



# Geophysical Society of Houston

VOL. 32, NO. 12

NEWSLETTER

SEPTEMBER 1997

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## President's Letter

Bill Gafford, Amoco



Welcome to the 1997-98 year of the Geophysical Society of Houston! The year ahead will bring many educational and social opportunities for the geophysical community in Houston. If you have been a member very long, you know that in the last few years, the GSH has expanded the educational program by sponsoring the Special Interest Groups (SIGS) in such areas as Potential Fields, Data Processing, Interactive Workstations, Environmental Applications, and Reservoir Geophysics. Some of these groups have been meeting for quite a few years and others are relatively new. These SIGS hold meetings at various locations, late in the afternoon, and offer the chance for our members to keep up with the constantly changing technology in each area, in a relaxed atmosphere. Everyone can find a topic of interest so watch for details in our monthly Newsletter. Our monthly Technical Luncheons will continue to feature some excellent subjects and speakers, and we will continue our successful Technical Breakfast meetings in different parts of town.

In addition we will be working with the SEG to help implement some of their new programs to increase access to Distinguished Lectures and Continuing Education at reduced cost to the membership.

The social events throughout the year offer a chance to meet your

colleagues on a more relaxed basis and maybe even practice your favorite sport. These include the Icebreaker, Shrimp Peel, Christmas Party, Awards Banquet, and Bar-B-Q, as well as the Tennis, Golf, Bass, and Sporting Clays Tournaments.

The success of these many programs during the year depends on volunteers to organize and plan them. As the industry activity has increased in the past year, the demands on our time have increased also. On page 2 of this newsletter you will find the names of the officers and committee chairpersons who will be planning this year's activities. Why not find an area of interest to you and call and volunteer your help? You will find it rewarding!

## Technical Luncheon

- Date:** Monday, September 22, 1997
- Time:** Register and cash bar, 11:30 AM ; Luncheon and Talk 12:00 Noon
- Location:** NEW Hess Building, 5430 Westheimer Formerly the Carlyle Restaurant located on the north side of Westheimer between Chimney Rock and Yorktown.
- Cost:** \$20 for pre-registered members; \$25 for walk-ins and guests
- Reservations:** Call 713-917-0218 or email: [reservations@hougeo.org](mailto:reservations@hougeo.org) no later than 12:00 Noon on Friday September 12, 1997

## GEOPHYSICAL SOCIETY OF HOUSTON

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

(713 785-6403 · (713) 785-0553 · Office Hours 7 a.m. - 4 p.m.

Event Reservations Number: (713) 917-0218 • email: reservations@hougeo.org

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## 1997-98 Editor's Notes

Dennis McMullin  
Landmark Graphics Corporation  
email: dmcmullin@lgc.com

As the new editor of the GSH Newsletter I'd like to welcome you to the 1997-98 season of the Geophysical Society of Houston. To begin this society year, I'd like to make some comments and observations about the operation of our newsletter publication.

### A Personal Thanks

First off, I want to personally thank my predecessor, Cliff Kelly, the 1996-97 newsletter editor. Cliff worked extremely hard on last year's newsletter and freely shared his insights into how the GSH newsletter works, how the GSH editor should work and how we might produce a better newsletter "communication product" for our society members. I look forward to getting help, suggestions and feedback from Cliff as well as from the rest of our society members.

### Newsletter Editorial Deadlines

The GSH newsletter like any monthly publication, must adhere to a very strict editorial schedule. During each publishing cycle I collect important "time sensitive" newsletter announcements and materials from numerous sources, both within and outside of our organization. Below are the editorial deadlines for each coming newsletter issue. This is my attempt to insure that important newsletter contributions and announcements appear in the appropriate newsletter issue and reach all our society members in a timely fashion. To insure your material gets into the right newsletter issue, I must receive it on or before the corresponding editorial deadline date.

#### Newsletter Issue

#### EDITORIAL DEADLINE

October, 1997  
**August 21, 1997**  
November, 1997  
**September 18, 1997**  
December, 1997  
**October 16, 1997**

January, 1998  
**November 13, 1997**  
February, 1998  
**December 18, 1997**  
March, 1998  
**January 15, 1998**  
April, 1998  
**February 19, 1998**  
May, 1998  
**March 19, 1998**  
June, 1998  
**April 16, 1998**

If you find these dates difficult to remember, the editorial deadlines are approximately six weeks prior to publication on the third Thursday of the month.

### GSH Calendar

The Newsletter relies upon an "official" GSH calendar to accurately communicate important monthly society activities. This official GSH calendar is maintained by Joan Henshaw, our GSH office manager. The calendar contains not only important GSH activity dates, but dates for other local and national professional society events. Maintaining a *centralized* calendar avoids date and timing conflicts between society activities. Please make sure to communicate your important activity dates to Joan. **You can contact Joan Henshaw at GSH Office (713) 785-6403, fax (713) 785-0553, email: reservations@hougeo.org**

### GSH Contacts

I encourage all members to use and save the listing of GSH Board of Directors, Executive Committee and SEG Section Representatives printed on the inside cover of each newsletter. This contact information is invaluable when trying to communicate with the GSH. If this listing needs corrections or updates, please contact me.

### Newsletter Articles

Last year Cliff Kelly began the practice of publishing short interesting articles in the newsletter, a practice that I plan continue whenever possible throughout my editorial year. Although I don't have specific issue topics or papers selected, I would be interested

in receiving recommendations from society members — and even more interested in hearing from members willing to submit articles for publication. Please contact me with any comments, ideas or articles.

### This Month

In our initial newsletter issue contains an article that looks at the O&G industry as a "knowledge industry". This concept seems far from our day-to-day technical and scientific concerns, and many in our industry do not yet view themselves as "knowledge workers". But more and more companies are realizing that the knowledge produced by their most creative and talented employees is ultimately their most valuable "product" — even though it never appears directly on the company's financial books. We "value-add" our professional experience and expertise to convert raw data and information (seismic, gravity, magnetics, well logs, reservoir and production measurements or whatever) into valuable "knowledge products" — products that discover new reserves in new places, or new reserves in old places, or better manage the reserves that we already have.

### Editor's Thanks

I want to thank everyone ahead of time for helping me make this year's GSH Newsletter a important and valuable source of information for our society's entire membership. I look forward to a great 1997-98 GSH Newsletter year.

Dates for all GSH calendar activities must be communicated to Joan Henshaw at the GSH Offices 7457 Harwin Suite 301, Houston, TX 77036; (713) 785-6403; fax (713) 785-0553; email: reservations@hougeo.org. Newsletter content submittals should be communicated to Dennis McMullin, GSH Editor, 7457 Harwin Suite 301, Houston, TX 77036; (281) 560-1069; fax (281) 560-1278; dmcmullin@lgc.com. Deadline for submission is six weeks prior to publication (e.g. August 15 for the October issue). Digital or electronic submittals are required.

**Speaker:** Donald "Don" L. Paul  
Vice President,  
Technology and  
Environmental Affairs  
Chevron Corporation

**Topic:** Transformation of the  
Upstream Research and  
Technology System

**Abstract:**

The transformation of the US industrial base over the last decade has been driven by the forces of expanding and inter-linked global economies, the increasing power of shareholders and financial markets, the revolution in information technology, and the rising level of expectations for environmental performance. In addition to these drivers, the upstream energy sector had to accommodate the return of oil and gas prices to their historical, inflation-adjusted norms and away from the "golden age" boom of the late 1970's and early 1980's. A radical restructuring of the energy industry was inevitable under the weight of these forces, and the technology system has been swept along with this tide of change.

Today, many upstream companies have added a growth component to their continued emphasis on cost reduction. However, these driving forces will continue to shape and change the economic landscape and increase the level of competition. The current "mini boom" in the E&P sector is serving to increase the intensity of the competition for resources. All enterprises, from independents to global majors to service companies to energy marketers, are continuously trying to create sufficient differentiation in the market to improve economic performance and increase shareholder value. This challenge is made even more difficult as new competitors are added to the mix in all segments of the value chain. For example, entirely new kinds of energy companies have emerged from the deregulation of natural gas markets (with electric power expected to follow). Using their highly developed marketing and financing competencies, they are putting increased pressure on the well head to market margins for many traditional producers.

This transformation of the business environment has simultaneously created

the pressure on the research and technology system to move away from its traditional supply-driven roots and to respond to a very different set of market conditions and time frames. All segments of the technology supply chain have been and continue to be affected, from academic and government research, to industrial R&D, to the technology product and service marketplace. The drivers for this transformation parallel those pushing the business system. For example:

- In many companies, R&D must now compete on a value-added basis with other high-risk, high reward investments for funds and resources, instead of being managed as a corporate entitlement;
- Decentralization and globalization favors the performance of distributed, global technology systems over the traditional centralized corporate organizations;
- The role of proprietary research and technology is being altered by the increasing presence of joint ventures, alliances, spin-offs, and equity (instead of operating) ownership;
- Wide-spread benchmarking and sharing of previously proprietary information is forcing more realistic assessments of the competitive value of internal research and technology capabilities;
- The shift of many technologies to an information technology base significantly alters the basis of competition for meeting customer expectations', developing new technology products, and preserving proprietary ownership of inventions;
- The R&D function is expected to demonstrate productivity enhancement and work process improvements in line with other business functions.

In 1992, Chevron took a "blank sheet" approach to re-inventing its upstream technology system to account for the significant shifts in the business environment discussed above. This approach required implementing a very different model for internal research and technology and thereby redefining its connection to the Corporation, the business units, and the external technology world. The results show significant improvements in:

- strategic alignment with the business directions and opportunities;
- operational value delivered to the bottom line of the business;
- connectivity to the external technology world, including more investment diversity and leverage in emerging technologies;
- cost effectiveness for delivering research and technology.

While recognizing the considerable challenges involved in these transformations, Chevron is now in the process of applying this technology model to the downstream and information technology sectors. The presentation will discuss our experiences with insights into the emerging models for managing research and technology in the new economic environment.

**Speaker:**

Donald "Don" L. Paul is vice president, technology and environmental affairs, for Chevron Corporation. He is also on the board of directors of NGC Corp., an affiliate of Chevron. Paul is responsible for coordinating the work of Chevron's research and technology companies and accelerating the development and application of competitive technology throughout the company's worldwide activities.

Don Paul is a graduate of the Massachusetts Institute of Technology, with a B.S in applied mathematics, a M.S in geology and geophysics and a Ph.D. in geophysics.

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## Technical Breakfast

There is no Technical Breakfast meeting scheduled for September.

The Technical Breakfast needs a volunteer to chair this activity.

Please contact John Sumner if you are interested.

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## Interpretation SIG

The Interpretation SIG will announce four meetings throughout the coming year on topics concerning *Technology for Interpretation*. Larry is actively looking for volunteers to serve

on the Interpretation Committee. These volunteers could help in organizing meetings, contacting and scheduling potential speakers, arranging venues, etc. If you are interested in helping out, please contact Larry Godfrey, 281-499-6068, the Interpretation SIG Chairman.

No Interpretation SIG meeting is planned for September.

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## Data Processing SIG

The Data Processing SIG has scheduled nine monthly meetings for the coming year with themes for each of the meetings as listed below. The meetings are scheduled from September 1997 through May 1998, and there will be two speakers at each meeting. The selected dates and topics are:

**9/17/97**

Ocean bottom cable acquisition and processing

Guillaume Cambois\*, Ilkka Noponen

**10/15/97**

Sampling issues in 3-D land acquisition

Art Barnes\*, Dave McCann

**11/19/97**

Wavefield reconstruction

Young Kim\*, Karl Schleichler

**12/10/97**

AVO

Stan Truxillo\*, Chengbin Peng

**1/21/98**

Velocity for depth migration

Alfonso Gonzalez\*, Dave McMann

**2/18/98**

Time lapse (4-D) seismic

Jozica Gabizsch\*, Chengbin Peng

**3/18/98**

Anisotropy

Chengbin Peng\*, Richard Verm

**4/15/98**

Multiple attenuation

Jerry Kapoor\*, Richard Verm

**5/20/98**

Traveltime calculation for depth migration

Ilkka Noponen\*, Karl Schleichler, Jerry Kapoor

\* denotes the primary organizer

## September Meeting

**Date:** September 17

**Time:** Social 4:30pm, presentations 5:00pm  
**Location:** CGG, 16430 Park Ten Place (exit Park Ten on I10)

**Cost:** NO CHARGE

**Topic:** Ocean Bottom Acquisition and Processing

**Speakers:** Guillaume Cambois, CGG, Mike Kelly, PGS-Seres

**Organizer:** Guillaume Cambois, CGG and Ilkka Noponen, PGS-Tensor

### First Paper Abstract:

#### 4-Component Ocean Bottom Acquisition and Processing using the Node Technology

by Guillaume Cambois, Christophe Pettenati, Claude Vuillermoz, CGG, and Eivind Berg, Subseaco.

It has been known for more than two decades that shear waves can provide useful information for reservoir characterization. When combined with the more traditional pressure waves, shear waves offer direct measurements of Poisson's ratio, crack density and direction of fracturation. Also, their slower velocity yields increased resolution and allows a better undershooting of salt bodies and basalt. The fact that they do not propagate in fluids is an advantage for imaging through gas chimney, but a serious drawback for offshore applications.

The only way to record shear waves offshore is to place multi-component phones at the bottom of the ocean. Since coupling of the horizontal components is critical for data quality (especially in 3D), we use 4-component nodes (3C geophone and a hydrophone) planted in the seabed by a ROV (Remotely Operated Vehicle). Recording shear waves generally requires large offsets and long listening times. It is therefore critical to carry out extensive feasibility studies (via elastic modeling) to optimize acquisition parameters. The challenge in processing shear and converted waves lies in data gathering, velocity analysis, static corrections and removal of anisotropic effects.

Results to date show that 4C

acquisition at the sea bottom is feasible. The data collected have an excellent signal-to-noise ratio, much higher than what can be recorded onshore. Processing is made easier by the improved data quality, allowing the final results to achieve the imaging goal.

Second Paper Abstract:

#### Ocean Bottom P-P and P-S AVO

By Mike Kelly, PGS-Seres

Multicomponent seismic data recorded on ocean bottom can provide both P-to-P reflection data and P-to-S converted reflection data. These can be used for AVO analysis, separately or jointly. The unique nature of these data requires special care in such tasks as suppression of multiples, gain correction, application of non-hyperbolic moveout, and calculation of angles of incidence. From the resulting "true-amplitude" data we can compute the AVO attributes for P-P and P-S reflections.

For the results to be truly useful we must establish the relationships between the AVO attributes and the rock properties. Here we have to consider the effects of the number of parameters, ranges of the angles, and signal-to-noise ratio. In this presentation processing and attribute analysis will be discussed.

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## POTENTIAL FIELDS SIG

**Date:** Thursday,

September 18, 1997

**Time:** 5:30 - Social Hour, 6:30 - Dinner, 7:30 - Talk

**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

**Topic:** Borehole Gravity Surveys - Recent Applications.

**Speaker:** Andy Black  
EDCON, Inc.

**Reservation:** Chuck Campbell, ACCEL Services, Inc.

# GEOPHYSICAL SOCIETY OF HOUSTON



## 12th ANNUAL SPORTING CLAYS TOURNAMENT

Saturday  
September 6,  
1997

The 12th Annual Shooting Clays Tournament will be held on September 6 at the American Shooting Centers. Come on out and try the passing dove and springing teal, goose tower and other challenging shots. The tournament will be an all day event and family participation is encouraged. Eye protection is required.

The tournament will be a 50 bird event and participants will shoot in groups of five (5). Participation is limited to 200 shooters, and due to the Labor Day Weekend, the sign-up deadline will be extended to September 3. Shells, BBQ lunch and refreshments will be provided.

To enter, complete the form below and mail along with a check (payable to GSH):

Western Geophysical  
P.O. Box 2469  
Houston, Texas 77252-2469  
Attn.: Chris Tutt  
(713) 963-2648 Fax: (713) 963-1921

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### GEOPHYSICAL SOCIETY OF HOUSTON 12th ANNUAL SPORTING CLAYS TOURNAMENT SEPTEMBER 6, 1997

NAME: \_\_\_\_\_ TEL: (RES) \_\_\_\_\_ (WRK) \_\_\_\_\_

ADDRESS: \_\_\_\_\_ COMPANY: \_\_\_\_\_

PREFERRED SHOOTING TIME: (circle one) 8:00 9:45 11:00  
— Please arrive 30 minutes before shooting time —

.....

SHOOTING GROUP (including self)

- |          |       |
|----------|-------|
| 1. _____ | 12/20 |
| 2. _____ | 12/20 |
| 3. _____ | 12/20 |
| 4. _____ | 12/20 |
| 5. _____ | 12/20 |

(CIRCLE GUN TYPE)



GSH/HGS Members or Guest \$55.00

.....

DISCLAIMER:

I acknowledge that neither the Geophysical Society of Houston nor the American Shooting Centers will be held responsible for injury or accidents during this event. **PRACTICE SAFETY!!**

NAME: \_\_\_\_\_ GUEST: \_\_\_\_\_

campbell@neosoft.com,  
or 713-993-0671

**Abstract:**

Borehole Gravity (BHGM) surveys are applied to a range of targets from the traditional remote sensing structural mapping role in salt exploration to time lapse monitoring of reservoir fluids on a formation basis. The tool has unique qualities that make its use attractive in several niche situations. In deep structural mapping it provides a very large volume of investigation at higher resolution than surface potential field techniques. In well logging applications, it provides a deep investigation porosity sensitive tool which is immune to metal casing and bad hole conditions. In all of these applications, the best use of BHGM incorporates data from other tools and BHGM data are usually integrated with surface gravity and seismic and well log porosity and electrical data.

The most effective BHGM structural mapping application is salt flank delineation. This has been used both on and off-shore in Northern Europe and in the Gulf Coast of the U.S.A. The technique relies on a high density contrast between the salt and the surrounding sediments.

BHGM is normally used to refine a salt dome structure interpreted from surface seismic, gravity and magnetic data. Often the flank is poorly defined because of high dips. Examples are shown from Germany and Mississippi.

Another BHGM application at an intermediate scale is the remote detection of porosity in reefs. Porosity development in reef carbonates is notoriously irregular. BHGM provides large volume measurements of porosity which often reveal production offset from the well. The Cotton Valley reef gas play is a good example of this. Here Bossier shale drapes over higher density Haynesville limestone reefs and a structural model based on 3D seismic structure is needed. BHGM density corrected for structure is then compared to well log density and porosity logs to indicate the presence of gas filled porosity which was not intersected by the well.

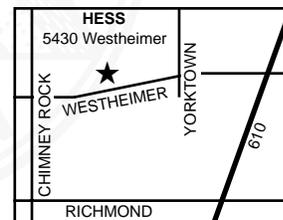
The smallest scale BHGM applications concern determination of fluid saturations within restricted depth in-

## GSH Ice Breaker

Come and join your friends and fellow members to welcome the '97/'98 Technical Program, and celebrate our industry's revival.

DATE: Monday September 8, 1997  
TIME: 5:00 - 8:00 P.M.  
PLACE: HESS • 5430 Westheimer  
(The old "Carlyle" next to the Bechtel Building)  
COST: \$10.00 (plus cash Bar)  
RESERVATIONS: Please either

- 1) Fax your info. including member number to (713) 785-0553
- 2) Call Joan @ office (713) 785-6403 or
- 3) Call Reservation line (713)-917-0218 by Friday, September 5 @ 1:00pm



tervals. Since this can be done through metal casing, time lapse monitoring of fluid saturations can be performed. An example is shown from Gabon.

**Biography:**

Andy obtained a B.Sc. degree in Physics and Geophysics at the University of Tasmania in 1970. He has worked in minerals exploration in Australia and North America using electrical, electromagnetic, magnetic and seismic methods. He also spent several years in seismic data acquisition, processing and interpretation offshore

Europe and on-shore North America. His present position is manager of Borehole Gravity with EDCON in Denver.

## Environmental/Near Surface Geophysics SIG

No September SIG meeting is scheduled.

The GSH welcomes the new chairman for the Environmental/Near Surface Geophysics SIG, **Tom Dobecki**, with FUGRO-McClelland (281/679-5558). Please contact Tom for information regarding future SIG plans and events.

## Reservoir Geophysics SIG

No September SIG meeting is scheduled.

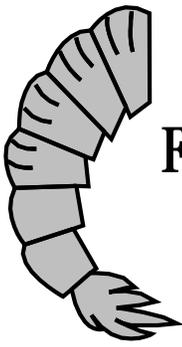
The GSH welcomes **John Eastwood** as the new chairman of the Reservoir Geophysics SIG. John is with Exxon Production & Research Co., and can be contacted at P.O. Box 2189, 713/966-3196, 713/965-7309(fax), john.eastwood@exxon.sprint.com.

John organized the Reservoir Geophysics Workshop in Vail, Colorado earlier this summer. Please contact John regarding future SIG plans and events.

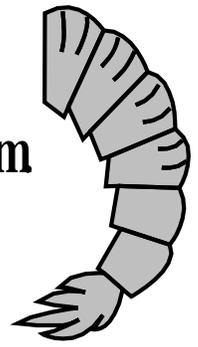
## Goals for the 1997-98 Continuing Education Committee

CE committee: Don Herron, Mike Cooper, Dave Agarwal, and Joe Mills.

Traditionally, the major event for the CE committee is the spring technical symposium, which is organized around a theme of current interest. At last year's symposium (The 3 E's of 3D: Efficiency, Effectiveness, and Economics) tremendous interest was generated by a talk on time lapse seismic. As a follow-on, we plan to solicit papers organized



# HGS/GSH Shrimp Peel



Friday, October 10, 1997 • 5:00 p.m until 9:00 p.m



**Houston's First Microbrewery**  
2522 Fairway Park Drive

Tickets \$15.00 advance / \$25.00 at the door (tickets may not be available at the door)

**Event limited to 600 Persons Only**

Make checks payable to GSH

Advance purchase by mail until **Friday, October 3, 1997**

**HGS/GSH Office**

**7457 Harwin, Suite 301 • Houston, Texas 77036**

(Enclose a self-addressed, stamped envelope)

Advance purchase in person until **Wednesday, October 8, 1997**

**Southwest**

Joan Henshaw  
HGS/GSH Office  
7457 Harwin, Suite 301  
(713) 785-6402/6403

**North**

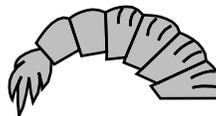
Mike Bennet/Hillia Barzilla  
Paradigm  
11 Greenspoint  
16945 Northchase, Suite 1400  
(281) 876-3473

**Downtown**

John Adamick/Melissa Ramos  
TGS Calibre  
333 Clay Street  
3 Allen Center, Suite 3900  
(713) 754-6701

**Galleria**

Julie Hardie  
Seismic Exchange, Inc.  
1776 Yorktown, Suite 500  
(713) 623-8300



**West**

Brian Anderson/Sarah Murphy  
LCT, Inc.  
1155 Dairy Ashford, Suite 500  
(281) 558-8383

**Event Chairpersons**

**Matt Bognar**  
Digicon  
(713) 512-8510

**Tim Hartnett**  
BHP Petroleum  
(713) 961-8346



**Refreshments**

**Music**

**Dancing**

around *time lapse seismic and associated issues* (such as repeatability, acquisition footprints, and processing footprints). Anyone with suggestions (or a paper to offer!) is encouraged to contact any member of the CE committee.

Since we are living more and more in cyberspace, we would also like to offer a special short course on *Internet and web-related issues*. We are currently trying to organize this course, which might be offered this fall.

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## Technical Transfer Committee

David Forel, Chair

The Technical Transfer Committee believes that the Geophysics journal is a valuable educational resource, but it is only available to the more affluent world economies. Some research institutions and libraries are simply not able to afford the US-based subscription rate. We collect back-issues of the journal and box them into sets. Please contact us if you are willing to donate your back-issues to the education of others.

Sometimes people tell us that, instead of the paper version, we should send the CD-ROM. Where computers and CD players are plentiful, this is a good idea. But where the hardware is scarce, paper versions are reliable. Also, a set can be used by more than one person at a time.

Currently, we have several complete sets. If your company is capable of shipping approximately 300 pounds of magazines (approximately 3'x3'x3'), please contact us. The magazines are in small boxes that can be packed around other goods that are to be shipped globally.

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## Reservations by E-mail

David Forel, Office Chair

Now you can make your GSH event reservation by e-mail. Our e-mail address is "reservation@hougeo.org". When you make your e-mail reservation, please include your Member Number. When we have your

name and your Member Number, we can make the correct reservation for William T. Smith instead of some other guy at some other company, William R. Smith. (E-mail names are frequently cryptic!)

Your Member Number is on your dues renewal notice and your Newsletter mailing label. Please include it in your e-mail reservation.

Also, our telephone reservation number is still available: 713-917-0218.

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## A Few Good Volunteers!

The GSH is looking for a few good volunteers. We all benefit when individual members are willing to invest some personal time working for the GSH. Volunteers are especially difficult to find now that the industry is booming and everyone is busy — but please consider how much volunteering your time and talents might benefit fellow GSH members. And to those members who volunteer on a regular basis — THANKS!

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## VOLUNTEERS NEEDED:

GSH Technical Breakfasts

Chairperson - contact John Sumner  
Interpretation SIG Volunteers -  
contact Larry Godfrey, SIG  
Chairman

Assistant Newsletter Editor -  
contact Dennis McMullin or Bill  
Gafford

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## American Institute of Professional Geologists - 34th Annual National Meeting

The Texas Section-AIPG officers and members host and enthusiastically invite members, guests, and friends to the 34th Annual National Meeting of the American Institute of Professional Geologists

**Where:** Double Tree Post Oak Hotel,  
5353 Westheimer Road in the  
Uptown- Galleria Area, Houston,  
Texas

**When:** October 6-12, 1997

"The 21st Century Professional Geologist: Training, Credentials, Political & Business Considerations"

**What:** This year's program includes:  
2 venues: ENERGY- Houston is the oil capital of the world.  
ENVIRONMENTAL MANAGEMENT- a newly emerging sector in industry.  
56 outstanding papers  
7,000 square foot Exhibit Area  
9 short courses and 1 mini-symposium  
8 field trips

**REGISTRATION:** Preregistration (payment on or before 9/12/97) and on site costs and refund policy are available from General Chairman John DeVault by fax 281/558-5876 and in the TPG newsletter.

**SPECIAL NOTE:**

MARS: Update on the Geological Investigation of Mars will be presented by David McKay of NASA in the Environmental Geology Distinguished Lectures Technical Session #1B.

See more details on Texas-AIPG website: <http://www.ela-iet.com/AIPG/aipg.html> and in the TPG newsletter.

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## Emerging Technologies Energy Conference

A new national technology transfer conference has been specifically designed for owners and CEOs of domestic oil and gas companies and will take place Nov. 17-19 at the Houston Hyatt Regency. The "**Emerging Technologies Energy Conference (ETEC)**" is a joint effort of IPAA (Independent Petroleum Association of America) and the regional network of the PTTC (Petroleum Technology Transfer Council).

ETEC will be held in conjunction with the 68th annual meeting of the Independent Petroleum Association of America and feature selected technology exhibits, workshops and break-out sessions. The program is

designed to address independent producer exploration and production technology issues — and methods for finding practical, cost-efficient solutions, according to PTTC Executive Director Deborah Rowell.

ETEC will differ from other industry shows by providing an interactive format based on specific technology needs identified by producers, Rowell said. The technological transfer conference's management orientation will benefit the owner-operators and CEOs attending the IPAA meeting.

Exhibitors will be invited to demonstrate E&P software, as well as integrated solutions to office environments, including hardware, data, technical reports and other information-based tools. ETEC is being designed as a unique producer forum to exchange technological solutions, discuss industry products and services, and share ways to improve executive efficiency, Rowell said. Hands-on workshops, educational sessions, one-on-one meetings, and a technology demonstration center will provide tools for improving business efficiency.

The ETEC advisory committee — with former DOE Deputy Energy Secretary Bill White serving as the honorary chairman — has developed a technology transfer program with expert speakers. Past IPAA chairman and PTTC board member George Alcorn, president, Alcorn Exploration Inc., Houston, is directing program elements.

"Technology has turned petroleum exploration and production — an industry many considered in its twilight years — into one of growth," White said. "Be sure you too are a part of this modern success story."

For information about exhibiting or attending, contact IPAA at 1-800-433-2851 or visit their National Website at <http://www.pttc.org/hq/>

## Competing in the New Era of Knowledge-based Petroleum Companies

by Robert P. Peebler  
President and CEO  
Landmark Graphics Corporation

As an exploration & production (E&P) information technology supplier, Landmark tracks industry trends to make sure we're developing the kinds of software, systems, and services that our customers need to compete more effectively. This article captures my personal vision of what it will take for oil companies to succeed in the coming years. This vision guides our own company's strategic planning.

I believe the industry is entering a new era of growth in which better decision-making, business advantages, and exponential gains in productivity will depend on a company's ability to integrate the collective knowledge of the entire organization. Leveraging knowledge, therefore, will be the new core competency. Successful companies will do so through significant social change, assisted by a wide range of integrated E&P information technologies.

As technology development and adoption cycles continue to shrink, executives will have less and less time to contemplate change. The ones that embrace technology early will reap the greatest rewards. They will, in effect, pluck the "low-hanging fruit" — much of it by the end of this century. Laggards may not survive the first decade of the next century.

### Entering A New Era

Since 1981, when oil prices began to drop from a peak at \$34/barrel, the industry has passed through an era focused primarily on re-engineering for cost savings. Companies have examined their business processes to increase efficiency. But most of the cost savings have come through consolidation and reducing headcount — "cutting the organizational fat." Industry employment peaked in the U.S. at about 700,000 in 1982, and has dropped continuously for 13 years, returning to pre-1980 levels. Oil prices have leveled off below \$20/barrel. And

there is widespread consensus today that, barring any disruption in supply, prices will likely remain flat into the next century.

In addition, the technical challenge of finding and producing remaining reserves of oil and gas grows more complex every year. The size of new discoveries continues to decline, with larger reservoirs found in deeper waters and more hostile frontiers that cost more to produce.

On the other hand, recent studies suggest that global demand for oil and gas may increase dramatically over the next few years. Economic improvement and population growth, especially in developing countries and the former Soviet Union, are fueling much of this demand. According to a U.S. Department of Energy report (June 1995): "Oil demand is rapidly expanding and projected to grow by 30 percent by 2010." That means the industry will have to increase oil production by an amount roughly equal to the current output of the United States, North Sea and Saudi Arabia combined. The need for natural gas may be even greater. Where are these additional reserves going to come from?

Obviously, for some companies, market conditions hold significant potential for growth. The challenge now is not just to cut costs, but to increase revenue. I believe the industry is quickly moving from an era of cost reduction to a new era of re-tooling for growth. To make money in this new era — with flat prices, lower headcounts, greater technical barriers, and growing demand — many E&P organizations have concluded that they must become far more productive. They are looking for ways to leverage their knowledge assets more successfully than competitors — to work smarter, not just harder. How will they accomplish this?

### Technology and Productivity

David Simon, Group Chief Executive of British Petroleum, recently stated: "The oil and gas industry is now being driven by technology" (New York Times, June 1995). Petroleum companies have long employed technology, but in the 1970s they were driven primarily by higher price

expectations, and in the 1980s and early 1990s by lower costs. Today, success depends on harnessing new technology to reduce cycle time and increase productivity.

Some technologies increase productivity incrementally, others through sudden leaps. But accumulated small gains can add up, over time, to dramatic changes. A decade ago, it took perhaps 30 to 45 days to drill a 10,000 foot well in the western United States. Now, that well can be drilled in about five days. Why? A hundred small technical improvements: Better drill bits, mud programs, crew organization. But each gain has been incremental, shaving off a few days every year.

Other kinds of new technology initiate dramatic leaps in productivity and efficiency. In our industry, there have been two major leaps due to technology since the early years of the E&P Information Age. And a third is just beginning (Figure 1).

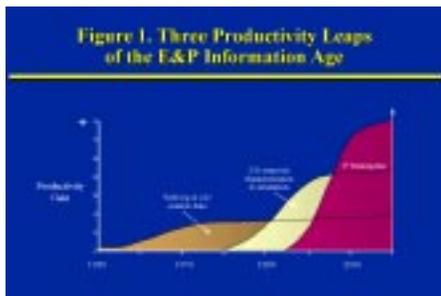


Figure 1. Three Productivity Leaps of the E&P Information Age.

**The First Leap.** In terms of finding and managing petroleum reservoirs, the first significant impact on productivity probably came in the late 1950s and 1960s with the widespread use of well logs and 2-D seismic data. Together, these technologies greatly improved structural interpretation of the subsurface \_ one through direct measurement, the other through indirect imaging. They were as important to E&P professionals as exploratory surgery and X-rays were to physicians.

Productivity improvements from this first leap peaked during the 1970s, with only incremental gains since that time. Logging tools and 2-D seismic processing have been refined, but the basic science has changed very little. As the first leap leveled off, the second

## 1997 GSH TENNIS TOURNAMENT

Friday, September 26, 1997  
12:00—5:00 pm  
Chancellors Tennis Club  
\$30.00 per person

Play will begin promptly at 1:00 pm and conclude by 5:00 PM. Lunch will begin serving at 12:00 pm and as usual it will be GREAT. Cold drinks will be available and a Keg will be available during the COOLING DOWN TIME. A NEW FORMAT will be tried this year to encourage more players . This will be a one half day A and B Scramble Tournament. A player will play with all other players in his group. Ladies will be teamed with partners in the A or B Groups as they choose. In addition to TROPHIES, there will be a drawing for a generous group of DOOR PRIZES. To ensure the proper amount of court space, food and drinks, complete and send in the entry form as soon as possible, but no later than September 22, 1997. We need more players and encourage you to get your associates to participate in this tournament. We are inviting players in the Geological Society to join with us this year so as to have more player~ and more FUN. For information call Bill Steiner 713/789-7250 or Joe Jones 281/438-5626

### 1997 GSH TENNIS TOURNAMENT ENTRY FORM

Name: \_\_\_\_\_ Phone No.: \_\_\_\_\_

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

Flight preferred: A \_\_\_\_\_ B \_\_\_\_\_ Ladies- \_\_\_\_\_

Make check payable to: GHS Tennis Tournament

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began.

**The Second Leap.** With the introduction of 3-D seismic technology in the early 1980s, the industry took an even greater leap in productivity. From the beginning, 3-D seismic was enabled by computers. Acquisition required computing technology in the field just to record the digital data; processing required powerful systems in the computing center; and interpretation and visualization of large data volumes required a new breed of interactive workstations in the office. To date, the primary use of 3-D seismic has been focused on better structural interpretation of faults and horizons.

Companies that pioneered this technology since the 1980s have experienced tremendous productivity benefits, and now recognize 3-D seismic

as a key ingredient to success. Companies just discovering 3-D seismic today are already late adopters of the technology, even among the independents. In terms of 3-D structural interpretation, I suspect that gains will be mostly incremental from here on. But that doesn't mean the second leap is complete.

Over the next five years or so, I believe the industry will see additional dramatic productivity improvements building on 3-D seismic technology. But the focus is shifting from pure structural interpretation to 3-D \_ and even 4-D \_ reservoir characterization and simulation. Integration is the key to this shift. That is, in addition to defining the structural "container," E&P professionals are integrating 3-D

seismic with *all* available data – geologic, geophysical, and engineering – to better model both rock and fluid properties of whole stratigraphic intervals.

Integration of data not only allows oil companies to characterize static properties of the reservoir today, but also to simulate dynamic flow through the reservoir over time. The fourth dimension, therefore, is time. Already, some companies are acquiring so-called “4-D seismic” – multiple 3-D surveys shot over a field at different times – to monitor and improve recovery efficiency. By the year 2000, as these techniques become widespread, productivity increases associated with the second leap will probably taper off.

### **Speed of Change.**

An important observation, especially for executives and senior managers, is that the rate of change due to new technology is rapidly accelerating. The first leap (well logs and 2-D seismic) took more than 20 years to peak; the first stage of the second leap (3-D structural interpretation) took perhaps 15 years; and the second stage (integrated reservoir characterization and simulation) could take less than 10 years.

The speed of technology adoption in our industry reflects a larger phenomenon, described in a recent study by CSC Executive Roundtable. In general, during the 1940s and 1950s new technologies used in various processes (from industrial manufacturing to building a house) took between 10 and 20 years to develop; and the processes affected by those technologies changed over a period of 15 to 20 years. Both individuals and organizations became accustomed to working in certain ways for long periods of time. By the 1980s, however, technology development cycles took only three to five years; and processes changed in less than eight years. Currently, technology life cycles last one to two years. Processes, which are far more complex now, change almost continuously.

This trend suggests two things to me. First, decision makers cannot afford the long technology assimilation

cycles of the past. Competitors may overtake them, or they may simply become unprofitable. Second, to manage change more effectively in the future, petroleum companies will have to collaborate more tightly with technology developers. Only then will they guarantee that rapid advancements in E&P information technology will fit the needs of continuously changing business and scientific processes.

### **The Third Leap: The I<sup>2</sup> Enterprise**

I believe a third major technology leap has only just begun. A few of the most visionary companies, the early technology adopters, are already looking beyond integrated reservoir characterization and simulation to the next long-term business advantage. This third leap extends integration from a single process to an entire E&P enterprise. I call such companies “I<sup>2</sup> Enterprises,” because they multiply “Informationalization” by “Integration” to increase enterprise-wide productivity – exponentially, not just incrementally.

### **The Two “I’s”**

For years now, the petroleum industry has been “informationalizing” many aspects of the business, investing literally hundreds of millions of dollars in computing technology. Many executives, however, haven’t seen the productivity gains they had expected. One reason is that most organizations have only applied information technology to specific tasks, rather than whole processes. Instead of significantly changing the way they work, they have simply automated old methods. Informationalization, therefore, is necessary but not sufficient to achieve dramatic improvements in productivity. Integration, on the other hand, requires whole new ways of working.

“Integration” simply means concurrently combining raw data and information from all parts of an organization, and connecting different peoples’ perspectives, expertise and ideas to make better business decisions in less time. Three of the most important information technologies that enable integration are: Desktop systems powerful enough to handle complex technical analysis; client/server computing for access to shared resources; and distributed databases. These enabling technologies no longer come from niche players, as they did a

few years ago. Now they are developed by large horizontal market suppliers such as Silicon Graphics, Sun, IBM, Oracle and many others. As a result, price/performance ratios of computing technology are constantly improving.

Every phase in the typical life cycle of an oil field (Figure 2) requires various E&P professionals to integrate field operations (data acquisition, drilling, enhanced recovery) with “knowledge work” (data processing, analysis, interpretation). Quality and productivity improve in each phase where people collaborate and have easy access to all the information they need. Ultimately, integration across all phases of the life cycle will yield even greater gains than integration within any particular phase.

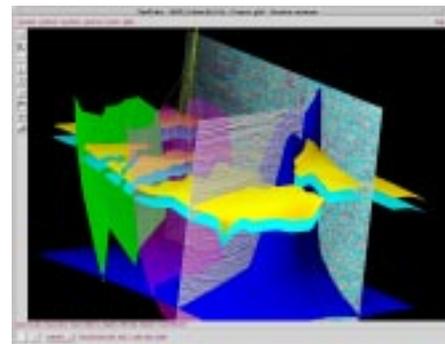


Figure 2. Eight Phases of a Typical Oil Field Life Cycle.

### **Cutting “Decision Fat.”**

Given all the changes in the industry, how much room actually remains for improvement in this new era? Oil companies have cut virtually all of the “organizational fat” from their technical staffs and operating budgets. Where else can they lose weight? I think most of the remaining fat can be found in inefficient decision-making processes. Many technical and operational decisions are flawed not because people lack intelligence, but because they lack information. The goal of the I<sup>2</sup> Enterprise is to eliminate this “decision fat” by leveraging the company’s collective knowledge more effectively.

I’ve been asking senior executives in the industry what percentage of the total E&P expenditures they feel is wasted through poor decision-making every year. In other words, how much “decision fat” remains? Their intuitive

estimates range from 15 to 50 percent, with an average of 25 to 30 percent. According to a recent study by Salomon Brothers (July 3, 1995), publicly-traded companies worldwide will spend nearly \$60 billion for exploration and production this year. If the executives I spoke with are correct, \$15 to \$20 billion may be wasted. If enterprise-wide integration could eliminate even a fraction of that amount, the payoff would be tremendous.

### The Hierarchy of Integration

I believe oil and gas companies have a hierarchy of integration needs, much like the hierarchy of human needs postulated several decades ago by Abraham Maslow, the social scientist. Maslow noted that people can move up the hierarchy only when their more basic needs are met. For example, unless a person's survival needs – air, water, food, shelter – have been met, he or she cannot even consider “self-actualization,” which Maslow identified as the pinnacle of human need. In our industry, I've observed four distinct levels of integration needs (Figure 3): (1) data integration, (2) integration of workflows within teams or operating groups, (3) integration of processes across different operational groups, and (4) company-wide resource allocation. A true I<sup>2</sup> Enterprise would address all four levels of integration with the aid of advanced E&P information technologies.

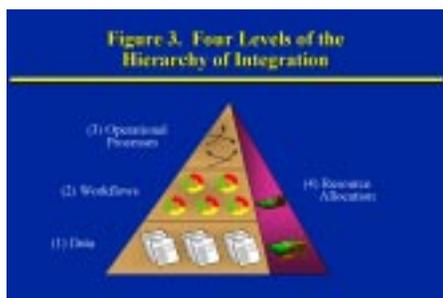


Figure 3. Four Levels of the Hierarchy of Integration.

### Level One: Data.

The most basic need industry professionals have today is “mechanical” integration of all the data within their organizations, in digital forms that facilitate more efficient work at every phase of the oil field life cycle. The ultimate goal is to provide “just-in-

time” information to all knowledge workers. Millions of dollars have been spent to develop standard E&P data models and some basic integration technology. While considerable progress has been made, the industry has not fully attained level one integration.

The problem is enormous. Companies store huge amounts of “legacy” data in numerous incompatible forms (from paper to digital) and electronic formats. What's more, the quantity of new data being acquired is growing rapidly. It has been estimated, for example, that the total amount of well log and seismic data acquired during the 1980s averaged less than 100 terabytes per year. During the 1990s, that number has jumped to an average of 500 terabytes per year. By the end of the decade, it could be nearly 1,000 terabytes per year. The industry is experiencing a data explosion.

In addition to raw physical data – well logs, seismic surveys, pressure tests, production rates – companies would also like to capture, and integrate, accumulated knowledge about a reservoir over its life span. That knowledge, however, is stored in the minds of the geoscientists and engineers who convert raw data into a better understanding of the reservoir. Unfortunately, the people who start the process usually do not carry it through the life cycle, since that cycle often spans decades. Along the way, increasing amounts of knowledge are lost as people change jobs or leave the company. To capture that knowledge will require more than a “data management” system; it will require new types of “knowledge management” technology as well.

Lack of basic data integration costs the average E&P professional a considerable amount of time. According to various estimates, geoscientists and engineers spend from 20 to 30 percent of their total project time searching for, loading, and formatting data. Obviously, significant productivity gains are still locked up in organizations that do not have level one integration.

How long is it likely to take before the industry achieves “just-in-time” data? Currently, I estimate (and this may be optimistic) that about 20

percent of oil companies have some type of level one integration. By the year 2000, however, 75 percent of the industry may have achieved this level (Figure 4). That means most companies can expect tremendous productivity gains over the next five years.

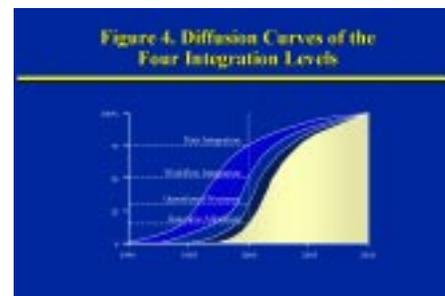


Figure 4. Diffusion Curves of the Four Integration Levels.

### Level Two: Workflows.

As E&P organizations begin to achieve data integration, then they can move up the hierarchy. Today, many are reorganizing work processes around multidisciplinary teams within their operating divisions. Most teams focus on one or two phases of the oilfield life cycle, such as prospect generation or reservoir development. Then they hand off to another team. But a few companies are starting to view the life cycle of assets as a whole.

Turning a collection of individuals into a high impact team requires certain enablers – some social, some technical. Socially, they must be launched with a holistic view of the business objectives, as well as clearly defined roles. An interdisciplinary team may be chartered, say, to increase reserves 40 percent, or reduce cycle time by 25 percent. Each team member's role and priorities, then, would be determined within the context of such objectives.

To integrate their workflows, high impact teams also require four technical enablers. First, they need access to data “just-in-time,” which can be defined as “right when they need it.” Waiting for data interrupts the workflow and consumes valuable time. Second, they need integrated software applications that share data easily and build bridges across the gaps between disciplines. Geostatistical software used in modeling complex reservoir properties would be an example of an integrating

application. Third, teams must have a highly interactive computing environment, so that every time they change a variable, the effect can be seen immediately. Finally, they need 3-D modeling and visualization technologies to display the team's collective results. Each team member may think about the reservoir differently, but modern visualization tools enable them to integrate all the information in a common 3-D (or 4-D) model.

When professionals work concurrently rather than sequentially to solve problems, they often collapse cycle times and boost productivity dramatically. The U.S. Air Force, for example, found that concurrent workflows reduced engineering cycle times by as much as 40 percent. One of Landmark's customers – a multidisciplinary team with a major oil company – cut its interpretation cycle time on one project about 65 percent using integrated geoscience applications and a shared database. More importantly, however, interactive testing of multiple reservoir scenarios improved the quality and accuracy of their final interpretation. As a result, the team increased reserves by several million barrels, and extended the field's productive life by 20 years.

So how long will it take for oil companies to reorganize around high impact teams and integrated workflows? Despite advancements in technology, probably only half of the industry will achieve level two integration by the end of the century (see Figure 4), largely because of social and cultural barriers to change.

#### **Level Three: Operational Groups.**

Once a petroleum company has integrated team workflows within operating groups, the next level would be integrating operational processes across groups. For example, reservoir characterization teams need to work closely with drilling groups and facilities planning to reduce long field development cycles. But each of these groups operates quite differently. Unless they can share common information quickly and easily, the company could make extremely costly errors, such as over-engineering production facilities for a new offshore

field. Because expenditures tend to be much higher at this operational level than at the team level, gains in productivity could have enormous economic impact.

One of the challenges of integration at the operational process level is that, in so-called "virtual corporations" not all of the "groups" are in-house. And in the future, even more work may be outsourced to service companies, consultants and vendors. Seamlessly integrated information systems across organizational boundaries will be vital to success. That means companies will have to find innovative ways of breaking down communication barriers while maintaining the security of proprietary information.

Considering the challenges involved, I suspect that only 30 percent of the industry will successfully integrate across groups by the year 2000 (see Figure 4).

#### **Level Four: Resource Allocation.**

Throughout the life cycle of a typical oil field, managers at all levels make business decisions that can set millions of dollars into motion. Decision-makers need interactive access to the collective wisdom of an organization, so they can understand how to allocate limited resources more wisely. For example, if they have 50 good prospects, but only enough budget to drill 20 wells, what is the best way to optimize the selection process? Effective resource allocation requires integration of information from all across the company: Reservoir size and risk, cost of production facilities, location of pipelines, regulatory restrictions, market status, and so on. For this reason, level four integration cannot be achieved until the first three levels are essentially complete.

Some companies and universities have begun experimenting with different approaches to resource allocation, replacing ad hoc decisions with statistical approaches similar to those used in investment portfolio management. By applying such an approach, one major oil company increased the net present value of its investment portfolio by \$20 million and cut capital expenditures by \$20 million, for a net benefit of \$40 million. In most cases, however, these new approaches are hampered by lack of enterprise-wide

information technologies needed to support significantly better decision-making. Eventually, managers and executives will have software tools designed specifically for resource allocation, giving them the ability to locate, integrate and visualize an enormous variety of data.

This level of integration may yield some of the greatest productivity benefits of all, but it will probably take much longer to realize them. Not only must level four build on the previous three, but it will also require considerable changes in management style and philosophy. By the year 2000, probably fewer than 20 percent of the companies in our industry will achieve fully integrated resource allocation (see Figure 4). Clearly, this technology will be in the very early adoption stage during the next five years.

#### **Conclusion**

Once an oil company has completely informationalized and accomplished all four levels of integration, it will be an I<sup>2</sup> Enterprise. It is doubtful that any true I<sup>2</sup> Enterprises exist today, but some are well on their way. Which companies will get there first? The ones that are focusing now on the second stage of the second great productivity leap: Integrated 3-D reservoir characterization and simulation. Of course, companies differ widely in size and style. So not all I<sup>2</sup> Enterprises will look exactly the same. But they will share a common goal: Eliminating "decision fat" from their organizations.

Using knowledge to compete will be the new core competency. I<sup>2</sup> Enterprises will deliver data "just in time," form high impact teams, improve intergroup cooperation, and optimize resources. In the process, they will make much better decisions faster, and achieve exponential gains in productivity.

#### **About the Author**

*Robert P. Peebler has been president and chief executive officer of Landmark Graphics Corporation since 1992. Previously, he held executive positions including chief operating officer, president of Landmark's seismic products division,*

and vice president of marketing. Over the past six years, Mr. Peebler has been the driving force behind Landmark's strategic acquisitions of leading geoscience and engineering software companies including Zycor, Advance Geophysical, Stratamodel, Munro Garrett, GeoGraphix and others. He also serves on the boards of Drilex Systems, Inc. and the Houston Museum of Natural History. Before joining Landmark in 1989, he was president of his own marketing/management consulting firm. He was also employed in the oilfield services business for 18 years. Mr. Peebler graduated from the University of Kansas with a degree in electrical engineering.

## A Giant is Gone

by Alf Klaveness



**R O Y**  
LIVINGSTON LAY died July 15, 1997, in Conroe, Texas. He was a pioneer Geophysicist, truly dedicated to his profession. He graduated from

Rice University in 1928 with a B. S. Degree in Electrical Engineering and spent much of his career in Geophysics with Texaco. There he rose to Geophysical Manager and successively held positions as Director, Chief Executive Officer and Board Chairman of various Texaco affiliated oil companies, including American Overseas Petroleum, Bahrain Petroleum and Western Australian Petroleum Company.

Roy was a founding member and past president of the Geophysical Society of Houston and the Society of Exploration Geophysicists where he served with distinction and received numerous honors and awards from his peers. He was a giant in his profession and will be greatly missed by his many, many friends and colleagues.

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**NORTH HARRIS COLLEGE**

**GEOSCIENCE TECHNOLOGY TRAINING CENTER**

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***FALL 1997 COURSE SCHEDULE***

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**AUGUST**

**AN INTRODUCTION TO UNIX-BASED SYSTEMS ADMINISTRATION 24 hours.**

This introductory course will discuss UNIX-based workstation systems administration from the viewpoint of the systems administrator. System maintenance, data base administration and storage, backup and restoration procedures, networking, space allocation, and security are some of the topics to be addressed by this course.

CGTTC 2D012 NN001 M 8/25 - 10/6 6:00 pm - 10:00 pm WNSP 261

**SEPTEMBER**

**WORKSTATION INTERPRETATION: GEOQUEST 24 hours**

Students will utilize a UNIX workstation, GEOQUEST IEX-IESX and 3D seismic data to interpret faults and horizons, create time slices, and contour maps using a variety of workstation viewing options and utility functions.

CGTTC 2E031 NN011 W/Th/F 9/3 - 9/5 8:00 a.m. - 5:00 p.m. WNSP 261

**WORKSTATION-BASED GEOGRAPHICAL INFORMATION SYSTEMS 24 hours**

This course discusses cartographic techniques and explores the use of GIS on a personal computer. It will cover the basics of what GIS is and what it can accomplish. GIS has technological applications in the petroleum industry, environmental sciences, city and utility planning, and for sales and marketing analysis.

CGTTC 2C011 NN003 S 9/6 - 9/20 8:00 a.m. - 5:00 p.m. CMED 207

**WORKSTATION INTERPRETATION: SEISWORKS 24 hours**

Students will utilize a UNIX workstation, LANDMARK SeisWorks and 3D seismic data to interpret faults and horizons, create time slices, and contour maps using a variety of workstation viewing options and utility functions.

CGTTC 2E051 NN013 S 9/6 - 9/20 8:00 a.m. - 5:00 p.m. WNSP 261

**GEOPHYSICAL DATA LOADING: GEOQUEST FORMAT 24 hours**

This course will cover the basic methods for loading 2D and 3D seismic data from tape into a project, or projects created to receive these data sets. This course will discuss seismic tape formats, quality checking data, scaling and clipping data for the final load, bit integers, time slice generation, and other topics relevant to 2D and 3D seismic data loading GeoQuest format.

CGTTC 2L021 NN024 M/W 9/8 - 9/24 6:00 p.m. - 10:00 p.m. WNSP 261

**WORKSTATION: GEOGRAPHIX 24 hours**

Students will utilize GeoGraphix Interpretation software to interpret a seismic data set on PC's. Students will interpret faults, horizons, create time slices, polygons, create various vertical seismic displays, and manipulate colors using a variety of workstation viewing options and utility functions.

CGTTC 2M011 NN026 M/W 9/8 - 9/24 6:00 p.m. - 10:00 p.m. CMED 207

**RESERVOIR ENGINEERING I****24 hours**

The geoscientist will be introduced to basic reservoir engineering concepts including: capillary properties of rocks, relative permeability, PVT behavior, fluid sampling, multiphase flow, and mobility ratio. In addition, classic reservoir engineering equations will be presented, including the instantaneous GOR (Gas Oil Ratio) equation, fractional flow equation and material balance. Behavior of oil and gas reservoirs will be discussed, including: dry gas, wet gas, retrograde gas, volatile oil, and black oil.

CGTTC 2H011 NN020 T/TH 9/9 - 10/02 6:00 p.m. - 9:00 p.m. WNSP 207

**AN INTRODUCTION TO ORACLE****24 hours**

This class is designed to introduce students to the ORACLE database administrator, and is the first in a series of three ORACLE courses. Topics will include client/server computing, networking and related issues, SQL, and PL/SQL.

CGTTC 2F011 NN001 S 9/27 - 10/11 8:00 a.m. - 5:00 p.m. CMED 207

**PERL****24 hours**

This course will provide geoscientists with basic programming skills in the Perl computer language. Perl is useful for processing binary SEG-Y files, reformatting grid and other graphic files, and mathematical tasks associated with geo-computing. This class will cover basic data types, mathematical expressions, string handling, regular expressions, control logic, standard and special file input/output, sorting, linear and associative arrays, and basic reporting operations. Some programming experience and a basic knowledge of Unix will be helpful.

CGTTC 2D032 N002 M/W 9/29 - 10/29 7:30 p.m. - 10:00 p.m. WNSP 261

**WORKSTATION INTERPRETATION: SEISMIC MICRO TECHNOLOGY 24 hours**

Students will utilize 2d/3dPAK seismic interpretation software to interpret a seismic data set on PC's. Students will interpret faults, horizons, create time slices, polygons, create various vertical seismic displays, and manipulate colors using a variety of workstation viewing options and utility functions.

CGTTC 2E071 NN016 M/W 9/29 - 10/15 6:00 p.m. - 10:00 p.m. CMED 207

**COMPUTER WORKSTATION MODELING: AVO****24 hours**

This course deals with the analysis of Amplitude Variations with Offset (AVO) and post-stack amplitude inversion. Topics will include seismic data processing and displays, forward modeling using well log data, synthetic models, and model-based inversion methods utilizing well logs and NMO velocities, and seismic trace attribute extraction.

CGTTC 2B011 NN001 T/W/Th 9/30 - 10/2 8:00 a.m. - 5:00 p.m. WNSP 261

**OCTOBER****COMPUTER WORKSTATION MODELING: AVO****24 hours**

This course deals with the analysis of Amplitude Variations with Offset (AVO) and post-stack amplitude inversion. Topics will include seismic data processing and displays, forward modeling using well log data, synthetic models, and model-based inversion methods utilizing well logs and NMO velocities, and seismic trace attribute extraction.

CGTTC 2B011 NN002 S 10/11- 10/25 8:00 a.m. - 5:00 p.m. WNSP 261

**RESERVOIR ENGINEERING II****24 hours**

The geoscientist will continue the study of reservoir engineering concepts covered in Reservoir Engineering 1, including: capillary properties of rocks, relative permeability, PVT behavior, fluid sampling, multiphase flow, and mobility ratio. In addition, classic reservoir engineering equations will be presented, including the instantaneous GOR (Gas Oil Ratio) equation, fractional flow equation and material balance. Behavior of oil and gas reservoirs will be discussed, including: dry gas, wet gas, retrograde gas, volatile oil, and black oil.

CGTTC 2H012 NN021 T/TH 10/14 - 11/6 6:00 p.m. - 9:00 p.m. WNSP 207

**WORKSTATION INTERPRETATION: SEISMIC MICRO TECHNOLOGY 24 hours**

Students will utilize 2d/3dPAK seismic interpretation software to interpret a seismic data set on PC's. Students will interpret faults, horizons, create time slices, polygons, create various vertical seismic displays, and manipulate colors using a variety of workstation viewing options and utility functions.

CGTTC 2E071 NN017 S 10/18 - 11/1 8:00 a.m. - 5:00 p.m. CMED 207

**GEOGRAPHICAL INFORMATION SYSTEMS: ENVIRONMENTAL 24 hours**

This **PC based** course will study the applications of GIS and ARC/INFO software to study such environmentally important issues as ground water flow and contamination, waste management, air pollution, and how to identify and track such problems through map generation and data-base management.

CGTTC 2C021 NN005 M/W 10/20 - 11/5 6:00 p.m. - 10:00 p.m. CMED 207

**GEOLOGICAL INTERPRETATION: STRATWORKS 24 hours**

This course deals with the interpretation of geological data using a UNIX workstation. topics will include the use of well logs and log correlation, construction of cross-sections, mapping of geological data, horizon interpretation, and map editing.

CGTTC 2E021 NN009 T/W/Th 10/21 - 10/23 8:00 a.m.- 5:00 p.m. WNSP 261

**WORKSTATION INTERPRETATION: SEISWORKS 24 hours**

Students will utilize a UNIX workstation, LANDMARK SeisWorks and 3D seismic data to interpret faults and horizons, create time slices, and contour maps using a variety of workstation viewing options and utility functions.

CGTTC 2E051 NN014 T/W/TH 10/21 - 10/23 8:00 a.m. - 5:00 p.m. WNSP 261



# SEPTEMBER 1997

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	<b>1</b>	<b>2</b>	<b>3</b> AAPG Luncheon	<b>4</b> HGS Executive Board Meeting	<b>5</b>	<b>6</b> GSH Sporting Clays
<b>7</b> AAPG International Conference	<b>8</b> GSH Ice Breaker AAPG International Conference	<b>9</b> HGS General Dinner AAPG International Conference	<b>10</b> Environmental Engineer/Geolo- gists Dinner AAPG International Conference	<b>11</b>	<b>12</b>	<b>13</b>
<b>14</b>	<b>15</b> GSH Technical Luncheon	<b>16</b>	<b>17</b> GSH Data Processing SIG	<b>18</b> GSH Potential Fields SIG	<b>19</b>	<b>20</b>
<b>21</b>	<b>22</b> HGS Golf tournament	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>
<b>28</b> HGS Golf tournament	<b>29</b>	<b>30</b>				

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Dates for all GSH calendar activities must be communicated to Joan Henshaw at the GSH Offices 7457 Harwin Suite 301, Houston, TX 77036; (713)785-6403; fax (713) 785-0553; email: reservations@hougeo.org. GSH Newsletter content submittals should be communicated to Dennis McMullin, GSH Editor, 7457 Harwin Suite 301, Houston, TX 77036; (281)560-1069; fax (281) 560-1278; dmcmullin@lgc.com. Deadline for submission is six weeks prior to publication (e.g. August 15 for the October issue). Digital or electronic submittals are required.