



# Geophysical Society of Houston

VOL. 32, NO. 6

NEWSLETTER

MARCH 1997

## Candidates for the GSH 1997/98 Executive Committee

President Elect:  
Bob Tatham  
Pat Peck

First Vice President:  
Joe Alcamo  
John Sumner

Second Vice President  
Scott Sechrist  
Don Herron

Secretary:  
Phil Inderwiesen  
Diana Shaw

Treasurer:  
Richard Verm  
Jock Drummond

Editor:  
Dennis McMullin

## March Technical Luncheon

- Date: Monday, March 17, 1997
- Time: Register and cash bar, 11:30 AM  
Luncheon and talk, 12:00 Noon
- Location: The New H.E.S.S. Location 5430 Westheimer, "The Old Carlyle Restaurant" (between Alabama and Richmond)
- Cost: \$17 to registered members  
\$22 to walk-ins and guests
- Reservations: Please call 917-0218 no later than 12:00 p.m. Friday, March 14, 1997 to make a reservation.
- Speaker: Fred J. Hilterman  
Geophysical Development Corporation
- Topic: Detection of Hydrocarbons with Lithostratigraphy

F.J. Hilterman\*, and J.W.C. Sherwood, Geophysical Development Corporation, R. Schellhom, and Brad Bankhead, ORYX, and Bryan DeVault, Colorado School of Mines

In many basins, the acoustic-impedance values of shales and gas-saturated sands are approximately equal and thus hydrocarbons are difficult to detect with conventional 3-D seismic data. Even AVO has had limited success because of the questionable relationship of the AVO attributes to media properties.

In order to resolve these questions,

a 3-D AVO study was conducted utilizing well-logs, cores, and production data to help calibrate the seismic response to the media properties. The study results showed that the AVO inversion yields two distinct reflectivities, a normal-incidence and a Poisson. The estimation of the Poisson-reflectivity section is stabilized by including CDP traces that have offsets as great as twice the depth. This requires the inclusion of anisotropic corrections in the total seismic processing flow.

The reflectivities are then related to chronostratigraphic and lithostratigraphic sections. The lithologic correlation results from petrophysical relationships of SP well-log curves to Poisson's ratio curves while the chronostratigraphic correlation relies on seismic stratigraphy. The benefit of these two sections is that the lithostratigraphic section (Poisson reflectivity), contains only very clean wet sand and/or gas-saturated sand events while the normal incidence section is a high resolution structural image.



**FRED J. HILTERMAN**

Fred J. Hilterman, received a geophysical engineering degree and a doctorate in geophysics from Colorado School of Mines. During his tenure with Mobil (1963-1973), his assignments ranged from field work and prospect evaluation to Activity Leader at the Field Research Laboratory. In 1973, he joined the University of Houston where he was a Professor of Geophysics. While at UH, Fred co-founded the Seismic Acoustics Laboratory (SAL) and

*continued on page 3*

## INSIDE

### GSH Meetings

- Editors Note ..... 3
- Seismic Data Processing SIG ..... 3
- Potential Fields SIG ..... 4
- Environmental Applications SIG ..... 6
- Reservoir Geophysics SIG ..... 7
- 1997 Spring Symposium ..... 9

### Social Events

- GSH Technical Luncheon, March 17 ..... 1
- GSH Technical Breakfast, March 12 ..... 3
- GSH Awards Banquet ..... 7
- Upcoming Meetings ..... 8

## GEOPHYSICAL SOCIETY OF HOUSTON

**Joan Henshaw, Office Manager • 7457 Harwin Drive, Suite 301 • Houston, Texas 77036**

**(713) 785-6403 • Fax (713) 785-0553 • Office Hours 7 a.m. - 4 p.m.**

**Event Reservations Number: (713) 917-0218**

### GSH Board of Directors = GSH Executive Committee + SEG Section Representatives

PRESIDENT .....	Wulf Massell .....	650-3820 .....	fax 659-3735 .....	geowulf@aol.com
Corporate Relations .....	Arthur Ross .....	423-5476 .....	fax 464-1615 .....	Art.H.Ross@exxon.sprint.com
Historian .....	Tom Fulton .....	464-1300 .....	fax 464-1615	
Honors & Awards .....	Art Ross .....	423-5476 .....	fax 423-5202	
Museum .....	Ray Farrell .....	552-1453		
Nominating .....	Wulf Massell .....	650-3820 .....	fax 650-3822 .....	geowulf@aol.com
Tellers .....	Lorinda Driskill .....	560-1104 .....	fax 666-9439 .....	lorindad@aol.com
PRESIDENT-ELECT .....	Bill Gafford .....	366-7873 .....	fax 366-7569 .....	wtgafford@amoco.com
Academic Liaison .....	Dale Sawyer .....	285-5106 .....	fax 285-5214 .....	dale@rice.edu
Advisory .....	Lee Lawyer .....	531-5347 .....	fax 531-5347 .....	ujhr40a@prodigy.com
Employment Referral .....	Sam LeRoy .....	556-9766 .....	fax 556-9778 .....	earthview@aol.com
Finance .....	David Forel .....	963-2493 .....	fax 963-2490 .....	david.forel@waii.com
Office .....	David Forel .....	963-2493 .....	fax 963-2490 .....	david.forel@waii.com
Volunteers .....	Bill Gafford .....	366-7873 .....	fax 366-7569 .....	wtgafford@amoco.com
FIRST VP .....	Dave Agarwal .....	650-0325 .....	fax 650-3822	
Continuing Ed. ....	Dan Ebrom .....	743-9144 .....	fax 743-9164 .....	ebrom@uh.edu
Speakers .....	Dave Agarwal .....	650-0325 .....	fax 650-3822	
Tech Breakfasts .....	Scott Sechrist .....	856-8029 .....	fax 856-7445 .....	acoustic@neosoft.com
Tech Luncheons .....	Phil Hoseman .....	655-9838 .....	fax 655-7301	
Technical Committee .....	Pat Starich .....	423-7234 .....	fax 423-7917 .....	76020.2244@compuserve.com
Technical Transfer .....	David Forel .....	963-2493 .....	fax 963-2490 .....	david.forel@waii.com
SIGs:				
Data Processing .....	Young Kim .....	966-6156 .....	fax 966-6333	
Environmental Appl. ....	Stephanie Hrabar .....	683-0638 .....	fax 683-0638	
Interpretation WS .....	Larry Godfrey .....	750-7544 .....	fax 750-7584	
Potential Fields .....	Chuck Campbell .....	993-0671 .....	fax 960-1157	
Reservoir Geophysics .....	Tien-When Lo .....	954-6249 .....	fax 954-6113	
SEC. VP .....	Lloyd Weathers .....	775-2453 .....	fax 775-4123 .....	Lloyd_r_weathers@ccmepus.mobil.com
Annual Meeting .....	Jim Moulden .....	659-2201 .....	fax 659-2301	
Awards Banquet .....	Carmen Comis .....	876-3473 .....	fax 876-1359	
Golf Tournament .....	George Lauhoff .....	963-2273 .....	fax 963-2070	
Shrimp Peel .....	Tim Hartnett .....	961-8500 .....	fax 961-8400	
Sporting Clays .....	Robert Perez .....	240-1234 .....	fax 240-4997	
Christmas Party .....	Lorinda Driskill .....	560-1104 .....	fax 560-1169 .....	ldriskill@lgc.com
Tennis Tournament .....	Joe Jones .....	438-5626 .....	fax 682-6928	
SECRETARY .....	Lorinda Driskill .....	560-1104 .....	fax 666-9439 .....	ldriskill@lgc.com
Directory .....	David Forel .....	963-2493 .....	fax 963-2490 .....	david.forel@waii.com
GSH Membership .....	Steve Starr .....	498-7008 .....	fax 498-0913	
Ladies Auxiliary .....	Barbara Thigpen .....	497-3299		
OTC Representative .....	Alf Klaveness .....	468-5123 .....	fax 468-0900	
SEG Membership .....	Jill Floto .....	974-0822 .....	fax 974-1928	
TREASURER .....	Joel Starr .....	781-4000 .....	fax 781-7858 .....	joel@hstn.tensor.pgs.com
Student Loans .....	Don Ashabranner .....	669-3782 .....	fax 669-3725	
EDITOR .....	Cliff Kelley .....	368-8103 .....	fax 368-8182 .....	kelley@houston.geoquest.slb.com
Assistant Editor .....	Dennis McMullin .....	560-1069 .....	fax 560-1278 .....	dmcmullin@lgc.com
Company Contacts .....	Scott Sechrist .....	856-8029 .....	fax 856-7445 .....	acoustic@neosoft.com
Electronic Pub. ....	Victor Koosh .....	773-2627 .....	fax 773-9620 .....	vkoosh@NewWorldHorizon.Com
Photography .....	John Freeland .....	423-7223 .....	fax 423-7801	
Publicity .....	Scott Sechrist .....	464-8200 .....	fax 856-7445 .....	acoustic@neosoft.com
Training Notices .....	Lloyd Weathers .....	775-2453 .....	fax 775-4123 .....	Lloyd_r_weathers@ccmepus.mobil.com
PAST PRESIDENT .....	Art Ross .....	423-5476 .....	fax 423-5202 .....	Art.H.Ross@exxon.sprint.com
PRIOR PAST PRES .....	TomFulton .....	464-1300 .....	fax 464-1615	
SEG SECTION REPS				
.....	Lee Lawyer .....	531-5347 .....	ujhr40a@prodigy.com	
.....	Richard Verm .....	782-1234 .....	fax 782-1829 .....	richard@geodev.com
.....	Pamela Moore .....	773-2627 .....	fax 773-9620 .....	pmoore@NewWorldHorizon.Com
.....	Bob Tatham .....	954-6027 .....	fax 954-6113 .....	TATHARH@texaco.com
Alternate SEG Sec. Reps.				
.....	Pat Peck .....	963-7801 .....	fax 963-7890	
.....	Merry Lynn Southers ..	840-8282 .....	fax 599-9110	
.....	Hugh Hardy .....	729-9208 .....	fax 726-0456	
.....	Cheryl Stevens .....	stevens@pakhome.khi.erum.com.pk		

The Geophysical Society of Houston Newsletter (ISSN 1082-0817) is published monthly except July and August by the Geophysical Society of Houston, 7457 Harwin, Suite 301, Houston, Texas 77036. Subscription to the Geophysical Society of Houston Newsletter is included in the membership dues (\$20.00 annually). Periodicals Postage Paid in Houston, Texas.

POSTMASTER: Send address changes to Geophysical Society of Houston Newsletter, 7457 Harwin, Suite 301, Houston, TX 77036.

continued from page 1

was Principal Investigator until 1981. At that time, he cofounded Geophysical Development Corporation where he is currently vice-president of development.

Fred was associate editor for GEOPHYSICS, SEG and MPG Distinguished Lecturer, Chairman of TLE editorial board, and Technical and General Chairman of SEG Annual Meetings. He has been an instructor in SEG's Continuing Education Courses since 1979. Fred is the 1996-97 President of SEG.

He received the SEG Best Paper Award, the CSM VanDiest Gold Medal, the SEG Virgil Kauffman Gold Medal, and Honorary Membership in SEG and GSH.

---

## Editors Note

I don't know about you, but for me the year is flying by. I can't believe it is already March. The activity I have seen in the first two months, indicates '97 may be another strong year for the Houston E & P business.

I would like to thank Landmark Graphics for inviting Wulf and me to their recent Worldwide Technology Forum. It drew a very nice crowd of local and international geoscientists. It was an excellent place to catch some good papers, and to see technology put to work solving real problems. Keynote speeches by author of 'The Prize', Daniel Yergin and Halliburton Chairman, Richard Cheney were additional highlights.

Please note that the Interpretation Workstation SIG will not have a meeting in March.

See ya next month.

Clifford Kelley  
Schlumberger Wireline  
1325 South Dairy Ashford  
Houston, Texas 77077  
281/368-8103  
281/368-8182 Fax  
Cliff-Kelley@slb.com

## GSH Technical Breakfast



### "Northside" Technical Breakfast Special Event SEG Spring Distinguished Lecturer

Date: Wednesday, March 12, 1997  
Location: The new HESS Carlyle location 5430 Westheimer  
Speaker: Dr. Amos Nur  
Topic: "Rock Physics and 4D Seismic".  
Time: Breakfast at 7:30 am, Speaker at 8:00 am.  
Charge: There is no charge to attend. This event is generously underwritten by Mobil Exploration Producing, US.  
Reservations: Early reservations recommended. Call the GSH office at 713.785.6403 by 5 PM. Monday, March 10.

---

## Data Processing SIG

Date: Wednesday, March 19, 1997  
Time: Social, 4:00 p.m. Presentations, 4:30 p.m.  
Location: University Hilton Hotel, University of Houston Main Campus. Before the Milton Dobrin Lecture.  
Cost: NO CHARGE  
Topic: Time Lapse 3D Seismic  
Speakers: Xuri Huang, Western Geophysical  
Christopher P. Ross and Suat Altan, PGS Tensor  
Organizers: Richard Verm, GDC  
Chengbin Peng, Shell

## Reservoir Characterization by Integration of Time-Lapse Seismic and Dynamic Data

XURI HUANG, Western Geophysical

Abstract:

Today most of the critical reservoir management decisions are made using reservoir models that match the production data and reproduce the static data. Recently 3-D time-lapse seismic surveys have been proposed to improve reservoir monitoring by relating time dependent changes in seismic to the flow processes in the reservoir. This paper documents a case study of a turbidite sheet sand reservoir in the Gulf of Mexico where the 3-D time-lapse seismic data was not only integrated with production data from three (3) wells over five (5) years to characterize the reservoir by optimization, but these same data were used to validate a seismic history matching methodology.

The seismic data from the base survey were combined with log and production data to build an initial simulator model which was run forward to the time of the monitor seismic survey. Dynamic history matching performed by a simulated annealing type of optimization further improved the simulator model. This monitor simulator model was then converted to an acoustic model using Gassman's equations and a simple convolutional approach to create a synthetic monitor seismic survey.

A preliminary comparison of the amplitude attributes extracted from the synthetic and the real monitor seismic data showed differences in the water encroachment. A more quantitative seismic history matching methodology was tested. The approach constrains the modeling process to match the production history and minimize the differences between the synthetic and real 3-D seismic monitor data. This new optimization process can lead to improved reservoir management.

### Repeatability testing for seismic monitoring

Christopher P. Ross and Suat Altan, PGS Tensor

Abstract:

The challenges associated with

continued on page 4



production-scale seismic monitoring of present day declining fields are formidable, and seismic processing is no exception. In addition to estimating possible changes in fluid state and determining the probability of seismic detectability, it is equally important to assess the repeatability of the seismic system to ascertain the noise level (residual reflector energy) of the background reflectors through survey subtraction. If the residual reflector energy (Ross, et. al, 1996) is larger than the expected seismic response associated with pore-fluid variations, the results may be ambiguous. Therefore, it is paramount to establish the system's residual reflector energy for comparison with the seismic detectability of the petrophysical variations in the reservoir. This paper examines the repeatability of seismic data processing for seismic monitoring and why uniform seismic processing is important.

An example of testing Data processing repeatability, Physical differences in acquisition systems (i.e. acquisition footprints and imprints) as well as processing can be most striking for data sets acquired with different equipment, different technology, and different illumination objectives. The primary goal in time-lapse seismic processing is to minimize these footprints and reduce the artifact levels,. The best way to accomplish this is with identical processing/reprocessing of the data. One way to evaluate the quality of the processing is to examine data volumes in areas where the pore fluids and geology are static. This can be performed in non-reservoir areas between two surveys, or by looking at surveys acquired within a short enough time period that no detectable reservoir change could occur.

For example, two surveys acquired in 1996 using OBS techniques in a shallow water area of the Gulf of Mexico, were acquired for a zero-time repeatability test. Data was acquired using the same crew and equipment over an area without any production with a very short time interval (less than a week). Data processing of each survey included a reformat, deconvolution NMO, DMO, stack, migration and filter. Velocity fields for NMO corrections and

migrations were identical for both surveys. The difference between these two surveys readily illustrates a lack of coherent energy which is expected in a zero-time repeatability survey. Since there are no dynamic changes associated with production, the difference between the two surveys can be considered residual reflector energy (RRE), which is a measure of artifact levels in the seismic system.

The results from this OBS repeatability test may be unique, and we do expect a range of RRE measurements depending on differences acquisition design, source stability, ambient background noise, etc..., and the best RRE measure might not be the most cost-effective solution for the particular seismic monitoring task. Presently, the energy market is dictating improving production profiles of declining fields to avoid abandonment, to capitalize on existing production infrastructure, and to improve finding and development costs. This will require incorporation of previously shot surveys, regardless of what acquisition differences may exist so repeatability tests are essential, and because of this, we do expect to see higher RRE levels. The question operators and contractors must answer is, "What are the RRE levels using previously recorded data, and are the results meaningful?" This can only be determined by modeling the potential reservoir changes and by testing the data to see what is detectable.

Time-lapse seismic monitoring can be performed using new or legacy surveys, but the results from seismic monitoring can only be deemed successful if the residual reflector energy is small when compared to the observed difference in the reservoir. Residual reflector energy values are relative and will vary depending on acquisition and processing, and are an important quality control feature for time-lapse interpretation.

## Potential Fields SIG

Date: Thursday,  
March 20, 1997  
Time: 5:30 - Social Hour,  
6:30 - Dinner,  
7:30 - Talk

### ATTENTION, NEW VENUE!

Location: NEW Hess Building,  
5430 Westheimer,  
Formerly the Carlyle  
Restaurant Located on  
the north side of  
Westheimer between  
Chimney Rock and  
Yorktown.  
Cost: \$20.00  
Reservation: Chuck Campbell,  
ACCEL Services, Inc.,  
campbell@neosoft.com,  
or 713-993-0671  
Topic: Exploration Case Study:  
Colombia Airborne  
Gravity & Magnetism  
Interpretation of the  
Putamayo & Upper  
Magdalena Valley,  
Colombia  
Speaker: John Ceron, Ecopetrol

### Abstract:

Exploration in rugged topography continues to be a difficult, costly, and often times hazardous undertaking. Airborne gravity and magnetism has proven itself to be a useful geophysical technique for rapid and cost effective exploration. Particularly when ground access is limited owing to natural barriers, topography, and foliage.

A recent airborne gravity and magnetism survey was acquired in southern Colombia by LCT for Ecopetrol. The study area covers approximately 40,000 square km, with dimensions of 500 km long and 80 km wide. The survey extends from the Putumayo River along the Colombian / Ecuador border northwards along the Magdalena Valley as far as the town of Neiva. The geography of the area is typical of most of the South American "Andean Cordillera". Mountains running southwest to northeast form natural borders along the west and in the northeast. The mountainous ranges

*continued from page 3*

rise sharply from the valleys, foothills and low lying southern plains (1600 ft amsl) to elevations of several thousands of feet (in excess of 15,000 ft amsl). The Magdalena Valley and Putumayo areas are physiographically distinct and are separated by a broad ridge which runs perpendicular to the axis of the valleys and mountains, representing the southernmost expression of the Cordillera Oriental (Eastern Cordillera).

Approximately 14,000 km of airborne gravity and magnetics data were acquired at a constant barometric altitude of 10,000 amsl. The data were acquired in under 60 days in extremely uncooperative weather. Typically, only a narrow time window was available for acquisition each day. The data were acquired using a Cessna Caravan survey aircraft, a ZLS-modified LaCoste & Romberg dynamic gravity meter, state of the art GPS technology, and a cesium vapor magnetometer with active compensation. Despite the weather, reflights were kept to a minimum, through the use of sophisticated data processing methods developed by LCT, which accurately model the aircraft movements in post-processing.

The processed products yielded maps of topography (derived from available data, plus the radar altimeter profile), free-air gravity anomaly,

terrain-corrected Bouguer gravity anomaly, isostatic gravity anomaly, and total magnetic anomaly. The interpretation project methodology involved: 1) building a series of geological profiles which contain all of the known and expected lithological and structural control, 2) calculation of the theoretical gravity and magnetic effect of the geological models, 3) comparison of this effect with the observed fields, 4) design and implementation of potential field filters to remove regional effects such as long wavelength terrain "noise" and isostatic signals, and to enhance the measured effects of the local geology, 5) design and implementation of Euler deconvolution operators for 2D and 3D magnetic calculation, and 6) construction and inversion modelling of the entire gravity field constrained along a number of key profiles.

The objective of the interpretation was to define the principal structural elements and the distribution of sedimentary basins across the study area. The gradient information content in the gravity and magnetic data is structurally definitive and can be used to identify the location and orientation of the main intra-sedimentary faults (thrust, wrench and normal) and basement fault block boundaries. The residualized gravity data were inverted and modelled to provide information

about the extent and thickness of the main sedimentary basins. The magnetic data were used to confirm the depth and structure of the magnetic basement, which in the study area is assumed to coincide with the top of crystalline basement.

Regionally, the area can be divided into two distinct oil bearing provinces: the Neiva Sub-Basin (south of the town of Neiva), and the Putumayo foothills (north of the border with Ecuador). These two provinces are presently separated by the Eastern Cordillera Ridge, but were likely joined during pre-Tertiary times. The Upper Magdalena Basin south of Neiva is bounded by thrust faults verging east and west, which are expressions of two different compressional events. Several other thrust (inverted) faults can be mapped within the basement, defining topographic highs that separate narrow, deep seated sub-basins. Many of these sub-basins are covered by thin volcanic sequences, which, prior to the availability of the potential fields data set described herein, precluded the discovery of these basins from the interpretation of other geophysical data sets.

In general terms, basement anisotropy is expected to exert a fundamental influence on the geometry

*continued on page 6*

## **MILTON DOBRIN LECTURE**

Date: Wednesday, March 19

Location: University Hilton Hotel, University of Houston, Main Campus

Time: Lecture 5:30 PM, Reception 6:30 PM

Speaker: Dr. Enders A. Robinson, a Maurice Ewing and Jay Lamar Wurtzell Professor at Columbia University.

Topic: "Extended Resolution in Seismic Imaging".

For more information contact Dr. Robert Sheriff at 713/743-3414

---

## **GSH AUXILIARY**

Sunday, March 2, 1997, Spring Brunch at the Lakeside Country Club, featuring the First Methodist Church and Music Academy of Sugar Land presenting a potpourri of Musical Comedy Hits.

There is also a Duplicate Bridge Group that meets at 7:30 pm on the 2nd Friday of each month at the Bridge Studio, 6640 Harwin.

If you are interested in attending any or all of the auxiliary functions as a guest or would like to join our organization, contact Barbara Thigpen, GSH Liaison, at 281.497.3299. Cost is \$5.00 for membership for the remainder of the year.

of a superimposed compressional fault system. It is likely that the major thrust faults in this area may overlap or coincide with an earlier sequence of normal faults. Given sufficient geological control it is possible to distinguish thin-skinned tectonic elements from deep-seated, underlying, normally faulted basement structures.

The airborne gravity and magnetic data successfully resolved a number of deep sedimentary basins and regional fault structures. Prospective basins have been identified and are currently undergoing additional exploration follow-up. A series of interconnected, narrow fault bounded sedimentary basins are evidenced from the gravity and magnetic data. This area is also transected by a number of large faults which are clearly visible in both the gravity and the magnetics data, which offset the resolved basins. These faults are parallel or strike close to many of the existing seismic lines that have been shot in this area, and are difficult to infer from the seismic data alone.

Present exploration of the region is focusing on several areas which have been cost effectively high-graded with the airborne gravity and magnetic data. Renewal of interest in the region is demonstrated by the present unavailability of open lease blocks, which will lead to numerous wells drilled in the years to come.

---

## ENVIRONMENT APPLICATIONS S.I.G. LOOKING INTO THE EARTH:

The geoscience approach for characterizing underground geology using appropriate non-intrusive geophysical methods prior to 1 to 2 core tests. "For at least the last twenty-five years that I have been in business, geophysicists in every industry except oil have been complaining that our clients neither understand what we do nor appreciate what we have to offer. . . why has oil exploration dominated virtually all of applied geophysics for the

last 40 years?" asked Dr. Phillip R. Romig, Department of Geophysics at Colorado School of Mines at the Symposium on the Application of Geophysics to Engineering and Environmental Problems in March 1990 in Golden, Colorado.

### COME TO THE MARCH '97 FORUM AND FIND THE ANSWER TO HIS QUESTION.

The purpose of the 2-day program is improve people's awareness about the use of non-intrusive geophysical methods to make better informed decisions.

The objectives are for participants to 1) avoid risk 2) satisfy regulatory requirements 3) learn about six proven non-intrusive geophysical methods for baseline studies and hazard delineation.

#### OPEN TO THE PUBLIC

#### 8:00-4:30 Friday 21 March

Introduce the geoscience method for site characterization and compare it with conventional environmental-engineering approach using two proposed permit applications before the State of Texas, vendor exhibits, and poster sessions. The two proposed permit applications include a 1) hazardous waste disposal well (injection well) into the Boling salt dome, Wharton County and 2) low-level radioactive waste facility (landfill), Hudspeth County. Location: Texaco EPTD, 3901 Briarpark (Westpark and Briarpark), host Dr. Phil Inderwiesen.

Exhibits Chairman: John DeVault, CPG, 281/496-1421

#### 8:30-5:30 Saturday 22 March,

Field demonstrations at North Harris College, W. W. Thorne Drive, at

Winship Bldg (near parking lot B-1) Methods include gravity, electromagnetic or conductivity, magnetic, seismic reflection, seismic reciprocal refraction and fan-shooting, and ground penetrating radar.

Field Demonstration Team Leaders: Tom Bakewell and Dr. Warren Franz

#### WHO SHOULD ATTEND AND WHY

The Geoscience Site Characterization Approach integrates the results of a combination of

appropriate non-intrusive geophysical methods to optimize the locations of core holes to evaluate anomalous underground conditions. This process is similar to a medical doctor conducting non-intrusive biophysical tests (blood pressure, listen to the heart and lungs with a stethoscope, X-ray, tap the knee for reflex, ultra sound and others) to identify unusual internal conditions that may require a biopsy or possible surgery. The test results may be retained for future reference.

Who benefits? How?

Appraisers: Risk potential for underground abandoned or unpermitted wells, landfills and waste pits.

Architects: Locate buried faults, unstable soil conditions, buried waste pits and dumps.

Civil engineers: Delineate unstable conditions for proposed structural loading. Reduce liability exposure.

Loan officers: Risk reduction. Determine hidden/buried liabilities prior to approving loans.

Geophysicists: Learn about issues and other businesses that need special consulting.

Hydrologists: Delineate fluid pathways and barriers to flow in three dimensions.

Hydrogeologists: Learn about methods that improve water reservoir/aquifer modeling performance.

Internal auditors: Environmental perspective for both operations and overall evaluation of the company's risk management system.

Investigators: Remote sensing methods to incorporate into investigations.

Programmers: See state-of-the-art computer workstations with graphical and analysis applications.

Public Health: Increase awareness about non-intrusive methods to reduce exposure to hazardous chemicals occupational workers.



## ENVIRONMENT APPLICATIONS S.I.G. Registration Form

LOOKING INTO THE EARTH: A special 2-day course offered by the Geophysical Society of Houston through North Harris College Continuing Education. You have the option to earn a certificate for 1.6 ceu for only \$6 additional dollars to the \$35 pre-registration (after 15 March \$40 registration).

REGISTRATION: 2-day pre-registration is \$35 until 15 March.  
Onsite registration \$40.

Lunch included with registration. CEU certificate: 1.6 ceu North Harris College \$6 extra.

Name (print) \_\_\_\_\_

Address \_\_\_\_\_

Write check to GSH-FORUM'97 and mail to GSH-FORUM'97, P. O. Box 925809, Houston, Texas 77292-5809. Call 713/683-0638 for details.

*continued from page 6*

**Ranchers:** Determine the top of groundwater prior to drilling water wells. Identify potential salt water contamination not visible at the surface.

**Regulators:** Increase awareness of commercially available methods that delineate underground environmental problems.

**Re-remediation:** Reduce risk, project time and cost to re-mediate.  
**Managers:** Determine probable maximum depth of contamination.

**Underwriters:** Reduce financial risk exposure for capital projects.

**Wildlife Managers:** Enhance conservation and restoration of water quality.

For Information: Environmental Applications Chairperson: Dr. Stephanie Hrabar, CPG, CFE, PG (KY) 713/683- 0636 or email: stephanie.hrabar@internetmci.com

## Reservoir Geophysics SIG

Date: March 25, 1997

Time: 4:00 PM

Location: Texaco E&P Technology  
Department 3901  
Briarpark Houston, TX  
77042

Topic: Unusual Time-Lapse  
Seismic Experiment

Speakers: Guy W. Purnell and  
Robert H. Tatham

Contact: Tien-when Lo  
(713-954-6865)

In 1992, Texaco conducted an experiment at Salem Oil Field, Illinois, to measure small temporal variations in seismic wave velocity. Using sources and receivers at fixed borehole and surface locations, we repeated recordings every 30 minutes over 4 days. The sources consisted of (1) dynamite 43-m deep in a cased, cemented hole and (2) a Bolt borehole airgun 393-m deep in a cased well.

Analysis of the data focused on variations in the travelttime, amplitude and average frequency of the direct arrivals. The variations of all three attributes involve apparently random

and nonrandom components, both of which may be large enough to affect the processing and interpretation of surveys conducted for seismic reservoir monitoring. In particular, a strong nonrandom component having a nearly diurnal period predominates for source-receiver pairs exhibiting high S/N. For example, the various dynamite recordings have travelttime variations that imply average velocities varying cyclically in the range 0.35-0.55%, consistent with periodic variations of 0.1-0.5% cited by academic researchers. The implied airgun velocities varied in the range 0.65-1.45%. Fluctuations in peak amplitude (up to 100%) and average frequency (up to 5%) tend to correlate strongly with the travelttime variations.

The experiment was designed based on the notion that solid earth tides would be the dominant mechanism for velocity variation during the experiment. However, the nonrandom variations may also be related to pore pressure changes associated with pumping of (1) near-surface groundwater, (2) water into deeper formations as part of enhanced recovery, or (3) fluids from deeper formations. We interpret the seemingly random component of the travelttime variations to be an artifact related to experimental nonrepeatability.

---

## ANNUAL HONORS AND AWARDS BANQUET

Thursday, May 8, 1997

Lakeside Country Club  
100 Wilcrest

The GSH will host its Annual Honors and Awards Banquet on May 8th, 1997. Our special guests will be your colleagues who have 50 and 25 years of membership in the SEG along with this year's GSH Honorary and Life Members. Details will appear in the April issue of the newsletter. If you are interested in attending or need information, please contact Carmen Comis, Banquet Chairperson, at 713-465-6612, ext. 109.

## Upcoming Meetings and Conferences

### **Emerging Technologies for the Natural Gas Industry in the Spotlight**

The U.S. Department of Energy will hold a Natural Gas Conference on March 24-27, 1997, at the Wyndham Greenspoint Hotel in Houston, Texas. The Conference is being sponsored by DOE's Morgantown Energy Technology Center, lead center for the Natural Gas Research Development Program.

The conference format will include both oral and poster session presentations as well as selected organizational exhibits and pilot technology demonstrations. The conference will kick off on Monday afternoon with natural gas workshops on (1) advanced drilling technologies and (2) evolving geophysical applications for the natural gas industry, and will continue with four geotechnical seminars on Tuesday morning. Seminar topics will include evolving drilling systems and technologies; 3-D seismic applications; the natural gas atlas series involving the Gulf Coast, Offshore, and Appalachian basins; and environmental applications for the petroleum industry. The General Session of the Conference will begin Tuesday afternoon with keynote speaker Kenneth Lay of Enron Corporation.

For continuing updates and further information please contact: Conference Services Morgantown Energy Technology Center 3610 Collins Ferry Road P.O. Box 880, MS-KO7 Morgantown, West Virginia 26507-0880 Telephone: (304)285-4108 Or visit METC on the Internet at: <http://www.metc.doe.gov> - Select METC Calendar of Events

### **U.S. Dept. of Energy's Natural Gas Conference**

Technical discussions will include current research activities in DOE's industry-partnership product areas of Resource and Reserves; Low Permeability Reservoirs; Drilling, Completion, and Stimulation; Natural Gas Storage; and Natural Gas Processing. On Wednesday morning, March 26, 1997, in the Low Permeability Reservoir session (Improving Integration and Application of Technology) will be presented two naturally fractured gas fields in which multi-azimuth 3D P-wave seismic data were evaluated for fracture density and fracture azimuth. Various seismic attributes were compared to EUR to determine which show better correlations. Each field area had some multi-component (shear-wave) seismic also recorded for calibration.

Location: Wyndham Greenspoint Hotel, 12400 Greenspoint Dr., Houston, TX March 24-27, 1997. For more information, please contact:

Conference Services, Federal Energy Technology Center, P.O. Box 880, MS-K07, Morgantown, WV 26507-0880. Fax (304) 285 4459. Telephone (304) 285 4750.

<http://www.metc.doe.gov> (Select METC Calendar of Events)

For information about the seismic reflection presentations, contact Dr. H. Lynn, Lynn Inc., 1646 Fall Valley Dr., Houston, TX 77077, telephone (281) 556 9196; Fax (281) 497 6250.

Prior to the Natural Gas Conference, there will be two technology seminars. Monday, March 24, 1997, 1-5 PM.

(1) Geophysical Applications Workshop, to be held at Western Geophysical, 10,001 Richmond Ave. (at Briar Park), Houston. This technology seminar features the DOE projects that used seismic reflection methods to determine relative fracture density and orientation. Three DOE-sponsored seismic field studies will be presented: 1) Utah, Bluebell-Altamont Project; 2) Wyoming, Wind River Basin Project; 3) Colorado, Rulison Field, Piceance Basin project. Included in the presentations are:

- basic elements of seismic anisotropy;
- analysis of multi-azimuth P-wave data (2D and 3D);
- analysis of multicomponent (P and S) field data;
- the "Fractogram" approach to evaluate multi-azimuth 3D P-wave data.

Attendance to the pre-conference workshop is limited to the first 100 registrants. Cost: \$50/registrant.

(2) Russian Drilling Technology Workshop- features presentations on Russian novel drilling technologies and techniques as well as Russian advanced downhole drilling motors. The workshop will be hosted by Mauer Engineering Inc. at their research facility in Houston, TX. March 24, 1997, 1-5 PM.

Attendance to the pre-conference workshop is limited to first 50 registrants. Cost: \$50/registrant.



# GSH 1997 Spring Symposium and SEG 13th Annual Gulf Coast Technical Meeting

April 23, 1997 BP Plaza Houston, TX

**“The Three E’s of 3D — Efficiency, Effectiveness, Economics”**

## Second Announcement and Pre-Registration

This year the Geophysical Society of Houston is sponsoring the SEG 13th Annual Gulf Coast Technical Meeting in joint session with its Spring Symposium. The meeting will be held on Wednesday, April 23 at BP Plaza, 200 WestLake Park Boulevard, Houston (this location is on the southeast corner of the intersection of Interstate 10 and Texas Highway 6 in far west Houston). The technical session, consisting of approximately eight presentations on the efficiency, effectiveness and economics of 3D seismic surveys, will be moderated by Malcolm Lansley (Western Geophysical) and Dave Monk (Energy Innovations). Selected SEG Continuing Education short courses will be offered at BP Plaza on the days preceding and following the meeting:

Tuesday, April 22: “Geophysics in Risk Management”  
8:00 AM - 5:00 PM Instructor: Laura Ethetton

Thursday, April 24: “Planning and Executing a Marine 3D Survey”  
8:00 AM - 5:00 PM Instructor: Malcolm Lansley

Please use the following course registration form to enroll in either or both of these courses (if registering for a course and the general meeting, please submit both the course and meeting registration forms together).

Advance registration for the general meeting is available using the following form. Pre-registrations must be received in the GSH Business Office on or before Wednesday, April 9. There will be on-site registration on the day of the meeting.

Contacts: Don Herron  
General Chairman  
(281) 560-3778

Dan Ebrom  
Technical Program Chairman  
(713) 954-6252

### Short Course Registration Form

**GSH 1997 Spring Symposium and  
SEG 13th Annual Gulf Coast Technical Meeting  
BP Plaza Houston, TX**

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: (daytime) \_\_\_\_\_

(evening) \_\_\_\_\_

Please check the course(s) in which you are enrolling:

Tuesday, April 22: “Geophysics in Risk Management”

Thursday, April 24: “Planning and Executing a Marine  
3D Survey”

Tuition is \$125.00 per course, \$225.00 if enrolling in  
both courses (tuition includes morning and afternoon  
refreshments).

Please send this completed form with a check or money  
order for tuition to: Geophysical Society of Houston, 7171  
Harwin, Suite 314, Houston, TX 71036.

Each course is limited to 40 students, so pre-registration  
is strongly suggested (there will be registration on a space  
available basis only on the day of each course).

### Registration Form

**GSH 1997 Spring Symposium and  
SEG 13th Annual Gulf Coast Technical Meeting  
April 23, 1997 BP Plaza Houston, TX**

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: (daytime) \_\_\_\_\_

(evening) \_\_\_\_\_

Please provide the following supplemental information:

Discipline (circle one): geophysics geology  
engineering other

Years of experience (circle one): < 1 year  
1 - 5 years  
> 5 years

Primary interest (circle one):  
exploration exploitation  
environmental other

Please send this completed form with a check or money  
order for \$60 (GSH members, unemployed and students  
— send proof of full-time enrollment) or \$80 (non-  
members) to: Geophysical Society of Houston, 7171  
Harwin, Suite 314, Houston, TX 77036.

Pre-registrations must be received by April 9, 1997.

# GEOPHYSICAL SOCIETY OF HOUSTON

## *JANUARY TECHNICAL LUNCHEON*



*Fernanda Gasparotto, EPR • Drake Cameron, EPR  
Dave Aganval I.I.T. • Peter Wang, Kelman*



*Rosemary Mullin, N.S. Neidell & Associates  
June Weeks, Guest*



*Donald Johnson, Grant Geophysical  
Lynn Chenault, Grant Geophysical  
Steve Campbell, Grant Geophysical*



*Norm Reidell, N.S. Neidell & Associates - Speaker  
Dave Aganval I.I.T.*





SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Submittals and suggestions should be sent to the GSH Editor at 7457 Harwin, Suite 301, Houston, TX 77036, or call Cliff Kelley, Editor, at 368-8103, or Fax to 368-8182. Deadline for submission is the 1st of the month preceding publication: e.g., September 1 for the October issue. Digital or electronic submittals required.						1
<b>MARCH 1997</b>						
2 Auxillary Spring Brunch	3	4	5	6	7	8
9	10	11	12 GSH Technical Breakfast HESS	13	14 Auxillary Bridge	15
16	17 GSH Technical Luncheon HESS	18	19 Data Processing SIG University Hilton Hotel U of H Main Campus  Milton Dobrin Lecture University Hilton Hotel U of H Main Campus	20 Potential Fields SIG HESS	21 Environmental Applications SIG Texaco EPTD	22 Environmental Applications SIG North Harris College
23	24  DOE Conference	25 Reservoir Geophysics SIG Texaco E & P Technology Department  DOE Conference	26  DOE Conference	27 Interactive Workstation SIG British Petroleum  DOE Conference	28	

## GEOPHYSICAL SOCIETY OF HOUSTON

7457 HARWIN DRIVE, SUITE 301  
HOUSTON, TEXAS 77036  
(713) 785-6403



ADDRESS CORRECTION REQUESTED

Periodicals  
U.S. Postage  
PAID  
Houston, Texas