



Geophysical Society of Houston

VOL. 31, NO. 7

NEWSLETTER

MARCH 1996

Letter from the Treasurer

There was a time in the search for oil when the prospector was financier, geologist, geophysicist and driller. (Wildcatters sometimes operate the same way today.) Often, these skills were shared among a small number of people. A successful group of this sort formed out of personal and professional respect. Decisions were made after hearing each person's opinion; opinions were valued based on the speaker's character and expertise.

Character was evaluated by socializing with one another. Years ago, the entire group lived together at the well-site. Reputations as "honest" and "dependable" were earned in the field. Expertise was also evaluated in the field (the well came in or it didn't) and knowledge was shared.

As the business of oil finding grew, companies grew and



David Forel
Western Geophysical

departments grew to enclose each specialty. Over time, each department allowed itself to believe that it, more than any other, determined the success of finding oil. Specialists would not, and sometimes could not, speak to each other. Knowledge was no longer shared.

Today, work units, departments and individuals are being reorganized into multidiscipline teams to solve the problem of finding oil. Once again, prospectors are meeting, learning each other's vocabulary and exchanging ideas.

The GSH is a great organization because we are devoted to helping people meet people and ideas. Every time I go to a technical or social event, I look forward to meeting someone who can help me gain more understanding of my chosen field. And what a field: The search for oil! It's sort of like being Captain Ahab on the great quest.

The growth of our technical program is huge. A handful of years ago, we had only two Special Interest Groups; currently we have five. Better yet, now it's "politically correct" to have a conversation with a petroleum engineer. Thanks to the GSH, meeting new people and ideas is easy and cheap.

Today, in the quest for oil, there are fewer people working closer together. Now is the time when we have to become multilingual, multidiscipline. Thankfully, the GSH offers the climate for this to happen.

INSIDE

| | |
|--------------------------------------|------|
| GSH Meetings _____ | |
| Data Processing SIG | 5 |
| Environmental Applications SIG | 6 |
| Interactive Workstation SIG | 4 |
| Potential Fields SIG | 5 |
| Reservoir Geophysics SIG | 4 |
| Technical Breakfast | 3, 7 |
| Technical Luncheon | 3 |
| Articles and Comments _____ | |
| Letter from the Treasurer | 1 |
| January Technical Lunch | 16 |
| Meetings and Events | 16 |
| Member News | 9 |
| Newsletter Online | 9 |
| SEG Gulf Coast Meeting | 10 |
| Slate of Candidates | 6 |
| Social Events _____ | |
| Bass Tournament | 13 |
| Golf Tournament | 14 |
| GSH Auxiliary - Spring Brunch | 6 |
| Honors & Awards Banquet | 15 |
| Courses and Workshops _____ | |
| Spring Technical Workshop | 12 |

GSH Auxiliary — Spring Brunch

Date: Sunday, March 10, 1996
Time: 11:30 am — Cocktails/Cash Bar
 12 noon — Lunch
Place: Lakeside Country Club
 100 Wilcrest Drive (west side of Wilcrest
 between Briar Forest and Memorial)

See page 6 for more information.

GSH/HGS/HAPL Annual Bass Tournament — March 30 & 31

See page 13 for entry form.

GEOPHYSICAL SOCIETY OF HOUSTON

Margaret Blake, Office Manager • 7171 Harwin Drive, Suite 314 • Houston, Texas 77036-2190

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

Event Reservations Number: (713) 917-0218

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Joint GSH/HGS Technical Luncheon

Date: Monday, March 18, 1996
Place: HESS, 3121 Buffalo Speedway
Time: Social, 11:30 a.m., Meeting, 12:00 noon
Cost: \$17 Pre-registered GSH/HGS members
\$22 All Others
Topic: **Real-time Interpretation Improves E&P Decision Making**
Speaker: Diana McSherry, CogniSeis Development
Please make reservations by calling the GSH reservation number **917-0218** prior to noon, Friday, **March 15**.

Real-time interpretation has significant implications for the E&P industry. The ability to reach an interpretation while fundamental exploration and production processes are underway holds the promise of substantially improving outcomes while acquiring data, drilling wells and managing reservoirs. "Real time" means that data can be visualized and interpretations performed during acquisition, processing, drilling and production. "Interpretation" in this context includes all the tasks needed for forming a consistent 3-D subsurface model: data processing, analysis, modeling, structural and stratigraphic interpretation, reservoir simulation and model integration with production data.

The benefits of real-time interpretation are significant. If interpretations are performed while acquisition is underway, the turnaround time for drilling decisions can be significantly shortened. In addition, navigation and seismic data can be quality controlled much more effectively with full processing interpretation during the acquisition phase. With respect to drilling, not only can the target area be hit more effectively if it is visualized, but there is a substantial reduction in blowout risk with real-time interpretation. Finally, reservoir management can be done much more effectively with the ability to continuously update the model during production.

To achieve real-time interpretation, new information technology is needed. Real-time 3-D data processing during acquisition requires fast parallel computers together with appropriately paralleled software. Effective utilization of different data types from separate locations requires new information access tools such as interactive video teleconferencing. The ability to visualize 3-D data with embedded interpretation requires new voxel-based technology. Synthesis of all data types and interpretation requires a software framework such as TerraCube, OpenWorks, or GeoFrame.



Diana McSherry

The goal for real-time interpretation is to improve outcomes through better and faster decisions. The method for achieving this goal is to use new technology to provide a more accurate and comprehensive understanding of the subsurface and to minimize time spent by the interpreter

Continued on page 6

Northside Breakfast — Best of GSH Series

Date: Wednesday, March 6, 1996
Time: 7:30 a.m. Technical presentation will start at 8:00 a.m.
Place: Wyndham Hotel Greenspoint
Cost: NO CHARGE
(underwritten by Exxon)
Topic: **Analysis of Subsalt Reflections at a Gulf of Mexico Salt Sheet Through 3-D Depth Migration and 3-D Seismic Modeling**
Speaker: G. G. Lewis, EPRC

Advance reservations urged — The host company needs an accurate head count. Please call GSH Reservations at **917-0218** prior to Monday, **March 4**.

An integrated, iterative approach was used to develop a velocity model and depth images of subsalt reflectors beneath a Gulf of Mexico salt sheet. The initial images contained artifacts due to at least three factors:

- errors in the velocity model,
- approximations in the migration algorithm, and
- insufficient subsurface sampling.

These factors combined to produce features which mimic faulting and stratigraphic variation in the subsalt section. A careful rework of the migration velocity model produced images with a much simpler subsalt section. A seismic modeling study was conducted to understand the impact of the migration algorithms and poor subsurface sampling on the images. Two and Three-dimensional raytrace modeling demonstrate the impact of line orientation on our ability to illuminate subsalt reflectors. Two-dimensional raytracing, wave equation modeling, and imaging of the model data allowed us to quantify the impact of poor illumination on our depth images.

We conclude that the most sophisticated imaging algorithms, properly applied, can still produce distorted images of the subsurface. Thus it is important to understand the factors which produce these distortions and to be able to identify their impact on the final image. This case history demonstrates one approach to analyzing the impact of such factors on depth images. It also illustrates some of the strengths and limitations of current depth imaging technology.

Gary Lewis received a B.S. degree in Physics and Geophysics from the University of Utah in 1980, and an M. S. degree in Applied Mathematics from the University of Colorado in 1989. He has been employed by Exxon since 1980; as a geophysical interpreter in the Exploration Department from 1980 until 1989, and as a research geophysicist at Exxon Production Research Company since 1989. His current research interests include seismic modeling, interpretation, and imaging of complex structures.

Interactive Workstation SIG

Date: Friday, March 15, 1996
Time: 4:30 p.m.
Place: GECO-PRAKLA,
1325 South Dairy Ashford
Third Floor, Room 3400 (Visitor Parking
is in the rear of the building)
Cost: NO CHARGE
Topic: **From Seismic Interpretation to
Reservoir Simulation: Critical Data
Elements in the Design of Reservoir
Simulation Models for Various Field
Operations**
Speaker: Myra A. Dria, Reservoir Technologies
Group, Schlumberger/GeoQuest

Please make reservations by calling the GSH reservation number **917-0218** prior to noon Tuesday, **March 12**.

A meeting of the SIG Steering Committee will be held at 3:30 p.m. prior to the presentation. All committee members are urged to attend.

The presentation will discuss the various uses of reservoir simulation during the productive life of an oil or gas field: from initial discovery and field development, through improved recovery. Significant improvements in the E&P computational environment and the use of software designed with the needs of cross-discipline interpretation and information transfer have dramatically improved the integration and use of all available data. The following topics will be presented:

- The types of simulation models and how these simulation models are used.
- How these models change to reflect the changing simulation needs and available data during the life of a project.
- The types of data and how they are used in the construction of a geological simulation model.
- How a truly integrated approach can result in an improved geological model.
- A description of the methods used to validate a geological/simulation model.

Dr. Myra Dria is Manager of E&P Integrated Studies for the Reservoir Technologies group of Schlumberger/GeoQuest. Her PhD is in Petroleum Engineering from the University of Texas at Austin. Her previous experience spans nearly 20 years with Sohio/BP, Shell Development Co., and Western Atlas prior to Schlumberger, and includes domestic and international E&P integrated studies. She is a member of SPE, AAPG, AIChE, and is a registered professional engineer in the State of Texas.

Reservoir Geophysics SIG

The Reservoir Geophysics Special Interest Group is an interdisciplinary forum for the discussion of reservoir geophysics topics of interest to geophysicists and geologists, and expanded interchange with the reservoir engineering community.

Date: Tuesday, March 19, 1996
Time: 4:00 p.m.
Place: Texaco EPTD
3901 Briarpark (Corner of Briarpark &
Westpark. Parking in front and rear of six
story building. Use front entrance of six
story building.) Conference Room A
Cost: NO CHARGE
Topic: **3-D Seismic for Continuing Field
Development**
Speaker: John Austin, Pennzoil Exploration and
Production Company
Organizer: Phil Inderwiesen, Texaco

Please make reservations by calling Kathy Gough at **954-6003** by **March 15**.

The Application of 3-D Seismic Technology to the Continuing Development of the Eugene Island 330 Field, Offshore Louisiana, Gulf of Mexico

The giant Eugene Island 330 field was discovered in 1971 and is located 170 miles southwest of New Orleans near the seaward edge of the Louisiana shelf in 245 ft of water. Producing since 1973, it is one of the largest Pleistocene fields in the world with production in excess of 300 million barrels of liquids and 1.5 trillion cubic feet of gas. The field consists of seven OCS blocks, with the crestal position under Pennzoil's Block 330. Other operators in the field are Shell, Exxon and Texaco. The primary structural feature of the field is a rollover anticline, downthrown to a northwest-southeast trending growth fault system, with secondary structures associated with upthrown fault closure. The productive section is a series of deltaic and fluvial-deltaic sands from 2200'-8000' which exhibit a very complex distribution of oil and gas accumulations. Cumulative production through 1995 from Pennzoil's Block 330 is approximately 130 million barrels of liquids and 650 BCF gas.

Development of Block 330 had been very successful into the mid-1980's utilizing proprietary and speculative 2-D seismic data and incorporating the subsurface data. Ten exploratory wells had been drilled and 60 development wells drilled from three platforms had produced 95 MMBO and over 400 BCFG, however, production was on a steady decline and no additional significant drilling opportunities were recognized. In 1985, a proprietary 3-D seismic survey was acquired to re-evaluate the field for additional exploration and development potential. The survey was underutilized until

Continued on page 7

Data Processing SIG

Date: Wednesday, March 20, 1996
Time: Social, 4:30 p.m.
Presentations, 5:00 p.m.
Place: Exxon Production Research Company
S-202, 3120 Buffalo Speedway
Cost: NO CHARGE
Topic: **Seismic Imaging Using Borehole Data**
Coordinator: Jozica Gabitzsch
Organizer: Young Kim
Speakers: Jerry Krebs, Radim Kolarsky

Accurate Migration Using Offset-Checkshot Surveys

J. R. Krebs*, Exxon Production Research Co.; D. R. Fara, and A. E. Berlin, Exxon USA

Accurate positioning of reflections in a migrated image requires an accurate subsurface velocity model, possibly including an accurate specification of velocity anisotropy. Producing such models is time consuming and expensive. Furthermore, the migration velocity models we build often have non-negligible errors. We propose using borehole-seismic data to achieve accurate migration without developing velocity models.

Kirchhoff migration requires only travel time tables, not a migration velocity model, as input. These tables contain the seismic travel time from subsurface imaging points to points in the surface migration aperture. This feature, of Kirchhoff migration, implies that kinematically accurate migration requires only accurate travel time tables, not accurate models of subsurface velocity. Offset-checkshot surveys are a type of borehole-seismic data designed to economically measure migration travel time tables directly in the field. Kirchhoff migrated images produced using travel time tables based on offset-checkshot surveys are kinematically accurate, at least at the wells used in gathering the offset-checkshot surveys. We will show examples of offset-checkshot based migration for steeply dipping reflectors near a Gulf of Mexico salt dome.

3-D Geospatial Modeling and Visualization of a Salt Diapir Based on Well Control and 3-D Salt Proximity Survey Data: An Example from Cote Blanche Island Field, Southern Louisiana

Radim Antonin Kolarsky, Texaco

This paper discusses the role of 3-D geospatial modeling in the development of oil and gas plays under a salt overhang. Based on 3-D salt proximity surveys and well control, the model gives a comprehensive geologic picture of the salt diapir and surrounding sedimentary rocks.

In the last 4 years, Texaco Exploration and Production, Inc. has acquired 10 state-of-the art 3-D refraction salt proximity surveys around the diapir. Modern acquisition technology allows 3-D salt images to be recorded both in old wells using slim-hole tools in tubing as well as in new wells (either open or cased). Seismic sources for this study were various air gun arrays positioned in the same location for all surveys.

Continued on page 9

Potential Fields SIG

Date: Thursday, March 21, 1996
Time: Social Hour, Dinner, and Program at 5:30, 6:30 and 7:30 p.m. respectively
Place: H.E.S.S. 3121 Buffalo Speedway
Cost: \$20 (Make checks payable to GSH)
Topic: **The Deep Penetration Density Logging Tool**
Speaker: Dr. Mark E. Ander, EDCON

Please make reservations by calling Brian Anderson or Sarah Murphy at **558-8383** no later than noon Wednesday, **March 20**. No shows will be billed.

This talk reviews the use of the borehole gravity meter (BHGM) which is the only logging tool capable of directly measuring density at a significant distance from a well. In fact, the BHGM is the only logging tool that can reliably obtain bulk density through casing. Using a BHGM, EDCON produces Deep Density logs. It is the ability of the Deep Density log to yield in situ density and porosity and to characterize pore content that forms the basis of its application to oil and gas exploration and production. The three primary advantages of BHGM surveys are (1) high relative accuracy, (2) direct density response, and (3) investigation of large volumes of formation. The Deep Density log can be productively used in virtually every aspect of oil and gas exploration and production. It can be used in exploration and formation evaluation, early field development, mature field development, and enhanced oil recovery. One of the more useful aspects of the BHGM, which makes it a very attractive logging tool for time-lapse production monitoring, is its ability to detect the contacts between gas, oil, and water at significantly larger distances from the borehole compared with all other density measuring tools. It can make these measurements through multiple casing strings and formation damage. Its capabilities are not significantly influenced by drilling mud, fluid invasion, hole rugosity, or formation damage that surrounds all wells to some degree. The Deep Density technique is particularly valuable in determining densities and porosities in damaged or deeply invaded formations.

Unfortunately, the use of the BHGM tool in petroleum exploration and production has not been widespread despite well known successes and several published favorable case histories. The reason for this is that the presently available BHGMs have several physical limitations. At present, LaCoste & Romberg Gravity Meters, Inc. is the only BHGM manufacturer. Their instrument is 4 1/8 inches in diameter, which severely limits the number of wells that it can access. Furthermore, it can only make gravity measurements from 0 to 14 degrees from vertical. With today's directional drilling technology, producing wells often pass through production zones at large deviations from vertical. A third disadvantage is that it takes an average of six to seven minutes to make a station measurement.

EDCON is developing a new generation borehole gravity meter, called a Deep Penetration Density Logging Tool (DPD). The DPD tool is designed to overcome the severe

Continued on page 8

Environmental Applications SIG

Affiliated with the Near-Surface Geophysics Section of the Society of Exploration Geophysicists and the Environmental/Engineering Committee of the Houston Geological Society.

Date: Thursday, March 21, 1996
Time: 4:00-6:00 p.m.
Place: World Geoscience, Bldg. 1A, Ste. 200 at West Houston Airport.
Cost: NO CHARGE (hosted by World Geoscience)
Topic: **Near-Surface Environmental Problems-What Are They?**
Speakers: Mike Pearson, Chris Sagstetter
Coordinator: Stephanie Hrabar, CPG

Airborne Conductivity Surveys for Locating Salinity Plumes and Leaking Wells (Mike Pearson, World Geoscience)

Dayton Salt Dome, A Potential Hazardous Waste Disposal Site Near A Major City Water Supply (Chris Sagstetter, Friends Insist Stop Toxic Waste, Inc. a local citizen non-profit group)

FORMAT: Each speaker has a 25 minute presentation. Presentations are followed by a dialogue with the audience. Session ends promptly at 6:00 p.m.

Directions to World Geoscience:

Take I-10 west to Barker Cypress exit (about 2.5 miles west of Beltway 8). Turn NORTH on Barker Cypress and drive 1 mile north to second stop light and turn RIGHT. Entrance to West Houston Airport at 0.3 mile on left. **CAUTION SPEED BUMPS.** Drive to last hangar at end of taxiway-BGM/Worldscience-enter bldg to 2nd floor.

Joint GSH/HGS Technical Luncheon

Continued from page 3

searching for projects, reformatting data and learning new software. The user remains the critical element of the system because it is the user who exercises the judgment, imagination and creativity to make final decisions, and it is the user who will make these decisions in real time while processes are underway in order to improve outcomes.

Diana McSherry, formerly President and CEO of CogniSeis Development, now serves on the technical advisory board for the company. She holds a Ph.D. degree in nuclear physics from Rice University and a Bachelors degree in physics from Harvard. Previously, Dr. McSherry was Vice President of Digicon, a geophysical services company.

GSH Auxiliary — Spring Brunch

Everyone is invited to join the auxiliary for our yearly Spring Brunch. You will enjoy a delicious buffet and be entertained by the world renowned Fort Bend Boys Choir of Texas. Do not miss this outstanding program.

Date: Sunday, March 10, 1996
Time: 11:30 am — Cocktails/Cash Bar
12 noon — Lunch
Place: Lakeside Country Club
100 Wilcrest Drive (west side of Wilcrest between Briar Forest and Memorial)
Cost: \$19.00 per person for GAH/GSH members
\$21.00 per person for Guests
Valet Parking Included

Reservation Deadline: Wednesday, March 6

Make checks payable to: Geophysical Auxiliary of Houston

Mail to: Linda Roberson
20103 Yorkpine Court
Katy, Texas 77450

Contact Linnie Edwards, Chairperson, at 785-7115 or Carol Gafford, GSH Liaison, at 370-3264 for more information.

Geophysical Society of Houston 1996-97 Slate of Candidates

President-Elect: Bill Gafford
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Jozica Gabitzsch

Second Vice-President: Scott Sechrist
Lloyd Weathers

Secretary: Lorinda Driskill
Dan Ebrom

Treasurer: Joel Starr
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Editor: Cliff Kelley

Technical Breakfast — April

- Date:** Tuesday, April 9, 1996
Time: 7:30 a.m., Technical Presentation will start at 8.00 am
Place: University Club, 5051 Westheimer, Galleria Entrance No. 2, Post Oak Tower, 3rd Floor, Northside, between Lord & Taylor & Cheese Factory
Cost: NO CHARGE (underwritten by Seitel, Inc.)
Topic: **Integrating Multiple Seismic Surveys to Interactively Interpret a Salt Dome Flank - (An ingenious application of the workstation technology in investigating an industrial waste disposal site)**
Speaker: H. Roice Nelson, Jr., Walden 3-D, Inc.
Carl L. Brassow, Secured Environmental Management, Inc. (co-author)

Advance reservations urged — The host company needs an accurate head count. Please call GSH at 917-0218 prior to Thursday, **April 4**.

Three seismic surveys were integrated to interactively interpret the northern flank of a salt dome, onshore South Texas. The specific objective was to evaluate if there is a salt overhang that could decrease the horizontal extent of salt between the salt-sediment interface and four planned salt caverns proposed as an industrial waste disposal site. The seismic surveys consisted of: (1) SEM, a high-resolution (0.25 ms sample rate) 3-D seismic survey on the crest of the dome; (2) Sheik, a high-resolution (2.0 ms sample rate) 3-D seismic survey off the north flank of the salt dome; and (3) S-2, a 2-D seismic line orthogonal to the salt dome and passing near both the SEM and Sheik surveys.

The seismic data for each of these surveys was loaded on a Landmark Graphics interpretation workstation.** Three projects were set up: SEM; Sheik; and Composite. A well-based interpretation of the Top-of-Caprock was gridded and entered into a horizon in the Composite Project. The smoothed travel-time exported version of this horizon was imported to the SEM survey to provide a check for picking the Top-of-Caprock. There is a direct correlation to a strong reflector consistent across the SEM survey. This reflector was interpreted as the Top-of-Caprock. This reflector ties nicely to the salt-sediment-interface interpreted on S-2. The S-2 salt-sediment-interface projects to the top of a no-data-area in the Sheik 3-D seismic survey, which was interpreted as top-of-salt. The location of the proposed salt caverns were converted to seismic travel-time and loaded into the SEM survey as both "faults" and "horizons" to show their spatial relationship to the Top-of-Caprock.

The interpretation process and results were captured in the ESF HyperJournal, a hyperlinked multimedia "liv-

Continued on page 9

Reservoir Geophysics SIG

Continued from page 4

1989 when, with the emergence of interactive workstations, a field study was initiated by Pennzoil to integrate the 3-D seismic data with the extensive well control and engineering data. A network of synthetic seismograms provided the critical tie of the seismic data to the well control. The resulting new structural and stratigraphic mapping, along with seismic attribute analysis, identified several workover and drilling opportunities, including infill, stepout, horizontal, extended reach and exploratory wells. As several prospects matured to the drillable stage in early 1990, production had declined from a peak of 43,000 BOPD and 125 MMCFD in the mid-1970's to 5,000 BOPD and 40 MMCFD. Drilling and workover activity began in early 1990 and continued into 1994. The field study was an ongoing process throughout this time that continued to generate new opportunities for each budget year.

Since 1990, utilizing the 3-D seismic data and advances in drilling and completion technology, 25 new wells and several workovers have resulted in significant reserve additions and reversed the production decline in Block 330. In 1994, oil production had tripled from the 1990 low to a peak of 15,000 BOPD and gas production reached 70 MMCFD. Due to limited activity in 1995, production has again declined to a current rate of 12,000 BOPD and 40 MMCFD. The next phase of exploration and development is getting underway with the acquisition of a 1994 GECO speculative 3-D survey. Seismic interpretation is in the early stages but new opportunities have already been recognized that should result once again in the rejuvenation of this old giant.

John Austin began his career at Pennzoil in 1979 and has worked as a geologist and geophysicist in the Gulf of Mexico. He is currently a geological advisor working on exploitation projects in the Eugene Island and South Marsh Island areas, offshore Louisiana.



Potential Fields SIG

Continued from page 5

instrument limitations that exist at present, thus opening the tool to greatly expanded use in both time-lapse production monitoring and by-passed oil and gas exploration. The DPD logging tool is designed to operate at any angle from 0 to 110 degrees and be no more than 3 inches in diameter. EDCON intends to build the smallest diameter tool possible and expects ultimately to reduce the DPD tool diameter below 2.5 inches. The station measurement time is expected to be less than 1 minute. The DPD gravity sensor is based on a metal zero length spring, similar to the LaCoste & Romberg Gravity Meter. The metal spring approach ensures the greatest sensitivity and stability with the lowest development risk. The DPD tool will overcome the present BHGM physical limitations, provide a superior density measurement, and be easier to build, operate, and maintain.

The L&R BHGMs have design features, which contribute to the degradation of reading sensitivity. These degradations are most pronounced below a sensitivity of 10. Thermal instability around the sensor is by far the largest source of instrumental error. It produces a variable drift in the gravity readings, which is strongly dependent on the ambient temperature of the sensor as well as the thermal gradients about the sensor. Imperfections in measuring this drift pattern can cause significant errors in high accuracy logging programs such as those designed to monitor fluid saturations. In 1993, EDCON began a major BHGM Upgrade Program for their L&R BHGMs aimed at producing significant improvements in thermal stability and in overall performance and reliability. This will allow substantial improvements in survey accuracy and decreased survey times. Some of the electronic and thermal technology utilized in the DPD design has been applied in modified form to the present L&R BHGMs with considerable success.

Dr. Mark E. Ander is a potential fields geophysicist who specializes in gravity. He is presently the head of borehole gravity development at EDCON. Before joining EDCON as vice president in 1994, Dr. Ander spent fifteen years as an active principle investigator and project leader at Los Alamos National Laboratory, where he was involved in a wide range of geophysical investigations and instrumentation development programs. He received international attention in the scientific and popular press for his geophysical scale measurements of the Universal Gravitational Constant and investigations into possible violations of Newton's inverse square law of gravity. During these studies, improvements in borehole gravity instrumentation were made, which ultimately led to the original concepts for the Deep Penetration Development (DPD) tool design in 1990. Dr. Ander founded TOR Geophysical, Inc., in 1992 to design the DPD tool. TOR merged with EDCON in January 1994. Dr. Ander received a BS in 1970 in mathematics and physics with departmental honors in physics from Jacksonville University. He received a MS in physics in 1974 and a PhD in geology and geophysics in 1980 from the University of New Mexico. He was elected to Sigma Pi Sigma in 1971. His professional affiliations include: the American Physical Society, the American Geophysical Union, the Society of Exploration Geophysicists, the Geological Society of America, and the Society of Petroleum Engineers, and he is a fellow of the Explorers Club. He is an author of 51 scientific articles, one video and 49 abstracts.

Technical Breakfast — April

Continued from page 7

ing report." Key stages from this report are available on the INTERNET at <http://www.hypermedia.com/w3d/geotechnology/W3D95C/index.html> using a browser like NetScape or Mosaic. The interpretation results were also transferred to The University of Houston's Virtual Environment Technology Laboratory and the spatial relationships evaluated in their visually immersive CAVE (for those familiar with StarTrek terminology, a computer generated "holodeck"). This virtual environment has proven to be a very useful means of communicating complex spatial relationships.

One of the more interesting results to be presented is the relationship of seismic amplitudes to calcite distribution in the caprock. Using the interactive system we evaluated the seismic amplitudes in 10 ms intervals (less than 30 feet). We interpret the strong difference between these amplitude maps to mean that the calcite zone is totally within the top 30 feet of the caprock. The map across the entire dome shows this to be a relatively simple dome. The structure of the Top-of-Caprock is simple in the area of the proposed salt caverns. Based on this integrated interpretation, there does not appear to be any salt overhang on the north side of the dome. This means there is virtually no possibility of water reaching the proposed salt caverns and their proposed storage of industrial wastes within the next few thousand years.

***Seismic data and interpretation results are available for viewing on a workstation at Interactive Interpretation & Training, Inc.*

H. Roice Nelson, Jr. received a B.S. degree in Geophysics from the University of Utah in 1974 and an MBA from SMU in Dallas, Texas in 1981. He is the co-founder of Landmark Graphics Corporation and the founder of HyperMedia Corporation, Dynamic Oil & Gas Corporation, Advanced Structures Incorporated and Walden 3-D, Inc. He is a geoscientist by training and disposition with 20 years experience. He worked at the University of Houston's Seismic Acoustic Laboratory as Senior Research Scientist and Allied Geophysical Laboratory as General Manager; Mobil E&P, Dallas as Geophysicist. He has also worked with Amoco in Denver and Applied Geophysics Corporation and the University of Utah in Salt Lake City. He wrote a series of articles in the early 80's which were published as the book "New Technologies in Exploration Geophysics". Additionally, He has presented over 130 papers at professional meetings. Professional affiliations include: AAPG, CSEG, GSH (honorary member), HGS, SEG and ULI.

Please fax your suggestions to Dave Agarwal at 650-3822 for the "Best of GSH" series Breakfast Meetings regarding Topics, Speaker, Place and Potential Sponsors.

Data Processing SIG

Continued from page 5

A shallow well drilled at the source location to the top of salt yielded velocities of the overburden as well as and top-of-salt control. All surveys were processed using the same overburden and salt velocities. Salt velocity was determined by careful calibration of the computed salt profile to salt picks in areas of dense well control. The velocity of the rocks flanking the salt was determined individually for each survey using sonic log and checkshot data.

To take full advantage of the 3-D nature of the salt proximity surveys, this study did not use conventional 2-D mapping techniques to capture the shape of the salt. Instead, it advanced into the realm of virtual reality and 3-D geospatial modeling and visualization became the tool for integrating 3-D salt proximity surveys with well control. Salt entry and exit points from approximately 70 wells, in addition to the salt proximity datapoints, were input into a 3-D geospatial modeling software package. The software can build rigorous structural and stratigraphic models from any datapoints expressed in an X, Y, Z coordinate system. Its capability to grid and visualize surfaces with multiple Z values (e.g. salt overhangs) makes it ideally suited for this situation. In addition to modeling the shape of the salt, it can integrate into the model formation structural grids (tops and bases) as well as rock properties (reservoir porosity and permeability, interval velocity etc.). The geologic model can be interactively viewed, rotated, taken apart block by block or layer by layer. The 3-D aspect of the model greatly enhances the understanding of the spatial relationships between salt, fault planes and reservoirs.

Jerome R. Krebs received his Ph.D in physics from the University of Wisconsin in 1981. Since then he has been a research geophysicist at Exxon Production Research Company in Houston. His work has mainly involved the development of seismic migration methods. He has also been active in velocity estimation, borehole geophysics, and signal-to-noise ratio enhancement. He is a member of the Society of Exploration Geophysicists, the Geophysical Society of Houston, and the American Physical Society.

Radim Antonin Kolarsky received a BS in geology from George Washington University in Washington, D.C. in 1989 and a MA in Geology from The University of Texas at Austin in 1992. He joined Texaco Exploration and Production Inc. in 1992 as an exploration geophysicist. His major areas of interest include integrated tectonostratigraphic studies of sedimentary basins, and applications of interactive geologic/geophysical interpretation and modeling software in hydrocarbon exploration. He has published several papers on basin tectonics of southern Central America, and given a number of presentations at AAPG and GSA conventions. He currently serves as editor of the Southeastern Geophysical Society in New Orleans.

GSH Newsletter Now Available Online!

Victor H. Koosh
GSH Electronic Publishing Chairman
New World Horizon, Inc.

For all you computer buffs, the newsletter is now available online in electronic format. You need to have Adobe Acrobat Reader 2.1 in order to read it. Acrobat Reader is available **free** at Adobe's WWW site which is accessible directly from the GSH Home Page.

The electronic version of the newsletter is searchable and has hotlinks which appear in red and take you directly to the page and article selected. You will find a current listing of events and committee contacts — everything you find in the monthly newsletter you receive by post.

Come check out the GSH home page and online newsletter at URL: <http://sepwww.stanford.edu/seg/sections/gsh/gshhome.html>

Suggestions or comments are welcome! My email address is: nwh@neosoft.com

Member News

Khushroo N.J. (Kush) Patel has been appointed vice president of geophysics at Swift Energy Company. Kush joined Swift Energy in May of 1990 as chief geophysicist. Swift Energy Company is a growth-oriented independent company engaged in exploration, development, operations, and acquisition of gas and oil properties with headquarters in Houston, Texas.

David J. Hall, to president, Excalibur Interpretation Company, Houston, TX. Previously senior technical associate, TGS-CALIBRE Geophysical Company, Houston, TX.

The senior management of LaFehr and Chan Technologies, Inc. (LCT) is pleased to announce their successful management buy-out of LCT from Geodynamics Corporation effective January 17, 1996. The new owners of the company include Dr. T.R. LaFehr, Dr. Kwok Chan and **John Bain**, together with a group of other officers and employees of LCT, and Tudor Trust. Dr. LaFehr and Dr. Chan were the original founders of LCT. Dr. LaFehr is Chairman of the Company, John Bain serves as President, and Dr. Kwok Chan will devote his efforts to development of new technologies.

Geophysical Society of Houston Environmental Applications Special Interest Group

will host a 2-day forum April 12-13, 1996
(following the SEG Gulf Coast Section meeting)

LOOKING INTO THE EARTH:

Environmental and Other Applications of Non-invasive Geophysics

to avoid risks when you plan to

√ Explore for natural resources √ Characterize the subsurface √ Analyze 'Brownfields'

People who will benefit from this 2-day forum:

- Appraisers and assessors
- Environmentalists
- Environmental managers
- Public health specialists
- Chemical engineers
- Environmental attorneys
- Hydrologists
- Geophysicists and geologists
- Construction and civil engineers
- Environmental biologists
- Internal auditors and investigators
- Principle responsible parties

Talks and Exhibits for Hunting Treasures or Avoiding Risks

Chairperson: Dr. Warren Franz, 499-0937
Location: Texaco EPTD, 3901 Briarpark (@ Westpark near Beltway 8), Conf. Room A
Date and Time: **Friday April 12** from 9 am-4:30 p.m.

The talks and exhibits are an introduction to the best available non-invasive geophysical technology to explore for resources and characterize the near-surface and environmental conditions in and around Harris County. The talks will be followed by a round table discussion.

Field Demonstrations

Chairperson: Mr. Alf Klaveness, 468-5123
Location: Rice University soccer field at entry #12. Visitor parking entry #12 off Rice Ave.
Date and Time: **Saturday April 13** from 9 am-3 p.m.

The field demonstrations will include non-invasive geophysical methods to:

- 1) Characterize the near-surface geology (strata, faults, and migration pathways).
- 2) Explore for buried treasures (old dumping grounds, oil and gas, and other natural resources).
- 3) Avoid hazards in Harris and the adjacent counties (landfills, waste pits, wells, and pipelines).

Local professionals will demonstrate: Electromagnetics/ Conductivity, magnetic interpretation, seismic reflection and refraction methods. Non-invasive methods are used to reduce the time and cost of sampling and drilling.

2-Day Preregistration: \$10 includes refreshments and snack at on site registration, box lunch, and a program booklet. Make check payable to the Geophysical Society of Houston and mail it to: GSH, 7171 Harwin, Suite 314, Houston, Texas 77036-2910. On site registration \$15.

Program coordinator: Dr. Stephanie Hrabar, CPG phone/fax 683-0638.
Program arrangements: Dr. Phil Inderwiesen 954-6244.

√ Explore for mineral resources √ Characterize the subsurface √ Analyze 'Brownfields'

GSH 1996 Spring Technical Workshop

Case Histories of Seismic Attribute Mapping

Date: April 17, 1996
Time: 8:00 am - 4:30 pm
Place: Marathon Auditorium
Moderators: Alistair Brown; Bob Hardage; Dave Johnston; Turhan Taner

Seismic Attribute Analysis and Calibration — A Case History from the Gulf of Mexico
(*Gianni Matteucci, Exxon*)

AVO Modeling, Inversion and Prediction Error
(*Jim Simmons, Bureau of Economic Geology, University of Texas at Austin*)

3-D Coherence Cube Processing — Interpretational Calibration of the Coherence Volume with Examples from both Onshore and Offshore 3-D Projects (*Tony Rebec, Coherence Technology Company*)

Reservoir Risk Reduction from Integrated 3-D Analysis (*John Sherwood, Western Atlas E&P Services*)

Seismic Delineation of Thin Sandstone Reservoirs in Shale-Rich Sequences Using Instantaneous Frequency and Reflection Amplitude, Texas Gulf Coast (*Kathleen Horkowitz, Sanchez-O'Brien Oil and Gas*)

Exploration Applications of 3-D AVO — Case Histories from the Deep Water Gulf of Mexico
(*Francis Rollins, Amoco*)

For more information contact Don Herron, BP, GSH Continuing Education Chairman at 560-3778.

GSH 1996 Spring Technical Workshop

Case Histories of Seismic Attribute Mapping

Registration Form

Name: _____

Company: _____

Address: _____

Daytime Phone: _____ Evening: _____

Please provide the following supplementary information:

Discipline (circle one)

geophysics geology
engineering other

Years of experience (circle one)

less than one year
1-5 years
more than 5 years

Primary interest (circle one)

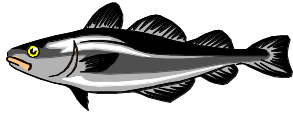
exploration exploitation
environmental other

Please send this completed form with a check or money order for \$30 (GSH Members, unemployed and students - include proof of full-time enrollment), or \$50 (non-members*) to: Geophysical Society of Houston, 7171 Harwin, Suite 314, Houston, TX 77036

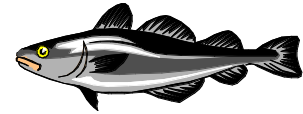
Pre-registrations must be received by **April 10, 1996**.

*non-members may join the GSH by sending their \$20 membership dues with the \$30 workshop fee. Membership applications are available from the GSH office or call Steve Starr at 498-7008. Membership dues will cover the remainder of this year and the full 1996-1997 year.

8th Annual GSH/HGS/HAPL Bass Tournament



March 30 & 31, 1996



This year the 8th Annual GSH/HGS/HAPL Bass Tournament will once again be held at Pendleton Harbor Marina on the Toledo Bend Reservoir. We are looking forward to an even bigger and better weekend of fishing, fun and friendly competition, along with the traditional Saturday Night Fish Fry with door prize drawings that evening.

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

| | | | |
|-----------------|-----------------------|-------------------------|--------|
| Contact: | Greg Doll (HGS & GSH) | (713) 579-9695 | HOME |
| | | (713) 975-3700 ext. 138 | OFFICE |
| | Bill Zwiener (HAPL) | (713) 650-0903 | OFFICE |

GSH/HGS/HAPL Bass Tournament Registration Form

NAME: _____

PARTNER: _____

ADDRESS: _____

PHONE (HOME): _____ (OFFICE) _____

GROUP AFFILIATION: _____

Make your check for \$45.00 per contestant payable to: GSH/HGS/HAPL BASS TOURNAMENT and Mail to:

| | | |
|---------------------------|----------------------|----------|
| Mr. Bill Zwiener | REGISTRATION FEE | \$ _____ |
| c/o Jones & Zwiener, Inc. | | |
| 1300 Main St., Suite 1920 | SPONSOR CONTRIBUTION | \$ _____ |
| Houston, Texas 77002 | | |
| | <u>TOTAL</u> | \$ _____ |

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

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

—Please register as soon as possible!—

Golf Tournament and Dinner Geophysical Society of Houston

DATE: Monday, April 8, 1996
PLACE: Kingwood Country Club
TIME: 9:30 a.m. Registration
 11:30 a.m. Tee Off (Shotgun)
FORMAT: Four Man Florida Scramble
COST: \$90.00 — GSH Members & Guests
DEADLINE: March 15, 1996

Please mail entries to:
 Digicon Geophysical Corp.
 3701 Kirby Dr., Suite 1118
 Houston, Texas 77098
 Attn: George Lauhoff

Make checks payable to:
Geophysical Society of Houston

Golfers: read carefully

No entry will be accepted until the entry form and fees are received in full.
NO EXCEPTIONS!

Mulligans \$5.00 each (max. 2/person)
 Available at check-in



GOLF TOURNAMENT FORM

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

Name: _____

Circle: Member Guest

Co. _____

Phone: _____ HDCP. _____

Name: _____

Circle: Member Guest

Co. _____

Phone: _____ HDCP. _____

Name: _____

Circle: Member Guest

Co. _____

Phone: _____ HDCP. _____

Name: _____

Circle: Member Guest

Co. _____

Phone: _____ HDCP. _____

Course Preference : MARSH
 (CIRCLE ONE) LAKE
 ISLAND

DINNER ONLY

Name: _____

Name: _____

Cost for Dinner \$15.00

GSH Annual Honors and Awards Banquet

Date: Wednesday, May 8, 1996
Time: 6:30 p.m. - Cash Bar
7:15 p.m. - Dinner
Place: Lakeside Country Club

Note the change from the first Thursday in May to Wednesday, May 8th. Please join us to honor your 25-year and 50-year SEG friends and co-workers. Details will be in the April Newsletter.

SEG 50-YEAR HONOREES

U.E. Neese

LeRoy Scharon

SEG 25-YEAR HONOREES

| | | | | |
|-----------------|-------------------|---------------------|-------------------|-----------------|
| Olan Adams | David Dickins | Paul L. Harrison | Larry Luton | Robert Thorburn |
| Lembang Alam | Gilbert Eppich | David Henderson | James MacKay | Richard Thorp |
| Edwin Allen | Gregory Finn | Patrick Hoffman | Rodney McAllister | Donald Townsend |
| Stanley Almoney | Thomas Fitzhugh | Gary Huxford | Edward Meanley | John Tumilson |
| George Barker | Robert Fontinelle | Maurice Isaac | Edward Mercado | Santos Villar |
| Wallace Beckhma | Dennis Francis | Richard Jes[persen | Thomas Peters | Neil Wendling |
| James Callaway | Don Funkhouser | Cecil Jones | John Rabalais | Russell Wharton |
| Wayne Carpenter | Thomas Getts | Goerge Jones | David Rush | Jon Wisda |
| Ron Casso | William Gilchrist | Joseph Kaminski | Victor Salvick | Neal Wylie |
| James Crompton | James Hallin | Richard Kostelnicek | William Steiner | Thomas Yoakum |
| John Czarnik | Paul J. Harrison | Zafar Kureshi | | |

January Technical Luncheon

January 22, HESS
Hybrid Migration: A Cost-Effective 3-D Depth Imaging
Technology
Young C. Kim



Pat Starich, EEC; Young Kim, EPR



Dan Ebrom, UofH; Gene Sparkman, Mitchell Energy; David Forel, Western



Young Kim, EPR; Doreen West, Pennzoil



Wenying Cai, Tensor;
Fred Li, Tensor



John Sherwood, GDC; Young Kim, EPR; Doreen West, Pennzoil



Ed Parma, Conoco; Alton Warren, Reservoir Geophysical Corp.

Houston Meetings

All Reservations and Cancellations for GSH and HGS Meetings call 917-0218.

March 6

Best of GSH Breakfast Meeting

Analysis of Subsalt Reflections at a Gulf of Mexico Salt Sheet Through 3-D Migration and Modeling - A Case History

Gary Lewis, Exxon PRC

Wyndham Greenspoint Hotel

12400 Greenspoint Drive

Breakfast 7:30 a.m. Program 8:00 a.m.

Reservations by Monday March 8.

March 15

GSH Interactive Workstation SIG

From Seismic Interpretation to Reservoir Simulation: Critical Data Elements in the Design of Reservoir Simulation Models for Various Field Operations

Myra A. Dria, Reservoir Technologies Group. Schlumberger/GeoQuest

Geco-Prakla, 1325 South Dairy Ashford

4:30 p.m.

March 18

GSH/HGS Joint Technical Luncheon

Real-Time Interpretation Improves E&P Decision Making

Diana McSherry, CogniSeis

HESS, 3121 Buffalo Speedway

Social 11:30 a.m. Luncheon 12:00 noon

March 18

HGS International Explorationists Dinner Meeting

Africa's Distinctive Behavior Over the Past 30 Million Years

Kevin Burke

Doubletree Post Oak, 2001 Post Oak Blvd.

Social 5:30 p.m., Dinner & Meeting 6:30 p.m.

Reservations by noon Friday March 15

March 19

GSH Reservoir Geophysics SIG

3-D Seismic for Continuing Field Development

John Austin, Pennzoil

Texaco EPTD, 3901 Briarpark

4:00 p.m.

March 20

Data Processing SIG

Seismic Imaging Using Borehole Data

Jerry Krebs, Radim Kolarsky

Exxon Production Research Co., 3120 Buffalo Speedway

Social 4:30 p.m., Presentations 5:00 p.m.

March 21

GSH Environmental Applications SIG

Airborne Conductivity Surveys for Locating Salinity Plumes and Leaking Wells

Mike Pearson, World Geoscience

Dayton Salt Dome, A Potential Hazardous Waste Disposal

Site near a Major City Water Supply

Chris Sagstetter, Friends Insist Stop Toxic Waste Inc.

World Geoscience, Bldg. 1A, Suite 200 at West Houston Airport

Program 4:00- 6:00 p.m.

March 21

GSH Potential Fields SIG

The Deep Penetration Density Logging Tool

Mark E. Ander, EDCON

HESS, 3121 Buffalo Speedway

Social 5:30 p.m., Dinner and Meeting 6:30 p.m.

Cost \$20.00, Reservations by Tuesday March 19

March 21

SIPES Luncheon

Petroleum Club, 11:30 a.m.

March 25

HGS North American Explorationists Dinner Meeting

The Next Wave

Thomas L. Davis

Doubletree Post Oak, 2001 Post Oak Blvd.

Social 5:30 p.m., Dinner & Meeting 6:30 p.m.

Reservations by noon Friday, March 22

March 27

HGS Luncheon Meeting

Modern Analytical Techniques for Fault Surface Seal Analysis:

A Gulf Coast Case History

Mary J. Broussard and Brian E. Lock

Houston Club, 811 Rusk

Social 11:30 a.m., Lunch 12:00 noon

Reservations by noon Monday, March 25

April 9

GSH Technical Breakfast

Integrating Multiple Seismic Surveys to Interactively Interpret a Salt Dome Flank

H. Roice Nelson, Jr., Walden 3-D, Inc.

University Club, 5051 Westheimer

7:30 - 9:30 a.m.

April 12-13

Environmental Applications - Special Meeting

Environmental Applications of Non-invasive Geophysical Technology

April 17

GSH Spring Technical Workshop

Case Histories of Seismic Attribute Mapping

Marathon Auditorium

8:00 a.m. - 4:30 p.m.

Events

March 10

GAH Spring Brunch

Lakeside Country Club

March 29-31

Arbuckle Mountains Field Trip

March 30-31

GSH/HGS/HAPL Annual Bass Tournament

Pendleton Harbor Marina

April 8

GSH Golf Tournament and Dinner

Kingwood Country Club

April 10-11

12th Annual SEG Gulf Coast Technical Meeting

April 19

HGS Tennis Tournament

Westside Tennis Club

April 27

Dinosaur Track Field Trip

Glen Rose, Texas

| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|---|---|---|---|---|--|-----------|
| <h1>March 1996</h1> | | | Submittals and suggestions should be sent to the GSH Editor at 7171 Harwin, Suite 314, Houston, TX 77036-2190, or call Pam Moore, Editor , at 773-2627 , or Fax to 773-9620. Deadline for submission is the 1st of the month preceding publication: e.g., March 1 for the April issue. Digital or electronic submittals required. (e-mail: nwh@neosoft.com). | | 1 | 2 |
| 3 | 4 | 5 | 6 BEST OF GSH NORTHSIDE BREAKFAST 7:30 A.M. WYNDHAM GREENSPOINT | 7 | 8 | 9 |
| 10 GSH AUXILIARY BRUNCH 11:30 A.M. LAKESIDE | 11 | 12 | 13 | 14 | 15 INTERACTIVE WORKSTATION SIG 4:30 P.M. GECO-PRAKLA | 16 |
| 17 | 18 HGS INTL. DINNER GSH/HGS TECHNICAL LUNCHEON 11:30 A.M. HESS | 19 RESERVOIR GEOPHYSICS SIG 4:00 P.M. TEXACO EPTD | 20 DATA PROCESSING SIG 4:30 P.M. EPRC | 21 SIPES LUNCH POTENTIAL FIELDS SIG 5:30 P.M. HESS ENV. APPS. SIG 4:00 P.M. WORLD GEOSCIENCE | 22 | 23 |
| 24 | 25 HGS NORTH AMERICAN DINNER | 26 | 27 HGS LUNCH | 28 | 29 | 30 |
| 31 | | | | | | |

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HOUSTON, TEXAS 77036-2190
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