) to determine depth and thickness of unconsolidated sediments and depth to the volcanic bedrock.

A total of nine geophysical profile lines, including four north-south profiles and five east-west profiles, were established for the magnetics and conductivity surveys. Following the magnetics and conductivity surveys, a total of ten stations were selected for the TDEM soundings. The TDEM stations were determined based on preliminary interpretations of magnetics and conductivity data, as well as a review of available geologic information.

Stratigraphic interpretations based on TDEM sounding data correlate well with boring log descriptions from monitor wells located near the sounding locations. For example, the combined geophysical and boring log information indicates that the approximately 25 to 45 meters of volcanic sediments overlie volcanic andesite/basalt along the south-central and southeast portions of the study area. In contrast, TDEM sounding results and boring log data indicate that the volcanic bedrock is apparently absent within approximately the upper 100 meters along the northern part of the study area.

The combined geophysical data indicate that six fault zones may be present within the study area. Four fault zones are oriented approximately north-south, and two fault zones are oriented approximately east-west. In general, locations of fault zones interpreted from geophysical data compare well with faults identified from surface geologic mapping and photolinears identified from aerial photographs. For example, general trends of fault zones identified from geophysical data are consistent with the north-south and east-west trends of faults documented by mapping studies performed in the area.

BIOGRAPHY

Mustafa Saribudak is a Principal in Environmental Geophysics, which is located at 9406 Palm Shores Drive, Spring, TX 77379. He received a master's degree in geology and a doctorate in geophysics from Istanbul Technical University, Turkey. He came to the University of Houston in 1989 to work on a project funded by the National Science Foundation. He worked for Tierra Environmental between 1990 and 1993, where he pioneered application of geophysical methods to environmental problems. He founded Environmental Geophysics in 1994 to provide near-surface geophysical services for engineering, environmental, oil and gas industries, and real estate developers. During the last five years, he has conducted geophysical surveys at more than 100 sites in the US and Central America. He has published numerous papers and short notes in geophysical and environmental journals.

SIG ANNOUNCEMENTS

GSH Processing SIG: Data Processing SIG

SIG Chair - Karl Schleicher
713 782 1234
karl@geodev.com

March Meeting

Date:	Wednesday, March 17, 1999
Time:	Social 4:30pm Presentations 5:00-6:30pm
Location:	Western Geophysical 10001 Richmond Ave.
Directions:	SW corner of Briar Park and Richmond Ave (just east of Beltway 8)
Cost:	NO COST

Topic: Time Lapse Seismic and Multi Component Seismic Data

Organizers:Jozica Gabitzsch, Consultant
Laurent Meister, Western Geophysical

Speaker1:
John Eastwood, Exxon
Title: Processing for Robust Time-Lapse Seismic Analysis Gulf of Mexico Example, Lena Field
Speaker2: Dan Ebrom, Texaco EPTD
Title: Processing of multicomponent seismic data from Teal South, offshore Gulf of Mexico

ABSTRACT 1:

It is a conceptually simple process to compute differences between two 3D seismic monitoring surveys. However, the naive application of this methodology can quickly lead to erroneous results Robust interpretation of seismic differences in terms of reservoir changes during production requires repeatability of the surveys. Repeatability problems are most pronounced with legacy seismic data volumes. The purpose of our study was to assess the impact of different processing efforts on two legacy data volumes and report the results in terms of not only repeatability but also the impact on the final time-lapse interpretation in the reservoir interval.

To better understand the magnitude of the processing effort required to obtain acceptable differences, we have chosen data acquired over the Lena Field in the Gulf of Mexico. We sequentially increase the level of sophistication of the seismic processing effort, quantifying and reporting the results at each step. Exxon acquired the baseline survey at Lena prior to production in 1983. The monitor survey is part of a regional spec 3D seismic survey shot by Western Geophysical in 1995. Initially, differences in the two seismic data volumes are substantial and are primarily due to differences in the acquisition and processing parameters.

A stepwise approach was taken regarding the processing of the two data volumes. Prior to analysis in the Western 1995 3D volume was re-gridded to be coincident with the Exxon 1983 3D volume.

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Post Stack - Post Migration Analysis

1. Regridding
2. Global equalization and positioning
3. Long window trace amplitude equalization (1983 vs. 1995)
4. Match filtering

5a) Difference
5b) Time alignment and Difference
5c) Residual Migration, Time alignment, Difference

For each processing scenario (5a,b and c) the differences are calculated for both the reservoir zone (relative to the seismic reservoir horizon) and for the seismic volume in the vicinity of the reservoir.

The initial difference (step 5a) showed large anomalies not only at the B80 reservoir but also all along the salt dome flank. This is an unsatisfactory result, since there are differences outside the reservoir, which are as significant as those contained within the reservoir.

Partial compensation for this problem was addressed by aligning pairs of traces from the two seismic volumes to maximize their cross correlation as determined from a moving window (4DXCOR - step 5b). The maximum correlation, the time lag, the trace sample difference are recorded in new 3D data volumes. These new data volumes quantify the repeatability, partially compensate for the migration discrepancies, and most importantly define a new set of 4D seismic attributes for the analysis of time-lapse differences.

For the B80 reservoir (which has an average dip of 15o) the range of time lags to maximize correlation was 5 to -25 ms, with the magnitude of correction increasing as the reservoir dip increased. This implies that the spatial positioning of these dipping reflectors in the independently migrated data volumes are also not aligned by as much as several seismic bins in the dip direction. Residual migration and 4DXCOR (Figure 3) addressed this problem.

Interpretation of the time-lapse differences was accomplished by building synthetic models, attribute analysis and integrating production information. The time-lapse analysis indicates the spatial location of gas cap expansion zone. This map presents a couple of possible in fill well locations to produce by passed oil.

Author Bio

Name: John Eastwood
Eduction: PhD. Geophysics 1992 University of Alberta
Employment History:
1992-1993 - Post Doc Industrial Research Fellow, Imperial Oil, Calgary
1993-1996 - Research Geophysicist, Imperial Oil, Calgary
1996 - Sr. Research Specialist, Exxon Production Research Company
Areas of Interest: Time Lapse Seismic, Development and Production Geophysics, Rock Physics
Activities, Awards: Member SEG, CSEG
1996 SEG Development and Production Forum Chairman
1998 SEG Karcher Award
1998 - SEG Development and Production Committee Chairman

ABSTRACT 2:

Processing of multicomponent seismic data from Teal South, offshore Gulf of Mexico, by Dan Ebrom, Guy Purnell, Paul Krail, Bertram Nolte, Xiuyuan Li, Dwight Sukup.

Teal South is a Texaco field located at block Eugene Island 354, in Water depths of 280 feet, and with subsea reservoir depths of 4500 to 9000 feet. A 4C (hydrophone + 3 component geophone) seismic survey was acquired at Teal South in late summer, 1997. The hydrophone and vertical geophone data were processed to provide a P-wave image of the reservoirs for comparison to an earlier legacy streamer survey. The horizontal component data were processed to provide a C-wave image (i.e. downward-traveling P-wave mode-converted at target to upward-traveling S-wave) of the same reservoirs. Processing of the C-wave was given special care, since our experience in such processing was more limited.

The initial processing flow for the Teal South C-waves assumed that azimuthal anisotropy and layering anisotropy effects were negligible.

The focusing-analysis-derived shear-wave velocity function for shallow depths (0 to 3000 feet) compared quite favorably (i.e. almost identical) to published results from Hamilton. However, the focusing-analysis-derived shear-wave velocity function at greater depths (5000 to 10000 feet, for which Hamilton has no published results) was systematically higher than the velocities from nearby dipole sonic logs. We suspect that this systematic bias is due to layering anisotropy. This, in turn, suggests that improvements in our C-wave images could be achieved by taking into account at least the complication of layering anisotropy.

BIOGRAPHY:

Dan Ebrom works in the Subsurface Imaging Portfolio of Texaco EPTD, and is interested in both time-lapse and multicomponent seismics.

GSH Interpretation SIG

Meeting Date: Wednesday, March 24, 1999, 4pm
Place: Texaco's Bellaire Office, Room E725

Title: Interpretation of Coherence Cube(tm) processing in the 3D workspace.

Presenter: Evelyn Medvin, Vice President Interpretation Services, Coherence Technology, Inc.

Bio: A graduate of the University of Oklahoma, Medvin began her career as with Cities Service as an Exploration Geophysicist responsible for South and Central America. Evelyn continued her career with Occidental Petroleum in Bakersfield, California. During her tenure as a Senior Geophysicist for OXY's Latin America Division, Medvin was active in many projects in the area, including onshore and offshore geophysical interpretation in

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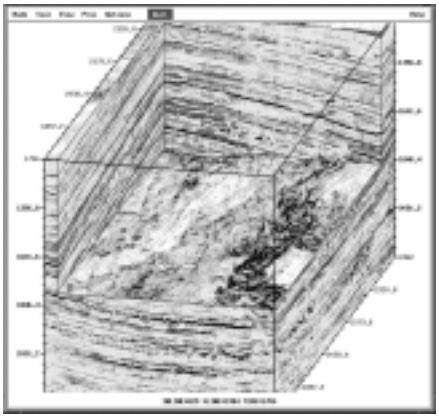
Colombia, Peru, Ecuador, Bolivia, Trinidad, Aruba and Argentina. She spent 4 years in domestic exploration both on and offshore. Evelyn spent 2 years at Schlumberger/GeoQuest where she gained expertise in 3-D visualization software. Combined with 8 years of Landmark experience, she specializes in making CAEX software work for seismic interpretation.



Migrated seismic data is displayed on the vertical walls of this chair diagram while the timeslice domain shows a Coherence Cube timeslice. The N-S trending channel system on the timeslice represents the geologic expression of the complex lobate seismic signal seen on the backwall of the cube.

Abstract:

Too often, 3D seismic data is underutilized because it is treated as a series of densely spaced 2D data during the interpretation phase. By performing a line by line or every Nth line interpretation we are missing the true value of 3D seismic data, a 3 dimensional view of our prospective area. In order to take advantage of what has been recorded and processed we MUST interpret our 3D seismic data in the 3 dimensional workspace to produce a 3 dimensional geologic picture.

Coherence Technology Company, Inc. (CTC), the leader in Coherence Cube(tm) processing, provides a highly innovative and accurate method for clearly imaging subsurface faults and stratigraphy recorded in your 3D surveys. Coherence Cube processing can be utilized in new exploration 3D projects to define the structural and stratigraphic trends within the data set prior to interpretation. In existing 3D projects, coherence will enhance the structural and stratigraphic understanding of the area as well as serve to refine existing interpretations. In fact, coherence can be utilized to refine your reservoir model for simulation.

Incorporation of Coherence Cube processing into the 3 dimensional workspace interpretation allows all project data to be incorporated for a comprehensive understanding of the structural and stratigraphic objectives and interpretation integrity. It provides the geophysicists and geologists the tools to produce a more accurate interpretation by identifying structural and stratigraphic trends that were previously undetectable.

The meeting will be in the Texaco's Bellaire Office, 4800 Fournace Place, Room no. E725. Park in visitor lot or as directed by Security. Sign-in in Lobby and get visitor pass. Please sign up with GSH office by Monday the 22nd.

Interpretation SIG is looking for papers for the current year (and next fall as well). Please contact Randy Hoover ((713) 546-4407) or Larry Godfrey ((281) 296-3094) with any interpretation oriented paper you would like to present.

Randolph A. Hoover
Geologic Advisor
PennzEnergy Co.

POTENTIAL FIELDS SIG ANNOUNCEMENT

Topic: SAMBA: How to make gravity data stand up and dance (or at least move around)!

Speaker: Bill Dickson

Location: HESS building, 5430 Westheimer, Houston
Date: March 18, 1999
Time: 5:30 Social Hour; 6:30 Dinner; 7:30 Presentation
Cost: $20.00

Contact: Mike Kowalski, Chair - GSH Potential Fields Group, at 713-432-6828 (kowalma@texaco.com) by Tuesday, March 16, for reservations. Please HONOR this reservation if you make it! We must start billing no-shows!

Abstract:

My talk illustrates themes in a condensation of two poster papers from AAPG Rio '98, augmented with material from SAMBA, a new joint project with Getech. The original work began so that an independent E&P company could evaluate large areas of the South Atlantic with a small staff and budget. The effort was based first on gravity but incorporated several other data types to provide quick-look evaluations. Gravity data collected on land, sea, air and from space were combined with magnetics, SAR, seismic, geologic and other data.

Several gravity products were then combined with plate-tectonic reconstruction software to help correlate data across the Atlantic. Instead of the old wire-frame reconstructions, this work had grid values at 4km spacing; maps were produced for 5 ages between 55Ma and 120Ma. This provided real exploration leverage in two ways. It provided a framework to extrapolate data from known to unknown areas (especially in the South Atlantic syn-rift basins) increasing the value of data already in hand. Better yet, it allowed the targeting of high-potential blocks before big money had to be spent.

The work helped determine factors important to hydrocarbon generation (oceanic vs. continental crust) and migration as well as reservoir rock distribution (controlled by transforms, fracture zones and their spatial and temporal persistence). All this was done in wall-to-wall color, making for nearly self-explanatory maps, truly wonderful tools for partner and management meetings.

This is not your father's gravity project - come and see what has changed.

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Bio:

Attended one room schools; graduated Physics and Math Honours from U of Manitoba in 1970; more geology courses in 1970-71 at U of Calgary. Work has been in International Exploration from a summer job for Pan American (Amoco) in Calgary through Texaco, Canadian Superior, Marathon and Union Texas in Houston and London. It started with geophysical interpretation in frontier areas with frequent temporary duty on lease sales in North and South America, then moved to varied interpretation work in the North Sea; then operated and non-operated work across Europe, Africa and the Middle East.

With the mid-1980's lull in exploration, built UTP's first exploration network in London and then spent three years in Houston rebuilding the exploration computer capability from scratch. Worked Australasia, SE Asia and the last 3 years on West Africa/South Atlantic on new ventures. Leaving employment, flew to the AAPG in Rio last November where two poster papers were well-enough received that the new company, Dickson International Geosciences (DIGs) began a joint project called SAMBA with Getech.

Member SEG, CSEG, AAPG, SPE and GSH

Call for Volunteers

Volunteers are needed for the Spring Symposium. If you are interested in helping out at the Symposium please contact:

Shane Coperude
(281) 275-7514
or email
scoperude@fairfield.com

GSH 1999 Spring Symposium/15th Annual SEG Gulf Coast Technical Meeting and virtual reality tour

Thursday and Friday April 15-16, 1999 in Houston, TX
on Exploiting Immersive Environments in Oil & Gas

H. Roice Nelson is coordinating as General Chairman, 713.974.6907

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GSH • 7457 Harwin Dr., Suite 301 • Houston, Texas 77036

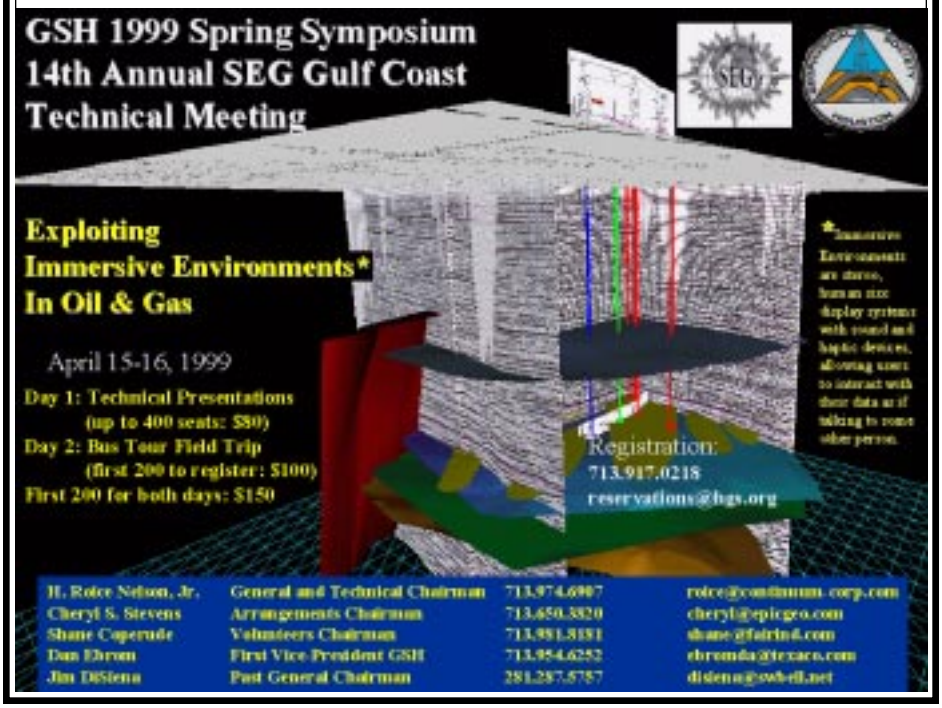
Check One: Day 1: ___ ($80.00 - limit 400 registrations)
Day 2: ___ ($100.00 - limit 200 registrations)
Both: ___ ($150.00 - limit 200 registrations)

Credit Card (Circle One): M/C VISA AMEX

ACCOUNT # _____ EXP. DATE_____

BILLING ADDRESS: _____

SIGNATURE: _____ DATE:_____



ANNUAL MEETING

and

Bar-B-Que

RAIN or SHINE

5:00 p.m. to 8:00 p.m. on Thursday, May 13, 1999
at the St. Arnolds Brewery

Come Enjoy A Great Evening
Welcome The New GSH Officers

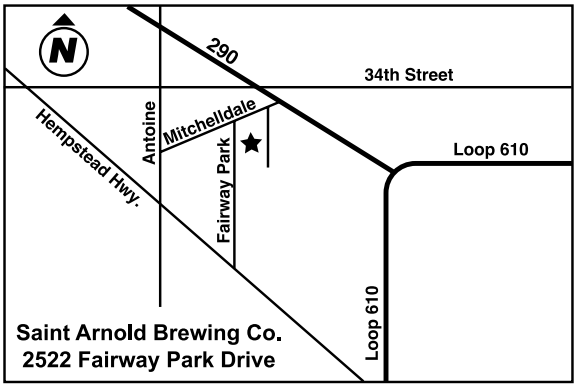
SAINT ARNOLD™ BREWING COMPANY

Tickets:

Only $17.00 Each
If Purchased By May 12, 1999
$20.00 Each At The Door

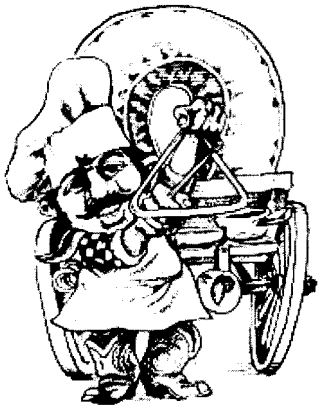
Note:

We Have To Guarantee The Number Of Dinners, So You Must Prepay To Be Guaranteed Your Meal.



WE WILL BE SERVING

- *Draft Beer*
- *Bar-B-Que Brisket*
- *Sausage*
- *Chicken*
- *Beans*
- *Cole Slaw*
- *Bread*
- *Pickles*
- *Onions*
- *Soft Drinks*
- *Iced Tea*



Annual Meeting and Bar-B-Que

Thursday, May 13, 1999

Name: _____ *Phone:* _____

Name: _____ *Phone:* _____

Number Tickets Desired: _____ *X $17.00 Each = $* _____

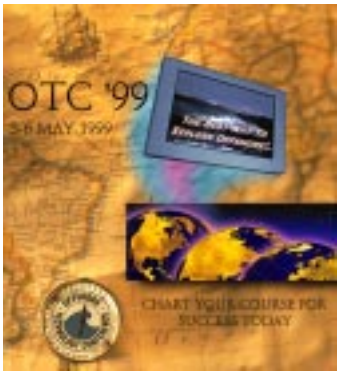
Enclose Check Payable To: Geophysical Society of Houston

And Mail To:

7457 HARWIN DRIVE, SUITE 301 • HOUSTON, TEXAS 77036 • (713) 785-6403
Questions to Jim Moulden, 281-293-5711, email james.k.moulden@usa.conoco.com

Tickets Will Be Held At The Door. If Your Company Is Purchasing A Block Of Tickets - Please Indicate Names On The Form To Eliminate Any Confusion At The Door.

Ticket Orders Must Be Received By May 12, 1999 to Obtain $17.00 Price.



Offshore Technology Conference 1999

May 3-6

Look ahead. Review the past. Focus on the many benefits exhibiting at OTC offers. Discover new uncharted territories-just beyond the horizon. Trade knowledge with 40,000+ professionals from 80 countries representing national and multi-national companies-all in one port. Join over 1,300 exhibitors from 24 countries on a well-planned expedition—OTC '99.

Draw on the technical advantage. The strength of OTC's Technical Program attracts the world's top engineers, scientists and managers. Developed by OTC's sponsoring organizations, 1999's program will feature over 300 technical presentations. The OTC audience will encompass bright minds in search of the industry's latest advances in products, services and technologies. The circle of influence and attraction continues to expand.

The 1998 Offshore Technology Conference was the largest and most successful in 13 years. Total attendance was 49,641, with 1,846 exhibitors covering nearly 370,000 net square feet. Make plans today to attend OTC '99, 3-6 May in Houston, Texas.

Be a part of OTC '99. For information about available exhibit space, contact our Exhibit Sales Department at 1-972-952-9494, or visit the website at: http://www.otcnet.org.

Highlights of the Forthcoming 1999 Offshore Technology Conference

May 3 - 6, 1999 in Houston, Texas Westchase Hilton, 9999 Westheimer (Wednesday May 5, 1999) Jamie Robertson of Arco will discuss "preparing for the upcoming oil price rise," a scenario which likely will ensue near the time that peak worldwide production occurs and production starts its inexorable decline. He will argue that Investing in E & P technology is essential to preparing for this scenario in order to cushion the impact of a sharp oil price rise on global growth and stability.

Technology Integration for Reservoir Characterization and Monitoring (Monday May 3, 1999)

Morning Keynote Speaker, Robert Heming of Chevron, will call for radical changes in work practices. The morning session will have a case history flavor with examples that span the globe from the North Sea to the Gulf of Mexico. Presentations will cover a multidisciplinary approach to reservoir management that creates value at Gullfaks field, how the integration of three-dimensional models and reservoir characterization has led to improved reservoir management at Ekofisk, Hibernia field reservoir characterization and monitoring through integrated geophysical, geological and production data, how the problem of accessing bypassed pay in a complex, mature field was addressed at Teak field in Trinidad and Tobago and the application of time-lapse 3D seismic at Lena field in the Gulf of Mexico. The session will conclude with a discussion of the problem of reserve creep and fall and the factors that influence reserve estimates.

Afternoon Keynote Speaker, John Hopkins of Conoco, will provide a perspective of reservoir technology into the next millennium. The afternoon session has an "applied techniques" flavor. Techniques to be discussed include effective use of effective permeability; artificial neural network application to field management; soft computing techniques for reservoir prediction; the integration of time-lapse seismic and reservoir simulation; recent advances in gas well surveillance; understanding the role of well testing from an integrated standpoint; downhole permanent gage data; and others.

Deepwater Exploration and Development (Tuesday May 4, 1999) Keynote Speaker, William T. Drennen III of Exxon, will set the stage by contributing a high-level perspective of the economic and technical issues involved in deepwater exploration and development. Deepwater basins around the world are becoming the next frontier for large-scale exploration and development projects as large hydrocarbon accumulations are announced in water depths over 3000 meters. The high costs and economic risks in the discovery and development of fields in deepwater areas have driven improved geophysical and geological techniques. Session presentations will illustrate key geological and geophysical techniques for prediction of favorable reservoir properties and reservoir connectivity, as well as structure and stratigraphy, which have led to economical and technical successes in deepwater areas.

Emphasis in the morning session will be on the geophysical technology, including seismic pre-stack depth imaging, that is required to understand the structure and the rock properties.

OTC 99 continued on page 10

OTC 99 continued from page 9

Presentations will include seismic pre-stack depth imaging, and other examples from the deepwater Gulf of Mexico. The afternoon session will accent getting the stratigraphy right in the structure/stratigraphy relationship. Presentations will highlight the use of sequence stratigraphy along with exploration and development examples from deepwater West Africa, the Caspian Sea, and from other areas outside the Gulf of Mexico.

Multi-Component 3-D Seismic Technology (Wednesday May 5, 1999) The morning's session will address the issues of how oil companies are managing the use of marine multicomponent seismics to find and produce oil and gas more economically. Keynote Speaker, Jack Caldwell of Geco-Schlumberger, will set a context for the competitive arena of multiple vendors and multiple acquisition/processing technologies. Talks will center on the geographical theme of 4C seismics in the North Sea. Examples will cover the application of 4C technology at the Valhall field, the 4C-2D Tommeliten survey, the 4C-3D Statfjord survey and other similar surveys. Other presentations will show how a difficult Class 2 AVO anomaly was better imaged using P to S mode conversions, and will describe a methodology for detecting fractures using marine ocean-bottom seismic data.

Afternoon presentations will highlight Mobil's experiences in 4C acquisition and processing, examine a time-lapse 3D-4C project at Texaco's Teal South field in the Gulf of Mexico, and discuss different coordinate frames (from the 4-C acquisition frame to the 4-C shear-wave birefringence frame) in multicomponent ocean bottom seismics and their utility in processing and interpretation. The session will seek to put the current achievements of ocean-bottom acquisition in their historical perspective, with illustrative data examples of both successes and failures of this technology and look to the future: Where is the technology going? And how will it impact the exploration and development objectives?

Last month, in The GSH Newsletter, Lee Lawyer wrote about the SEG-GSH Museums. My eternal vigilance regarding that matter detected an error, a misleading inference and a difference of opinion. The article claimed that Tom Fulton was actively working on the GSH Museum at North Harris College. Wrong, I am the current chairman of the GSH Museum Comittee but the 'work' was completed by Bill Gilchrist and Bill Swart, Jr.while I was GSH President in 1994. Since then I have merely reported on their significant continuing work.

Contrary to Lee's opinion, I believe the SEG has been responsive to the needs of both museums and their placement at conventions. The location of the SEG Museum display in New Orleans was on a main aisle which I do not consider an out of the way place. Further, the 1995 SEG-GSH Museum display took up 6 prominent booth spaces in the registration area. Besides the displays it featured the continuous showing of a movie of the first 3-D survey as well as a contest to identify items.

Lee's inference was that the GSH Museum only consisted of displays at North Harris College. We currently have displays at both North Harris and San Jacinto Colleges as well as items recently selected by Bill Gilchrist, Bill Swart Jr., and Joel Watkins for display at Texas A&M (fortunately we still have over 500 items to be placed wherever there is a sponsor). Many of the items at North Harris were donated by Scott Petty Jr. from his family's collection (you may remember them in the 'Petty Ray Geosource' Museum once located on the Southwest Freeway). We continue to be thankful for that contribution as well as to Hayes Information Management who provide space to store the remaining items. While the SEG Museum is usually behind locked doors (key must be requested to enter) away from both SEG members and students, the GHS museum pieces are readily available for viewing with a docent sometimes present to answer questions.

Please understand that I am for a combination of the museums and in agreement with Rutt Bridges who wanted to move the SEG Museum out of the SEG Building in Tulsa. Funding for museum activities could come from the dedication of additional rental income from the first floor and basement of the SEG building. Just as churches ask for our time, gifts, and service, we are in a similar situation. Both the SEG and GSH need volunteers! Without volunteers forget about ANY museum. Sure we would all like a permanent museum, with a curator, but we should be realistic. Traveling Museums, of the type GSH has in place, do create interest. The Virtual Museum is both the better vehicle for documentation and for greater audience. GSH members could certainly contribute to the SEG Virtual Museum using GSH artifacts. For a time we had, full time, volunteer docents for the North Harris Museum and I am sure that help there and at San Jacinto College would be appreciated. Further, help is needed to make our museum pieces more presentable. These services may appeal to some who may have more time on their hands than they would want. The GSH Museum Foundation has more than a half dozen Life Members who have contributed $1000 or more. They get a door stop geophone with a plaque - no small doodlebugger statue - but for a contribution of $2500 we could provide a walk around, 90 pound torsion balance - we have some 20 of these.

Lee's article not only prompted me of the need to report the current GSH Museum status but also plans for a display of GSH's 'new' 1950's 'doghouse' at the SEG convention in Houston starting October 31. Our display will feature the doghouse with cables and geophones to replicate a field crew. At this time it is not known if the jug hustler will be real or just a statue! Live volunteers for booth duty, however, will be greatly appreciated.

Tom Fulton

Worldwide Technology Forum

May 10-12, 1999
Adam's Mark Hotel
Houston, Texas

During this three-day event, technology tracks will focus on innovations in the use and application of technology, as well as emerging technology trends. Technical and Case Study presentations, panel discussions and update sessions will follow these technology tracks:

Shared Earth Modeling: Revolution in the White Space

Advances in Integrated Interpretation and Processing: Reshaping the Industry's Future

Integrated Information Management: Driving the E&P Decision Chain

Immersive Technologies: Enabling Collaborative Teams

Reservoir Management and Simulation: Strategies for a Complex World

Advances in Integrated Well Planning, Drilling, and Production Monitoring: Bridging the Gap

The Economies of Knowledge: Managing Your Virtual Assets

Advances in Computing Environments: Looking Over the Horizon

Landmark invites you to attend the 1999 Worldwide Technology Forum, May 10-12, 1999 at the Adam's Mark Hotel in Houston. This annual conference provides a unique forum focused on enabling you to gain the greatest business and technical value from Landmark's spectrum of integrated solutions systems, software, and services.

This is the only event of the year in which you'll have the opportunity to see virtually everything Landmark has to offer, as well as exchange information with your peers, our software developers, and industry experts. For years, attendees have told us the Forum has become a vital part of their professional development and strategic planning.

The theme of the 1999 conference is "Beyond the Boundaries." We'll address an array of significant information technology breakthroughs that are creating the new economics and reshaping our industry as we approach the next millennium. Our agenda includes technical presentations and case studies, panel discussions, update sessions, exhibits, and demonstrations by Landmark, GeoGraphix, Halliburton, and many third-party representatives.

Targeted sessions throughout the three-day conference will provide valuable, relevant, and up-to-date information for E&P and IT professionals at the executive, management, and technical levels.

Regardless of where your primary interest lies, we hope you'll join us for Landmark's sixth annual Worldwide Technology Forum.

Three easy ways to register... Registration Information

There are three easy ways to register for the 1999 Worldwide Technology Forum mail, fax, or electronically. To register electronically using your credit card, see http://www.cmsusa.com/landmark/. If you do know someone who does not have access to the internet, please e-mail their name and complete address to forum@lgc.com and a registration packet will be mailed to them. Complete a separate form for each person registering from your company.

Registration Changes and Inquiries

Registration changes and inquiries should be sent to:
1999 Landmark WWTF
911 Busse Highway
P.O. Box 998
Park Ridge, IL 60068
Fax: (800)813-3459 or
(847)698-9245 if outside the U.S.
Phone: (800)823-1532 or
(847)384-7729 if outside the U.S.
Monday-Friday, 8:30am-5:00pm, Central Time.

To avoid duplicate charges to credit cards, DO NOT mail a copy of your registration form once it has been faxed or submitted via the worldwide Web.

FORTUNE FAVORS THE BOLD

SEG '99 Houston

Oct 31 - Nov 5, 1999

The best and the brightest names in the geophysical exploration industry are coming to Houston.

Can you think of a better place to establish your name as a prominent leader in the energy exploration industry?

The SEG International Exposition and Annual Meeting is the world's largest oil, energy and mineral exposition. Leaders of industry, academia and government acknowledge this event as the premier showcase of cutting edge geophysical technology. Last year over 370 companies and over 10,000 professionals attended the international Exposition and Annual Meeting. Houston promises to attract more.

Many excellent opportunities are available to showcase your company's name as a sponsor of events and programs. We are actively seeking sponsors for the 1999 SEG International Exposition and 69th Annual Meeting. Please consider the various sponsorship levels and events to determine which would best showcase your company.

Priority Points will be given to sponsoring companies, which increases the advantage for booth location.

For more information, contact:

Jim Thomas
International Showcase Chairman
Western Geophysical
3600 Briarpark Drive • Houston, TX 77042-5275
713-689-6820 • 713-689-6860 (fax) • jthomas@seg.org

Marty Brandt
Special Programs Chairman
Chevron USA Production Company
1301 McKinney, Room 1892 • Houston, TX 77010
713-754-3870 • 713-754-2880 (fax) • mbrandt@seg.org

GSH Employment Referral Service

This free service connects employers with potential employees and consultants in the geophysical industry. It is free to both employers and employees - the only restriction for potential employees is that they be members in good standing in the GSH. The service acts as a clearing house where employers can request individuals with specific skills and receive a confidential service in the form of resumes of all qualified personnel.

To have your resume included, mail it to:

Sam LeRoy
GSH Employment Referrals
12,000 Westheimer, Suite 320
Houston, TX 77077

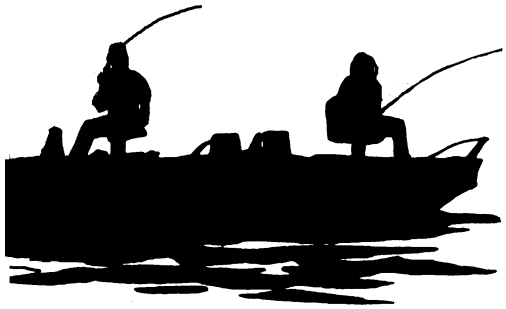
Employers - Just email or fax your requirements to us. Please include your fax number so we can send the resumes to you.

Sam LeRoy, Steve Starr
GSH Employment Referral Committee
(281) 556-9766
fax (281) 556-9778
email: earthview@aol.com
On the web at:
http://members.aol.com/earthview/Gshers.htm

Auxiliary News: MARCH

The Spring Brunch to be held Sunday, March 14, 1999 at Lakeside Country Club is a very special treat; husbands and friends are also included to enjoy delicious food, fellowship, and pleasant music by George Garza at the piano.

For information, contact Jeanne Cooley, 713-665-8432



6th ANNUAL GSH/HGS/HAPL BASS TOURNAMENT

May 1 & 2, 1999

This year the 6th Annual GSH/HGS/HAPL Bass Tournament will once again be held at Harbor Marina on Toledo Bend Reservoir. We are looking forward to an even bigger and better weekend of fishing fun and friendly competition along with the traditional Saturday Night Fish Fry with door prize drawing that evening.

Prizes will be awarded for overall first, second, and third place team total weight of black bass as well as individual GSH, HGS, HAPL, and Guest prizes for biggest bass caught from each group. A Big Bass Pool for each day will be available as well. Each participant will be provided with a copy of the specific tournament itinerary, rules sheet, and prize breakdown with their tournament registration. For more information please contact:

Greg Doll (HGS & GSH)	**(713) 658-8096ext11.Office** **E-Mail to: gqdoll@msn.com**	**(713) 951-0343..Fax**
Bill Zwiener (HAPL)	**(713) 650-0903..Office**	**(713) 650-3547..Fax**

Once again, Harbor Marina has reserved a block of rooms for our tournament and several mobile homes are available as well. To make reservations, call (409) 625-4912 and be sure to mention that you are participating in this tournament. The rates are reasonable and there is a limited number of rooms available so reserve your accommodations as soon as possible! Frontier Park Marina (409) 625-4712 also has a few cabins and several mobile homes available within one mile of Harbor Marina.

Corporate and individual contributions are appreciated and will be acknowledged on a sponsor board at the weigh in station and in the respective organization newsletters following the tournament. This is a great way to entertain friends, business associates, and clients, so spread the word!

GSH/HGS/HAPL BASS TOURNAMENT REGISTRATION FORM

NAME: _____ AFFILIATION: _____

ADDRESS: _____ PHONE: _____

PARTNER: _____ AFFILIATION: _____

PHONE-OFFICE: _____ PHONE-HOME: _____

E-MAIL: _____

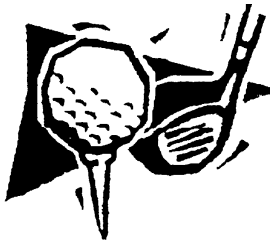
Please clip this form and return it with your payment, make your check for $50.00 per contestant payable to:

GSH/HGS/HAPL BASS TOURNAMENT and Mail to:
Mr. Bill Zwiener, Jones & Zwiener, Inc., 1010 Lamar, Suite 650, Houston, Texas 77002

Registration Fee: $_____ + Sponsor Contribution: $_____ =

TOTAL $_____

Golf Tournament and Dinner
Geophysical Society of Houston



DATE:	Monday, May 24, 1999	FORMAT:	Four Man Florida Scramble
PLACE:	Kingwood Country Club	COST:	$110.00 Members and Guests
TIME:	8:00 AM Registration 10:00 AM Tee off (Shotgun)	DEADLINE:	April 15, 1999

MAIL ENTRIES TO:
Fairfield Industries • 14100 Southwest Freeway, Suite 600 • Sugar Land, TX 77478 • Attn: George Lauhoff

MAKE CHECKS PAYABLE TO:
Geophysical Society of Houston

GOLFERS READ CAREFULLY
The three courses at Kingwood are available to the first 432 entrants. No entry will be accepted until the entry form and fees are received in full. NO EXCEPTIONS!!!

MULLIGANS $5.00 EACH (MAX. 2/PERSON) AVAILABLE AT CHECK-IN

If you are not playing golf but want to join your friends attending the dinner following the tournament, please send in $15.00 per person to cover the cost of the dinner. Make a note at the bottom of the check “Dinner Only”. These checks should also be payable to the Geophysical Society of Houston.

GOLF TOURNAMENT FORM

You may select your own foursome, if not you will be assigned to a group. The first name listed will be considered the TEAM SPOKESPERSON.

Name: _____ Name: _____

Circle: Member Guest Circle: Member Guest

Company: _____ Company: _____

Phone: _____ HDCP: _____ Phone: _____ HDCP: _____

Name: _____ Name: _____

Circle: Member Guest Circle: Member Guest

Company: _____ Company: _____

Phone: _____ HDCP: _____ Phone: _____ HDCP: _____

Course Preference: ISLAND LAKE MARSH DEERWOOD
(Circle One)

Annual Honors and Awards Banquet

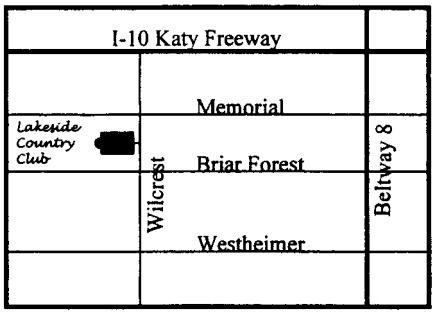
Thursday, May 6, 1999
Lakeside Country Club

On Thursday, May 6, 1999, the GSH will host it **Annual Honors and Awards Banquet** in the Grand Ballroom of the Lakeside Country Club. Our special guests will be your friends who have 50 and 25 years of membership in the SEG along with this year's GSH Honorary and Life Members. Bring your spouse or guest and enjoy cocktails (cash bar) from 6:30 - 7:15 pm in the Pine Lake Room. Then at 7:15 pm, enjoy an elegant seated dinner and the music of Marshall Maxwell. SEG President Brian Russell, will give the Presidential Address and assist GSH President Bob Tatham in presenting the awards.

The cost for the dinner is $30.00 per person, with pre-paid reservations necessary to accommodate the guarantee requirements of Lakeside Country Club. Make your check payable to the GSH and forward it by April 30th to Carmen M. Comis, c/o Paradigm Geophysical Corp., 1200 Smith Street, Ste. 2100, Houston, TX 77002. Please reference "Awards Banquet" on your check.

Menu

Chicken & Leek Soup
House Salad
Salmon Poblano
New Red Potatos
Zuchinni & Squash Medley
Ices and Fresh Berries



RESERVATION FORM

Name: _____

Guest: _____

No of Guests: _____ Check No: _____

Make your check **payable to the GSH** and forward it by April 30th to:
Carmen M. Comis
c/o Paradigm Geophysical Corp.
1200 Smith Street, Ste. 2100
Houston, TX 77002

Please reference **"Awards Banquet"** on your check.

New Members approved at the February Board Meeting:

Active Membership:

Douglas L. Park, Consultant
Wing Leong, Consultant
Colin M. Sayers, Schlumberger
David L. J. Tsay, BP Amoco
Robert C. Wegner, Exxon Production Research

Associate Membership:

Charles W. R. Brown, Charles Brown Law Firm
V. Renee Elmquist, Marathon Oil Co.
Larry R. Gilmore, DDD Energy
Michael J. Tompkins, Anadarko Petroleum Corp.
Harry J. Wagner, Geoquest - Schlumberger

Student Membership:

Ricko Andy Wardhana, University of Houston

MARCH 1999

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1	2	3	4	5	6
7	8 GSH/HGS Joint Dinner	9	10 GSH Technical Breakfast	11 Board Meeting (HESS)	12	13
14 GSH Auxillary Spring Brunch	15	16	17 Data Processing SIG	18 NEWSLETTER DEADLINE Potential Fields SIG	19	20
21	22	23	24 Interpretation SIG	25	26	27
28	29	30	31			

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