Incorporating non-seismic information for improved positioning with anisotropic PSDM

Lorie K. Bear*, Thomas A. Dickens, and Peter Traynin, ExxonMobil Upstream Research Company

While it is well known that anisotropic migration is necessary to obtain accurate seismic images in many areas, parameter estimation has posed a serious challenge due to marked non-uniqueness. Our approach to mitigating this non-uniqueness involves:

• trying to fit all available data - not just seismic;
• producing models with only the required complexity;
• using a priori geologic assumptions to constrain the model where the data are inadequate.

We perform parameter estimation by using an interactive tool that allows us to estimate the VTI parameters vertical velocity, $\delta$, and $\eta \equiv (\varepsilon - \delta)/(1 + 2\delta)$. Our tool is capable of incorporating surface seismic, sonic log, checkshot, and offset checkshot information. It also has a unique model representation that allows us to choose the interpolation/extrapolation directions for the values within the model.

We present three anisotropic PSDM examples from marine areas, each of which exhibits marked P-wave anisotropy. In each case, we found that the velocity values generally followed compaction trends, while the largest control on anisotropy values appeared to be lithology. Being able to interpolate/extrapolate anisotropy values along structural trends simplified the model building process, but the trend directions were dictated by the data, not the model representation. For each data set we were able to fit all the available data while producing geologically reasonable models. We also observed improved positioning accuracy compared to isotropic depth migrations.

Biography:

Lorie Bear received her B.S. (1990) and M.A. (1992) in Mathematics from Indiana University in Bloomington. She also received a Ph.D. in Geophysics from Indiana University in 1998. Lorie joined ExxonMobil (then Exxon) in 1997 where she has worked as a Research Geophysicist developing in-house velocity model building techniques and systems. Lorie is a member of the SEG and GSH (Geophysical Society of Houston). E-mail Lorie.K.Bear@exxonmobil.com.
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On the back – Enlarged SGS logo printed in red & blue

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I dreamed I walked in space
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Southeastern Geophysical Auxiliary attendees for
The SGS February Luncheon
As we enter into spring, there are signs all around us of change from emerging blossoms to warming water temperatures for fishing enthusiasts. We are also approaching our annual election for the Southeastern Geophysical Society. The Society needs your help and participation to continue to thrive in the future. By serving on the Executive Committee, you have an opportunity to meet and work with many outstanding geoscientists in our local industry. Working with the Committee, you are able to help strengthen the technical and personal interaction among our members, providing a more vibrant geophysical community. There is also plenty of opportunity to shape the direction of our Society for years to come, giving a sense of fulfillment from this public service. We need your help and participation, and hope you will contact one of the current Executive Board members to volunteer. Nominations need to be received in March. Balloting is conducted in April, and results are presented in May at our general meeting.

Our speaker for March, Lorie K. Bear (ExxonMobil), will be giving a wonderful talk on “Incorporating non-seismic information for improved positioning with anisotropic PSDM”. This presentation is a terrific example of integrated velocity inversion for improved seismic imaging. Ms. Bear works in ExxonMobil’s research group and is pushing the envelope of velocity modeling and seismic imaging. I hope you can attend the luncheon in the Fairmont Grand Ballroom on Thursday, March 11th, 2004.

The Southeastern Geophysical Society provides two types of scholarships annually to high school seniors planning to attend college, undergraduate, or graduate students, in good academic standing, who are a daughter/granddaughter or son/grandson of a current member of the SGS. The Bill Blair Memorial Scholarship is a fifteen hundred dollar scholarship. There are also several seven hundred and fifty dollar scholarships given through the local universities. The deadline for scholarships is April 9 and is fast approaching. The application from for scholarships can be found in this newsletter.

We are also sponsoring the Gulf Coast Energy Marketplace (GCEM) scheduled for April 6-7, 2004. This event will offer a unique opportunity for the people involved in the exploration, drilling, producing, transporting, and sales of oil and gas assets to gather and network. The GCEM will also provide the exposure to available capital for projects and technologies used in the ongoing quest for the nation’s energy resources (please see http://www.gcem.net/). We are looking for volunteers to man our booth and help at the event. Please contact Larry Franceware (contact at end of newsletter), if interested.

This coming May, we are planning to host a new event, the Southeastern Geophysical Symposium, “Geophysical Solutions in Gulf of Mexico Prospecting”. The event is intended to foster communication between our members in the New Orleans...
geophysical community. We would like each of you to consider giving a paper on your work to this wider audience. Please submit one page SEG style abstracts to Cathy Thibault or Jake Brown (contact information at end of newsletter). We would very much appreciate your participation and believe this event will be a resounding success. Hope to see you at our March meeting.

Bob Shank
Our annual Golf Tournament and Scholarship Fundraiser is quickly approaching being less than a month away and the Thursday following our March Luncheon. Those of you who would like to show off your golf skills or just bring your clubs out of hibernation from over the winter will have that opportunity here on an outstanding course, with friends and colleagues, and in a relaxing environment. The venue, same as last year, will be at Money Hill Golf & Country Club in Abita Springs on Thursday, March 18th, the day following the Central Gulf Lease Sale. I urge you to send in your tournament team registration forms as soon as possible to both assure that your team has a spot in the tournament and to allow for the tournament committee to effectively plan and provide for a successful event. Eagle Geophysical is sponsoring a crawfish boil after tournament play. They have done an excellent job boiling the mudbugs the past two years and we welcome their support. There are still a number of holes available for sponsorship. The ditty bags need fillers and larger prizes are needed for the door prize drawing. The Golf Tournament is our primary source of revenue for the SGS Scholarship Fund and we are still in need of a few general sponsors. The SGS considers these scholarships an important contribution to and promotion of scholastic excellence that should be a part of our professional society. Your participation in the golf tournament as a player and/or as a sponsor will help to support this worthy cause as well as provide for an enjoyable experience.

Super Science Saturday is March 27 from 10 AM to 2 PM at the Louisiana Children’s Museum. I hope you can volunteer to work or bring a child to enjoy the hands-on activities and learn about dinosaurs, earthquakes and oil. I’ve worked this event for the past two years and everyone has a lot of fun. The SGS will have an earthquake station (oscilloscope & geophone) where kids can see a graphical display of the “earthquake” waves they generate by jumping. UNO will have a 12 channel seismograph system with a weight drop. There is also a fun Oil Finder game where you can try your luck at wildcatting. NOGS will have their dinosaur fossil collection on display. Admission is $6 but volunteers get in for free. See ad in this newsletter for more information.

Mark Friday, April 23 on your calendars for a one day course entitled “The New E&P Workforce: Adaptive Skills for Career Management”. This is a hands-on seminar designed by and for geoscientists to provide specific techniques required today to manage careers, find and retain jobs, and make better career decisions in this uncertain business climate. We could all use a little advice these days when we are faced with jobs moving to Houston, company mergers, company downsizings, etc. This course was well received last year when hosted by the Houston Geological Society. More info to come.
Our February luncheon brought together probably the most diverse group of attendees we have had so far this year as represented by regulatory, academia, engineers, geology, geophysics, retirees, life members, and of course our esteemed SGS Auxiliary. It was an honor to give recognition to our Southeastern Geophysical Auxiliary (SGA). We express our thanks and appreciation to Western Geco for both sponsoring our February luncheon and for allowing Andy Hannan (Schlumberger Reservoir Services) to attend and present a poster session. To compliment the diverse nature of our attendees was the unique opportunity we all had to both reflect on technical geophysics through Andy Hannan’s poster session and then broaden our perspective into a new arena that deviates slightly from the technical that as geophysicists we are accustomed to with Bob Tippee’s (Oil & Gas Journal) speaker presentation “License to Work”. Our thanks go to both Bob Tippee and Andy Hannan for their very interesting and enlightening presentations. Andy’s report will be published this summer at the 66\textsuperscript{th} EAGE with the title “Multicomponent data interpretation workflow & PP/PS joint inversion: 3D/4C Integrated study at Eugene Island Block 330, GOM”. You can contact Andy Hannan at hannan1@houston.oilfield.slb.com for more information. Contact Bob Tippee at bobt@ogjonline.com for more information about his talk.

Our March luncheon is scheduled for Thursday, March 11\textsuperscript{th}, in the Blue Room on the lobby level of the Fairmont Hotel. Our speaker, Lorie Bear (ExxonMobil Upstream Research Co.), will present “Incorporating non-seismic information for improved positioning with anisotropic PSDM.” Anisotropy is significant in parts of the Gulf of Mexico and estimating anisotropic PSDM parameters has always been difficult. This talk may provide some valuable insights. Please RSVP by Monday morning, March 8\textsuperscript{th}.

I once again thank each of you for your interest and support of our Society and look forward to sharing some time together once again at our luncheon, golf tournament and/or Super Science Saturday in March.

Lisa Buckner
SGS is now accepting nominations for the following 2004/2005 offices:

President, 1\textsuperscript{st} Vice President, 2\textsuperscript{nd} Vice President, Secretary, Treasurer, Editor, and Webmaster

Please contact Richard Morgan before April 6th
(504) 561-7915
richard.mongan@bakeratlas.com
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Pushing the Leading Edge of Geophysics through Technological Innovation
Fostering technical communication among geoscientists in the New Orleans vicinity, the Geophysical Symposium will feature papers from our local New Orleans Geophysical community and the greater southeastern region. Subjects regarding all aspects of geophysical technologies practiced by those engaged in work throughout the gulf coast area will be considered. It is our hope that this symposium will:

- Increase quality communication among geoscientists, particularly geophysicists
- Allow for better communication among companies
- Advance the science of geophysics
- Foster the sharing of best practices
- Yield insight for opportunities to work more closely together
- Strengthen the New Orleans Geophysical community

Submit a one page, SEG style abstract to:
Catherine Thibault, SGS Past President
thic@chevronexaco.com; 504-592-6845
March 2004

SGS Calendar Events

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**Notes:**
- Gulf Coast Energy Marketplace, New Orleans, LA
- SEG Geophysical Conf, Beijing, China
- AAPG Annual Convention, Dallas, TX
It’s time to think about renewing your membership!

Membership in the SGS runs from June 1 to May 31 of the following year. We are also looking for suitable candidates to run for various offices on the SGS Committee next year. In order to be eligible to serve as or vote for next year’s officers you must be a paid member of the Southeastern Geophysical Society for the fiscal year June 1, 2004 – May 31, 2005.

It’s time to renew your membership dues!

Membership can be renewed through to May 31, 2005 when you sign up for the Golf Day/Student Scholarship Fundraiser or at any time from now onwards by paying the appropriate fee and completing a membership application form (found on the website or elsewhere in this publication). People say nothing’s changed since last year but we are continually finding e-mail addresses that don’t work, people have changed company (or their company has changed names on them by merger or whatever) or moved entirely out of the area. The only record we have of people being a member is this completed form and the only way we can reach you is by the addresses, physical or otherwise that you provide.

I’ll speak a little more about the elections, the candidates, their biographies and the offices they’re running for next month but for now Lifetime members are eligible to vote as may the recently renewed members listed below:

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If you yourself would like to be considered for office or can think of somebody that would be willing to run please let one of the committee members know and the officer concerned can have an informal chat about what background commitment is necessary to keep our society up and running and the Geophysical Society to belong to in Southeast Louisiana.
Southeastern Geophysical Society
Membership Application
Fiscal Year
June 1, 2003 - May 31, 2004

Member Information

- New Member
- Renewing Member

NAME

Last

First

M.I.

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- Associate
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Undergraduate/Graduate Schools: BA/BS: ______________________________________
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GOLF TOURNAMENT

THURSDAY, MARCH 18, 2004

Day After Central Gulf Lease Sale 190

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9:00 am......SHOTGUN START, 4 PERSON SCRAMBLE

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And a sponsored lunch!!!
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SGS GOLF TOURNAMENT REGISTRATION FORM
DEADLINE FRIDAY, MARCH 12TH

Membership application forms must be included for all nonmembers wishing to receive SGS membership benefits through May 2005 which include member discount for the 2005 golf tournament, annual society directory, free admittance to Fall Social, discount luncheon admittance, monthly newsletter and more!

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Checks payable to SGS and mail to:
Southeastern Geophysical Society
P.O. Box 57141
New Orleans, LA  70157-7141
Website: www.sgs-neworleans.org
Registration Contact - Tabbie Benanti Ph 504-592-5100
tbenanti@new-orleans.westerngeco.slb.com
Lisa Buckner, SGS 2nd VP, Ph 504-728-6801, email lisa.buckner@shell.com
Southeastern Geophysical Society Golf Tournament

March 18, 2004, Money Hill Golf & Country Club, Abita Springs, LA, 9:00am Shotgun Start

Come join us for our annual Fund Raiser and Golf Tournament on Thursday, March 18th, following the Central Gulf Lease Sale. The Southeastern Geophysical Society is committed to presenting a quality first class golf tournament for its members and fellow colleagues. We will play on Money Hill’s 18-hole championship course designed by Ron Garl, named the “World’s Golf Course Designer of the Year” by the International Network of Golf in 1996 and has 16 layouts listed in GolfWeek magazine’s list of “America’s Best Golf Courses”.

Our Spring Golf Tournament is the main source of funds for the SGS Scholarship Fund, which awarded a total of $5,250 last year to 5 students studying in the geosciences. The SGS considers these scholarships as an important contribution to and promotion of scholastic excellence that should be a part of our professional society. Your participation in the golf tournament and as a sponsor will help to support this worthy cause. The “General” category sponsors, Platinum -$1000, Gold - $500, and Silver - $250, will be applied to the SGS Scholarship program. The SGS Golf Committee will have “Hole” sponsorship opportunities for each of the 18 holes with a minimum sponsorship of $100 per hole. Companies/Corporations are encouraged to provide “Ditty Bag Fillers” such as golf balls, golf towels, t-shirts with logos, tees, ball markers, pens, pencils, notepads, snacks, etc. and “in kind” donations such as gift certificates. Recognition will be given to all sponsors.

Come and join your fellow friends and colleagues in the geophysical industry and exploration and production to enjoy an exceptional day of golf.

Your entry fee includes:

- Green fees
- Carts
- Beverages on the course
- Hole contests, such as closest to the hole, longest drive, & longest putt
- Sponsored Lunch & Awards

Four Person Team Format

Format will be a best ball four-person scramble team format.

Registration

Register before Friday, March 12, 2004, to allow us to provide for a successful tournament.

Please direct tournament entry correspondence to Tabbie Benanti, (504) 523-6781,

Email: tbenanti@new-orleans.westerngeco.slb.com

Mail checks made payable to “Southeastern Geophysical Society” along with registration form and membership forms to Southeastern Geophysical Society, P.O. Box 57141, New Orleans, LA 70157-7141. Membership forms must be included for all nonmembers wishing to receive membership benefits through May 2005 which include member discount for the 2005 golf tournament, annual society directory, free admittance to Fall Social, discount luncheon admittance, monthly newsletter and more!

Players are encouraged to arrive at the course early to provide for a prompt start at 9:00 am. The awards ceremony, door prize drawings and lunch will immediately follow the tournament.

Southeastern Geophysical Society
P.O. Box 57141
New Orleans, LA 70157-7141
An affiliate of the Society of Exploration Geophysicists

Website: www.sgs-neworleans.org
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We’re also working hard to improve the quality of life in the New Orleans area through our support of educational and environmental programs, the arts, and the United Way.

We’re working for the future of New Orleans and the futures of our children.
Gulf Coast Energy Marketplace
Onshore and Offshore

April 5-7, 2004
Fairmont Hotel
New Orleans, LA

For more information, call (713) 650-1212 or (504) 733-3117
or visit www.gcem.net

For Sponsorship opportunities, please contact Shawn Porche @ (281) 531-1447 ext. 22

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Southeastern Geophysical Society
Reflections
March 2004
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OILFIELD TECHNOLOGY SOLUTIONS

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Southeastern Geophysical Society  
Scholarship Program  

Application for Scholarship  

Name ____________________________________________________
Address ____________________________________________________

General requirements for Eligibility:

1) A student must be enrolled or planning to enroll in college for the next school year.
2) A student must be a daughter/granddaughter or son/grandson, of a current SGS member.
3) The applicant must be:
   a) A high school senior planning to attend college next fall.
   b) An undergraduate or graduate college student whose grades are above average.
4) A student’s need of financial assistance will be considered.

How to apply:

Fill out this form and mail it* promptly to:

SGS Scholarship Committee
P. O. Box 57141
New Orleans, LA 70157

*or submit by the SGS luncheon in April

Requirements for Filing This Application:
• Completely fill out the Scholarship Application Form: Sections One, Two, and Three.
• Submit a transcript of your academic career thus far (high school/college through present)
• Request two (2) letters of recommendation from faculty

Applications and supporting documents must be in the hands of the Scholarship Committee on or before April 9.
Applications will not be considered unless the required transcripts and letters of recommendation are received by the Committee by the deadline.

Signature_____________________________________________  Date  __________________
(Signature of Applicant)

Have either parents or guardian sign the following statement if applicable: I (we) have read this application and I (we) give our approval.

_________________________________________ Date  _______  ___________________________ Date  _______
(Father or Guardian)                                                                                     (Mother)
Scholarship Application Form
Southeastern Geophysical Society

Before you submit this application, either type or use ink to PRINT all the information requested. If additional space is needed to answer questions, use separate sheets and attach to this application. PLEASE COMPLETE ALL INFORMATION REQUIRED IN EACH SECTION BEFORE RETURNING THE APPLICATION TO THE SCHOLARSHIP COMMITTEE. THIS FORM MUST BE IN THE HANDS OF THE SCHOLARSHIP COMMITTEE ON OR BEFORE APRIL 9.

Section One: General Information

Date ________________

Full Name of Applicant

(Last)                   (First)                   (Middle)                             (Social Security Number)

Home Address

(Number and Street)             (City or Town)                   (State)             (Zip Code)             (Telephone)

Present address for Correspondence

(Number and Street)             (City or Town)                    (State)             (Zip Code)              (Telephone)

Date of Birth_____________________________________________________________

(City or Town)                   (State)             (Country)

email address

Indicate Person who furnishes your principal financial support:

Father ____  Mother ____  Guardian ____  Spouse ____  Self ____

Full name of this person if other than self:

(Last)                   (First)                   (Middle Initial)

Address

(Number and Street)             (City or Town)                              (State)             (Zip Code)

Employed by:

(Company)                                                                  (Address)

What Southeastern Geophysical Society member is your sponsor?

___________________________________________________

What relationship to you is the sponsor?

___________________________________________________
Section Two: Current Classification

Special Note: Section Two requires you to complete only the part applicable to your current classification (i.e., High School Senior, Undergraduate, Graduate Student). Only one part of Section Two should be filled in.

High School Senior:

Name of school now attending
________________________________________________________________________

Address of school now attending
________________________________________________________________________

When will you graduate from high school?
________________________________________________________________________

Include a transcript of your high school record for at least the last 3 years.

List courses now in progress
________________________________________________________________________

________________________________________________________________________

It is important that two letters of recommendation from your science or mathematics teacher or school principal, in support of your application, be requested by you and sent directly (by the teacher or principal) to the SGS Scholarship Committee. The Committee must receive these references no later than April 9. In addition, a transcript of your high school courses up to the present semester is required.

In which College or University do you wish to enroll?
First Choice _____________ Second Choice _______________ Third Choice _____________

To which of these colleges have you applied for admission?
________________________________________________________________________

To which accepted?
________________________________________________________________________

SAT Test Scores: Math _____ Verbal ____ Date _______ ACT Test Score ________________

State what major you intend take in College: _______________________________________

What professional career do you intend to follow? ____________________________________

List any scholastic honors you have received
________________________________________________________________________

________________________________________________________________________

Have you been elected to any school office (list)?
________________________________________________________________________

On what athletic teams have you played?
________________________________________________________________________

Other activities in which you have participated.
________________________________________________________________________

________________________________________________________________________

What recreational activity or hobby outside of school interests you most?
________________________________________________________________________

________________________________________________________________________
Have you received any special recognition outside of school?
_______________________________________________________________________________
_______________________________________________________________________________

Have you participated in any community volunteer activities?
_______________________________________________________________________________
_______________________________________________________________________________

Undergraduate (Current Status)

Freshman ___ Sophomore ___ Junior ___ Senior ___

If a senior, will you be attending graduate school next year? Yes ___ No ___

Name of college or university now attending
_______________________________________________________________________________

Will you attend this school next year? Yes ___ No ___ New school ______________________

State what major you are taking in College:
_______________________________________________________________________________

What professional career do you intend to follow?
_______________________________________________________________________________

Include a transcript of your college grades and/or your high school record (the latter is most helpful if you are in your first year of college).

It is important that two letters of recommendation from faculty members, in support of your application be requested by you and sent directly to the SGS Scholarship Committee. The Committee must receive these references no later than April 9.

SAT Test Scores: Math _______ Verbal _______ Date __________ ACT Test Score __________

Have you taken the GRE? _________ Your scores ________________

List any scholastic honors you have received
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

Have you been elected to any school office (list)?
_______________________________________________________________________________

Other activities in which you have participated.
_______________________________________________________________________________
_______________________________________________________________________________

Have you been elected to any school office (list)?
_______________________________________________________________________________

What recreational activity or hobby outside of school interests you most?
_______________________________________________________________________________
_______________________________________________________________________________
Have you received any special recognition outside of school?
_______________________________________________________________________________
_______________________________________________________________________________

Have you participated in any community volunteer activities?
_______________________________________________________________________________
_______________________________________________________________________________

Graduate (Current Status)

M.S. _____ M.A._____ Ph.D. ____

Name of university now attending
_______________________________________________________________________________

Will you attend this school next year? Yes ____ No ____ New school
_______________________________________________________________________________

State what major you intend to take in College:
_______________________________________________________________________________

What professional career do you intend to follow?
_______________________________________________________________________________
_______________________________________________________________________________

When do you plan to receive the ___________ Degree? ______________

Include a transcript of your grades for your college career.

It is important that two letters of recommendation from faculty members, in support of your application, be requested by you and sent directly to the SGS Scholarship Committee. The Committee must receive these references no later than April 9.

What are your scores on the GRE test? ______________

List any scholastic honors you have received
_______________________________________________________________________________
_______________________________________________________________________________

Have you been elected to any school office (list)?
_______________________________________________________________________________

Other activities in which you have participated.
_______________________________________________________________________________
_______________________________________________________________________________

What recreational activity or hobby outside of school interests you most?
_______________________________________________________________________________
_______________________________________________________________________________

Have you received any special recognition outside of school?
_______________________________________________________________________________
_______________________________________________________________________________

Have you participated in any community volunteer activities?
_______________________________________________________________________________
_______________________________________________________________________________
Section Three: Financial Information

Indicate Person who furnishes your principal financial support:

Father ___  Mother ___  Guardian ___  Spouse ___  Self ___

Are you a previous SGS Scholarship Recipient?  Yes ___  No ___  If so ____________________________

(School Year)

How do you plan to finance your education?

List any jobs held in the last three years.  An attached resume would be desirable.

List all scholarships that you have been awarded including the value of each.

Briefly list and explain any time gaps that may have occurred in the pursuit of your education, i.e., full time employment, armed forces, etc.

Please furnish additional information, which you feel the Committee should have in considering your application (i.e., resume, personal statement).
The New Orleans Geological Society
American Petroleum Institute
Shell Offshore Inc. &
Southeastern Geophysical Society

Presents . . .

Saturday,
March 27th, 2004
10am - 2pm

at the
Louisiana Children's Museum

Explore dinosaur worlds from the Jurassic and Cretaceous. Create your own earthquake, or drill into the deep for oil. No, you are not at the movies, but the 6th Annual Geology Super Science Saturday at the Louisiana Children's Museum! Roam the vast hall with velociraptors searching out prey! Look out for the sharp teeth of Stan, the 5 foot t-rex skull. Puzzle at how to put together a duckbill dinosaur's real leg bone! Dig up dinosaurs in the sand, touch lots of real dino bones, stencil and paint their huge skulls. That's not all, create your own seismic earthquake or drill and find an oil field in the fun filled Gulf of Mexico oil finder game.

Sponsored by the New Orleans Geological Society, American Petroleum Institute - Delta Chapter, Shell Offshore Inc. and the Southeastern Geophysical Society.

Mark your calendars for March 27th.
Tell your teachers and bring your kids and youth groups.

Contact:
Tom Bergeon at
thomas.bergeon@shell.com
or
504/728-6480
for more info.
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New Orleans, LA 70157

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