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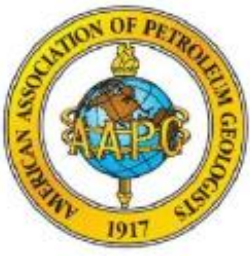
Dallas Geological Society



The SWS President's Welcome

Is anyone doing domestic exploration? Domestic Exploration: Well Worth the Effort is the theme for this year's Southwest Section annual convention hosted by the Dallas Geological Society. Each year our convention draws as many as half of our 1200 members and members from surrounding geological and geophysical societies. Geologists in the Southwest Section work in diverse geological settings across Texas, North America and the world. Locally, our geologists work a variety of plays including unconventional resources plays which is the topic of a number of our convention speakers.

Members of the Southwest Section are known for their scientific curiosity and our convention provides a relaxing and comfortable environment for discussions with colleagues, friends and associates and to meet new friends. John Lorenz, AAPG president, will be here as the keynote speaker for the All Convention Luncheon. Dick Stoneburner, President of Petrohawk Energy Corp., will be here speaking for the All Division Luncheon. Mike Grace will be here leading the pre-convention field trip down the Brazos River to study fluvial depositional systems. Barbara Kearney will be here, she has to, she's the convention general chairwoman who has done an extraordinary job putting the convention together with the goal of making it the best ever.

When you're standing in the middle of the Southwest Section, somewhere west of Abilene, you realize how great it is to be able to practice our profession here. But what makes it really great is being able to work with other geologists, the friends and associates and even family of our member geological societies; Abilene, Dallas, El Paso, Fort Worth, Graham, North Texas, San Angelo, Roswell, and West Texas.

Please join me in thanking the Dallas Geological Society SWS committee members, chaired by Barbara Kearney, and Sirman Hollabaugh, President Dallas Geological Society, for the tremendous sacrifice and effort they expended in order to make this convention so enjoyable and successful for our membership. When you see any of the convention committee members listed in this publication, give them a big ol' Texas thank you!

Is domestic exploration worth the effort?..... We know it is.
Welcome to Dallas! "There is no better time to explore than now."

Lee Higgins
President, Southwest Section AAPG

The Chairman's Welcome

On behalf of the Dallas Geological Society, I wish to welcome you to Frisco, Texas, where it is our pleasure to host the 2010 SWS AAPG convention. In keeping with our theme of "Domestic Exploration: Well Worth the Effort," we have lined up an excellent technical program which is focused on the prolific shale gas plays as well as the conventional plays in our nearby basins, and the technologies being used to unlock them.

In addition to the Technical Program and Exhibit Hall, we have arranged several social events. Sunday afternoon we will walk over to the Dr. Pepper Ballpark and enjoy beer, wine, BBQ, and soft drinks while we watch the Frisco Roughriders take on their opponent. Monday evening we will meet for an Icebreaker on-site where we will enjoy wine, beer, cocktails, and a Tex/Mex buffet while catching up with old friends and making new acquaintances. The adventurous among us will be taking a canoe trip down the Brazos River on Saturday, for a Brazos River Fluvial Seminar led by Mike Grace. The more studious will be taking a short course on Tuesday, on "Understanding heterogeneity in shale plays across the US" with Richard Salter and Rick Lewis. And, as always, we will be hosting the "Rocks In Your Head" Seminar for teachers at EMGI on Saturday.

For spouses, or for anyone looking for a get-away, you will be taking a ride down to the beautiful Dallas Arboretum for lunch and a stroll through the grounds. Or, on your own you can enjoy world class shopping at IKEA or Stonebriar Centre- both are nearby. Better yet, make an appointment at the Spa Botanica, a leader in luxury and relaxation! Stop by the Ladies Hospitality Room for a cup of coffee and a brownie, we are so happy to have you here with us!

I would like to take this time to thank the members of the 2010 SWS AAPG Convention Committee. The convention has been in the planning stages for over a year and a small group of people (listed elsewhere in this program) is responsible for planning all that I mentioned above! My heartfelt thanks to them for their time and patience.

We think we have planned something for everybody! On behalf of the Convention Committee and the DGS Board of Directors, welcome and enjoy!

Barbara Kearney
General Chair, 2010 SWS AAPG Convention

AAPG SOUTHWEST SECTION ANNUAL CONVENTION
DOMESTIC EXPLORATION WELL WORTH THE EFFORT
DALLAS, TEXAS • MAY 16-18 2010

Social Events

TAKE ME OUT TO THE BALLPARK!
Sunday, May 16, 2010, 1:00 –5:00 PM

Join us for an afternoon of Baseball and camaraderie as we watch the Frisco RoughRiders take on their opponent in their home stadium, the newly built Dr. Pepper Ballpark, just steps away from the Embassy Suites Hotel. Included in the price of your admission will be a BBQ lunch, beer, wine, and soft drinks!

MONDAY EVENING ICEBREAKER!
Monday, May 16, 5:00 –7:00 PM

Mix and mingle with old friends and new! Enjoy beer, wine, cocktails, and a Tex/Mex buffet. The Icebreaker will be held on-site at the Embassy Suites, so whether you are winding down from a day at the convention, or winding up for an evening out, we have you covered with this Icebreaker Event!

A DAY AT THE DALLAS ARBORETUM!
Monday, May 17, 10:00 AM - 4:00 PM

The Dallas Arboretum and Botanical Society Inc. is 66 acres of lush gardens and gorgeous vistas of downtown Dallas and White Rock Lake. Located in the heart of Dallas, the gardens are comprised of two estates, the DeGolyer estate and the Camp estate. Cost includes transportation, entrance fee, lunch, and a presentation!

Dallas Arboretum
Let nature nurture you.

Schedule of Events

(All events will be at the Embassy Suites unless otherwise noted)

Saturday, May 15

8:00 AM-6:00 PM	"Brazos River Fluvial Seminar:", Mike Grace and Steve Brackeen, meet at Frisco Con vention Center (north side)

Sunday, May 16

12:00 PM -5:00 PM	`Registration and Exhibitor set-up (Frisco 6)
12:00 PM-4:00 PM	SW Section Board Meeting/Luncheon (Hamilton/Lebanon Room)
1:00 PM-5:00 PM	***"A Casual Afternoon of Baseball, BBQ, Beer, Wine and soft drinks," Dr. Pepper Ballpark, adjacent to the Embassy Suites***

Monday, May 17

7:30 AM-4:00 PM	Registration
7:30 AM-8:30 AM	Judges, Moderators, & Speakers Breakfast (Bass School Room)
7:30 AM –8:30 AM	House of Delegates Breakfast (Bush Erudia Room)
8:00 AM -5:00 PM	Exhibit Hall (Frisco 6)
9:00 AM-3:00 PM	Spouse Hospitality Room (Hamilton Lebanon Room)
8:30 AM-10:00 AM	Opening Session (Frisco 1/2)
10:00 AM-4:00 PM	Spouse Event-"***A Day at the Dallas Arboretum"***
10:00 AM-4:20 PM	Technical Sessions (Frisco 4/5, Frisco 7)
12:00 AM-1:30 PM	All Convention Luncheon-***Speaker John Lorenz, AAPG President*** (Frisco 1/2)
5:00 PM-7:00 PM	Icebreaker –***Beer/Wine/Cocktails and Tex-Mex Buffet*** (Frisco 8/9)

Tuesday, May 18

7:30 AM-12:00 PM	Registration
7:30 AM-8:30 AM	Judges, Moderators, & Speakers Breakfast (Bass School Room)
7:30 AM-9:00 PM	DPA Breakfast-***Speaker David Curtiss, AAPG GEO-DC*** (Bush Erudia Room)
9:00 AM-4:20 PM	Technical Sessions (Frisco 4/5, Frisco 7)
9:00 AM-3:00 PM	Spouse Hospitality Room (Hamilton Lebanon Room)
8:00 AM-4:00 PM	Exhibit Hall (Frisco 6)
12:00 PM-1:30 PM	All Division Luncheon-***Speaker Richard Stoneburner, President Petrohawk Energy Corporation*** (Frisco 1/2)
8:30 AM-5:00 PM	Short Course -"***Understanding heterogeneity in Shale Plays across the US and enhancing resource exploitation throught the use of multi-Disciplinary data from seismic, core and logs," Richard Salter and Rick Lewis*** (Frisco 8)

All Convention Luncheon

Monday May 17, 12:00-1:30
Speaker: John Lorenz, President AAPG
Room Frisco 1/2, $25 per person

THE INTERPLAY BETWEEN GEOSCIENCE AND THE OIL AND GAS INDUSTRY

Advances in geoscience have been critical to maintaining the viability of the oil and gas industry. One of the better measures of this is the success rate of oil and gas wells: the percentage of drilled wells that turn into producers has remained constant over the years even though the largest plays and "easy oil" were found early on. The success rate of wildcat wells has never been less than about 15%, and in fact has improved in the last 10-15 years, suggesting that advances in geoscience are allowing us to become more efficient. Unfortunately, geoscience alone cannot maintain production levels since no-one can produce what is no longer there, and the ratio of energy expended to energy recovered for these same wells has decreased.

AAPG was founded and continues to exist for the benefit of its member geoscientists. Over 80% of AAPG members work for industry, thus what benefits our members indirectly benefits industry. Many companies recognize this and have been generous in support of various AAPG programs. However, AAPG is not a lobbying group for the industry. Rather, the primary purpose of AAPG is to foster and disseminate the historical and leading-edge geoscience that allows members to do their jobs efficiently and effectively.

Biography for John Lorenz

I earned my undergraduate degree, majoring in geology in anthropology, from Oberlin College in 1972, after which I went to Morocco to teach English and learn Arabic with the Peace Corps. While in Morocco I hooked up with a group of geologists from the University of South Carolina, and did a MSc on a Moroccan Triassic rift basin. I worked for the USGS in Louisiana and New Mexico from 1975 to 1977, then returned to school, working on the Nubian Sandstone in Libya and Cretaceous strata in Montana and earned a PhD from Princeton University in 1981. I joined Sandia National Laboratories in 1981 to be the geologist for the low-permeability natural-gas reservoir investigation called the Multiwell Experiment in the Piceance basin of Colorado. I worked for Sandia Labs from 1981 to 2007, doing fractured-reservoir studies in exotic places such as Alaska, Algeria, and Texas. During that time I served as the AAPG Elected Editor from 2001-2004. I left Sandia in March of 2007 and have been consulting in reservoir characterization for the oil and gas industry. I currently serve as the 2009-2010 AAPG President.

All Division Luncheon

Tuesday May 18, 12:00-1:30
Speaker: Richard Stoneburner,
President Petrohawk Energy Corp.
Room Frisco 1/2, $25 per person

THE HAYNESVILLE AND EAGLE FORD SHALE: TWO WORLD CLASS GAS SHALE RESERVOIRS

The Haynesville and Eagle Ford Shale plays were both discovered as prolific gas shale reservoirs during 2008. In the time since they were discovered it has become obvious that these two plays have many things in common. Some of these common aspects as they relate to Petrohawk's acreage position are:

They are both found at approximately the same depth (10,500-13,000')
They both have thick net pay intervals (>200')
They both have very high net/gross pay intervals (~100%)
They are both relatively young gas shale reservoirs (Jurassic/Cretaceous)
They are both overpressured reservoirs (.65-.88 gradient)
They both have exceptional gas filled porosity (~9%)
They both have high volumes of gas in place (~150 Bcf/section)
They both have exceptional permeability for gas shale reservoirs (500-1100 nanodarcies)

Both of these plays are still in their infancy and much more needs to be learned about each to more fully understand the potential of each. However, it appears most likely that both of the gas shale discoveries should become two of the most significant gas shale reservoirs in the Lower 48.

Biography for Richard Stoneburner

Mr. Stoneburner is currently responsible for all phases of upstream operations for the company. Prior to his current role he served as Executive Vice President-Exploration. Previous positions include Vice President—Exploration of 3TEC Energy Corporation from December 1999 until its merger with Plains Exploration & Production Company in June 2003. Prior to joining 3TEC, Mr. Stoneburner worked as a geologist for a number of E & P companies including Hugoton Energy Corporation, Stoneburner Exploration and Texas Oil and Gas. Mr. Stoneburner has over 30 years of experience in the energy business and has a Bachelor of Science degree in Geological Sciences from The University of Texas at Austin and a Master's of Science degree in Geology from Wichita State University.

Speakers -Room Frisco 4/5

Monday AM-East Texas Basin

10:00-"Sedimentology, Ichnology, Depositional Environment Interpretation, and Reservoir Characterization of the Cotton Valley Sandstones in the Amoco Grace Lowry #1, Harrison County, Texas"
Justin Bagley, Matador Resources
11:00-"Lower Bossier-Haynesville Formations, New Biostratigraphic Data, from North Louisiana Salt Province"
Ignacio Pujana, UT Dallas

Monday PM-Delaware Basin

1:30- "Kelly and Snakebite Fields –Horizontal Ellenburger Play, Edwards County, TX"
Steve Shaw, Firstview Resources
2:30-"Depositional Systems and Gas Production, Atoka and Morrow Series (Pennsylvanian), Haley Field Area, Loving County, Texas"
William Hasler, XTO Energy

Tuesday AM-Gas Shales Geology

9:00-"The Stratigraphic Framework of the Haynesville Shale in North Louisiana and North East Texas"
Bo Henk, Matador Resources
10:00-"Benzene Detection from Barnett Shale Natural Gas"
Lori Siegleman, W&W Environmental Group
11:00-"The Marcellus Shale and Gas Production"
John Ward, PetroEdge

Tuesday PM-Gas Shale Technologies

1:30-"Redefining North American Gas Markets" The New Role of Shale Gas in Satisfying Energy Demand"
Ken Medlock, Rice University
2:30-"Detailed Rock Evaluation and Strategic Reservoir Stimulation Planning for Optimal Production in Horizontal Gas Shale Wells"
Camron Miller, Schlumberger
3:30-"Multi-Scale and Multi-Disciplinary Approach to Unconventional Reservoir Characterization: Example of Hydraulic Fracturing Treatments in a Horizontal Barnett Shale Well"
Joel LaCalvez, Schlumberger

Poster Sessions-Tuesday, May 17

9:00-10:20 AM-"Preliminary Chemostratigraphic Results from the Barnett Formation, Southern Fort Worth Basin, Texas: Changes in Depositional Environments Across the Basin"
James Hoelke, UT Arlington

10:30-12:00 PM-"Preliminary Chemostratigraphic Results and Paleoceanographic Constraints from Bossier-Haynesville Mudrock Cores, East Texas Basin, Texas and Louisiana"
Pukar Mainali, UT Arlington

1:30-2:50 PM-"Preliminary Chemostratigraphic Results from the Eagle Ford Formation, South Texas: Implications for Regional Correlation and Late Cretaceous Ocean Anoxia"
T.J. Kearns, UT Arlington

Speakers -Room Frisco 7

Monday AM-Fort Worth Basin and Central Texas

10:00-"Recent Exploration Activity, Kerr Basin (Central Texas); Bandera Ellenburger Field Gas Discovery:
Charles Sternbach, First Place Energy Ltd.
11:00-"Stratigraphy of the Marble Falls Interval (Pennsylvanian), Jack and Wise Counties, Texas"
Klinton M. Farrar, EOG Resources

Monday PM-Midland Basin

1:30-"Evaluation of Microbubble Seep Theory"
Monte Meers, Meers Microseep Surveys, Inc.
2:30-"Regional Depositional Analysis Upper Permian "Yates" Gas Sands, Permian Basin, Texas"
Lee Higgins, Lynx Production Co.
3:30- "Lower Permian Supersequences and Evolving Sequence Architectures of the Eastern Shelf, Midland Basin, Texas"
Peter Holterhoff, Texas Tech University

Tuesday AM-Geophysical Topics

9:00-"Shale Gas Reservoirs, Similar Yet So Different"
Murray Roth, Transform Software
10:00-"Eagle Ford Shale Prospecting with 3D Seismic Data Within a Tectonic and Depositional System Framework"
Galen Treadgold, Weinman Geoscience, Steven Sinclair, Matador Resources
11:00-"Seismic Attributes: So Many Tools, So Little Time"
Martin Selznick, Rosewood Resources

Tuesday PM-Geophysical Topics

1:30-"Microseismic Advances in Resource Plays with Low Thermal Maturity"
Doug Walser, Pinnacle Technology
2:30-"Using Surface Seismic to Improve Gas Shale Profitability"
David Paddock, Schlumberger

Short Course: "Understanding heterogeneity in shale plays across the US and enhancing resource exploitation through the use of multi-disciplinary data from seismic, core and logs*", Richard Salter and Rick Lewis, Schlumberger*

Tuesday, May 18, 8:30-5:00 (Frisco 8)
($15 includes lunch)

Brazos River Fluvial Seminar
Saturday, May 15, 2010
Leaders: Mike Grace and Steve Brackeen
$90 per peson

We will examine common sedimentary structures, discuss implications for facies identification and reservoir architecture using a clastic point bar on the Brazos River south of Granbury, Texas. Meet at the Frisco Convention Center (north side.) The bus leaves promptly at 8:00 AM and the bus will arrive back in Frisco by 6:00 PM.

Abstracts

Sedimentology, Ichnology, Depositional Environment Interpretation, and Reservoir Characterization of the Cotton Valley Sandstones in the Amoco Grace Lowry #1, Harrison County, Texas, *Justin Bagley, Matador Resources*

The Cotton Valley formation in east Texas and north Louisiana is a proven hydrocarbon producing tight gas sand reservoir. Understanding the depositional environment, sandstone body geometries and reservoir properties are important for exploration and development. Two hundred and thirty eight feet of conventional core, over the Cotton Valley sandstone interval, was described and interpreted from the Amoco Grace Lowry #1, located in Harrison County, Texas. The sedimentology and ichnology as well as the net sandstone isopachous maps provided the basis for the depositional environment interpretation. Core plug derived porosity and permeability, electric logs, and thin sections were utilized for reservoir characterization. Three separate sandstone intervals were identified and referred to as the Roseberry, Davis I, and Davis II sands. These are part of the massive undifferentiated Cotton Valley sands. The best quality reservoir sands were identified in the Davis I and are interpreted to be deposited within a shallow marine shoreface environment. The poorest reservoir quality sandstone is within the Roseberry interval and is interpreted as a reworked delta front system. Grain size, cementation, chlorite clay grain coating and clay distribution are the primary controls for reservoir quality.

Lower Bossier- Haynesville Formations, New Biostratigraphic data, from North Louisiana, Salt Province, *Ignacio Pujana, UT Dallas*

This study reports the discovery in a core sample of a well preserved microfossil association (Radiolaria and Foraminifera), together with ammonites, bivalves and nannofossils.

The material analyzed is from the Core Whitaker 23-1, Haynesville Formation at 11,220 and 11,190 feet, with an observed Haynesville Shale net thickness of 158 feet. The well is located at Section 23 / Township 15 North / Range 13 West, Desoto Parish, Louisiana, North Louisiana, Salt Province.

The use of biostratigraphic methods in subsurface for the Jurassic and Lower Cretaceous units, is not as common as in younger sequences. The analysis of foraminifera and nannofossil associations show the studied core levels as Upper Jurassic. However using the newly discovered radiolarian assemblage, the age is better defined as uppermost Kimmeridgian to lower Upper Tithonian. The Louisiana's association is composed by several conspicuous forms, already described for Taman and La Caja Formation, from East Mexico.

The depositional environment according to the radiolarian presence corresponds to normal marine conditions possible with high productivity favored by coastal upwelling. The use and developing of this biostratigraphic tool in subsurface will contribute to develop a more precise description and classification of deep sources and reservoirs in The Gulf of Mexico Basins. Worldwide chronostratigraphic correlations based on these planktonic forms will contribute to a better understanding of the distribution in Middle and Upper Jurassic rocks.

Recent Exploration Activity, Kerr Basin (Central Texas); Bandera Ellengurger Field Gas Discovery, *Charles Sternbach, First Place Energy Ltd*

Kerr Basin lies immediately south of the Llano Uplift in Texas "Hill Country". Though exploration work has remained essentially dormant during recent years, twprevious decades: Mountain Home (1982; 80,000 BO cumulative) and Manzanas (1995; 30,000 BO cumulative). These fields produce from o small, light-gravity oilfields were found in

Abstracts

Cambro-Ordovician Ellenburger reservoirs. The Kerr Basin is postulated to be the eastward continuation of the new Ellenburger gas production along the Edwards Arch to the west at fields like Geronimo Creek (2005), Four Mills (2004) and Snakebite (1995).

In 2003 frontier-oriented First Place Energy, Ltd. re-worked existing data and initiated a leasing campaign. Higher oil prices and new technology offered opportunity to revisit a lightly drilled underexplored basin believed to possess such favorable fundamentals as: seal, large undrilled structures, and source rocks yielding 40 degree API gravity oil. An initial farmout in 2005 failed to reach basement or establish commercial production. Nonetheless FPE proceeded to find a new operator, Gunn Oil Company (GOCO), who expanded exploration to include a proprietary seismic campaign and additional leasing. This effort focused on four-way dip structural closures and fault trap horst blocks along a regional structural nose extending southwest into Bandera County from the Blanco Arch shown on the Tectonic Map of Texas (Ewing, et al, 1990). It should also be noted that both source rock and (karsted) reservoir rock are exposed at the surface on the aforementioned, nearby Llano Uplift.

This talk will focus on regional geology and the results of two exploration basement tests drilled by GOCO in 2007-8. GOCO discovered the Bandera Ellenburger Field late 2007. The field was shut in until gas prices improved and pipeline was completed 12/2009. Currently the GOCO Carter #1 well produces about 0.750 MMCFG/D with future offset wells planned. The field is on the leading edge of a regional autochthonous buttress overthrusted by allochthonous Pennsylvanian strata, the latter being highly distorted and incipiently metamorphosed. Although the Barnett Shale source rock surrounding the field is in the oil window, the Carter well produces dry gas. Tight gas sandstones in Pennsylvanian thrust sheets have yielded non-commercial shows to date in the GOCO Stevens #1 well, in a setting analogous to the West Texas Overthrust play.

Stratigraphy of the Marble Falls Interval (Pennsylvanian), Jack and Wise Counties, Texas, *Klinton M. Farrar, EOG Resource*

The Marble Falls interval in the northern portion of the Fort Worth basin is comprised of five informal stratigraphic units. Four units, an upper limestone, upper shale, lower limestone and lower shale, are present in the eastern half of Wise County. The limestones and shales interfinger to the west in Jack County with a heterolithic unit comprised of interbedded siltstone, mudstone and. Four lithologies are present in core taken in the Marble Falls interval in the House No. 1 well in southwestern Jack County. Here only the heterolithic unit is present. It is comprised almost entirely of spiculitic siltstone and laminated black mudstone. Crinoidal siltstone is present in a thin interval near the top of the heterolithic unit. A dark micritic limestone is present beneath the heterolithic interval in the core.

Six facies are present in the heterolithic unit in the cored interval. The facies are defined primarily by the relative abundance of siltstone to mudstone or claystone, and secondarily by the composition of the silt fraction and degree of bioturbation. Facies A is a light gray, laminated spiculitic siltstone with thin interbeds of dark gray to black laminated mudstone. Siltstone comprises 90% of the facies and is often highly bioturbated. The laminae in the siltstone are generally continuous across the core. Facies B consists of nearly equal amounts of highly bioturbated crinoidal siltstone and black claystone. Facies C resembles facies A, but the laminae in the siltstone are discontinuous across the core. Facies D contains significant amounts of quartz in the silt fraction and relatively fewer sponge spicules, but otherwise resembles facies C. Facies E is a

black claystone with thin interbeds of spiculitic siltstone. The siltstones are moderately bioturbated. Facies F also consists of black claystone with thin interbeds of spiculitic siltstone, but the interbedded siltstones are not bioturbated.

The two facies (E, F) comprised mainly of black claystone are present only in the lower third of the core, and the one (F) in which the interbedded siltstones are not bioturbated is found only at the base of the core. Facies C comprises most of the cored interval (48%). It is interbedded with Facies E in the lower third of the core and passes upward in to silt-rich facies (A, B) at the top of the core. The stacking of facies reveals a gradual change from a low-energy anoxic setting to a higher energy environment with a thriving infauna. This change in depositional conditions during the deposition of the heterolithic unit probably represents a shift from basinal to slope and shelf settings associated with the filling of the Fort Worth basin in the late Pennsylvanian.

Depositional Systems and Gas Production, Atoka and Morrow Series (Pennsylvanian), Haley Field Area, Loving County Texas,
William H. Hasler, XTO Energy

Haley Field, Loving County, Texas has produced over 300 bcf of gas from Morrowan and Atokan strata in the Delaware Basin. However, only one in four wells drilled in the field is economic. The reservoirs were deposited in deep-water settings in a basin undergoing active tectonism associated with the Marathon-Ouachita orogeny. Tectonic activity largely determined patterns of sediment distribution and accumulation in the basin. Primary structural features affecting sedimentation were the Central Basin Uplift, Red Hills Arch, and Grisham Anticline. The basin fill was derived from the Pedernal Massif to the northwest and the Central Basin Uplift to the east.

Lower and middle Morrow strata represent distal deposits of basin-margin turbidite complexes. Muddy and sandy sediment formed lobate submarine ramps off the Northwestern Shelf in the northern portion of the study area. Linear slope aprons were formed in the southern portion by sediment derived from the steep, uplifted margin of the Central Basin Uplift. The rising Red Hills Arch and Grisham Anticline formed bathymetric obstacles on the sea floor that deflected currents to the southwest. Sedimentation changed from predominantly clastic in the lower and middle Morrow to mainly carbonate in the upper Morrow and Atoka. Upper Morrow and Atoka strata consist primarily of carbonate sediment deposited as the shelf edge prograded into the basin during a relative rise in sea level. Deep-water sediments were deposited to the southeast of the prograding shelf. Sediments were deposited in both fan and ramp settings off the Central Basin Uplift. By the Late Morrowan and Atokan, the Northwestern Shelf had prograded into the basin, covering the Red Hills Arch. The Central Basin Uplift and Grisham Anticline continued to control patterns of sediment distribution to the south.

Potential hydrocarbon reservoirs exist in stacked turbidite channels, overbank splays, and fan lobes within both Morrowan and Atokan fan complexes. These reservoirs will have good seals, but are likely to be highly heterogeneous. Potential reservoirs also exist in feeder channels on the Northwestern Shelf and the Central Basin Uplift, as well as slope aprons deposited along the flank of the Central Basin Uplift. Natural gas accumulations in the Haley Field area are highly overpressured and very deep. Reservoirs along the northern end of the Central Basin Uplift are likely to be shallower but still possibly overpressured.

Abstracts

Evaluation of Microbubble Seep Theory

Monte Meers, Meers, Microseep Technology

Surface geochemistry and the study of seeps and microseeps has been part of oil and gas exploration since Drake drilled his discovery well on an island in Oil Creek near Titusville, PA in 1858. A wide variety of methods for detecting seeps have since been developed, but irrespective of the geochemical exploration methods, an understanding of seep paths and signatures is critical to applying these methods to drill site selection. For a better understanding of these ideas, we have developed a numerical solution to the anisotropic diffusion equation where we introduce the concept of effective diffusability to examine the preferential movement of gas in the vertical direction. In addition, we also developed a physical sandbox model to evaluate numerical results, and as an alternative method of investigation.

Our studies suggest that the halo anomalies reported in the literature are the result of loss of vertical permeability over oil and gas reservoirs (plugs), an idea supported by a study of acoustic velocity distribution. Also, structural dip of beds of varying degrees of anisotropy shift seeps down dip; faults and fracture systems may also shift seeps away from the center of the reservoir.

If the reservoir is narrow or not associated with structure the seep is directly over the reservoir – an apical signature. These signatures can be shifted by regional dip or variations in overlying geology.

Our modeling also suggests that the thickness of the weathered zone may affect the magnitude and sharpness of the seep signatures. These effects detract from data that are already inherently noisy. We suggest that ample sampling and noise reduction is needed to adequately describe seep patterns.

We conclude that our numerical model, although restricted because of our inability to quantify the effective diffusability, is a useful tool for understanding the paths of microseeps. Physical models are useful for appreciating some of the effects of the environment, and for evaluating numerical results.

Lower Permian Supersequences and Evolving Sequence Architectures of the Eastern Shelf, Midland Basin, Texas

Peter Holterhoff, Texas Tech University

The Early Permian was a time of significant global climate change. The earliest Permian (Asselian and Sakmarian; Wolfcampian) was the acme of the Late Paleozoic icehouse, characterized by extensive glacial deposits across most of the Gondwanan sub-continents. This icehouse interval gave way to an essentially ice-free Gondwana during the middle portion of the Early Permian (Artinskian; early Leonardian). This non – glacial interval was followed by a period of late Early Permian (Kungurian; late Leonardian) glaciation in Australia and portions of Siberia that lingered into the Middle Permian, after which few glacial deposits are recognized.

Three Permian supersequences are recognized on the Eastern Shelf of the Midland Basin that appear to roughly correlate to the climate episodes observed on Gondwana. The upper Cisco Group is an extensive progradational package of Wolfcampian age representing a complex set of high – frequency sequences. These HF sequences are characterized by abrupt vertical facies transitions, thin but well – developed open marine carbonates during maximum transgression, and well – developed lowstand incised valley fills, all of which are characteristic of extreme changes in shelf accommodation space driven by glacial eustasy.

Abstracts

The Cisco is overlain by the Albany Group, which is a transgressive sequence set displaying significant platform aggradation and coastal onlap. The thick carbonate – dominated sequences of the Albany are characterized by stepped vertical facies transitions, thick packages of marginal to open marine carbonate – clastic facies couplets, and poorly developed lowstand lithofacies packages. These characteristics appear to be quite similar to sequences from ice – free, greenhouse climates and appear to be coeval with the Artinskian non-glacial episode on Gondwana.

The overlying Clear Fork Group is a complex of aggradational platform top coastal plain systems and progradational shelf margin systems of the Midland Basin. The Clear Fork is a highstand sequence set, and the Albany and Clear Fork together compose the second Lower Permian supersequence of the Eastern Shelf.

The overlying Duncan Sandstone of the San Angelo Formation represents a significant basinward shift in facies; thus it is the platform top expression of the lowstand systems tract of the overlying third Lower – Middle Permian supersequence. The timing of this lowstand roughly coincides with the Kungurian glacial episode of Australia and Siberia and may represent significant loss of accommodation space on the Eastern Shelf driven by the onset of this glacial interval.

The Stratigraphic Framework of the Haynesville Shale in Northwest Louisiana and North East Texas, *Bo Henk, Matador Resources*

The Late Kimmeridgian Haynesville shale member in a 7 county-parish area of Northeast Texas and Northwest Louisiana has been found to be a highly prolific gas bearing shale. This organic-rich Haynesville shale represents a transgressive flooding event in a restricted shelfal basin following the deposition of the Smackover formation. Laterally, this shale grades into Haynesville, or Cotton Valley limestone build-ups along the margins of the basin. Thicknesses approaching 300 feet are common in the northern area and 130 to 150 feet is common in the south. Above the Haynesville, the Bossier shale is present with less organic facies preserved and represents shallower more oxygenated shelfal conditions.

Matador's Hall 5 conventional core (310') was the central data point for much of our interpretation and well logs and other core information from other operators have enabled us to correlate across the basin and establish a stratigraphic framework. We have defined the physical stratigraphy as being composed of three units: a more organic-rich lower interval, a mid-level siltier and muddier member, and an upper interval with an organic-rich base and calcareous upper facies. Internally, there are several marker beds we use to define separate packages across the basin and these low gamma-ray, high density markers are defined as marine cement grounds with crystalline dolomite.

In a sequence-stratigraphic framework, we have identified several transgressive to maximum flood events, marked by organic carbon preservation, several high stand events and the cement grounds may cap the parasequences as marine firm to cement grounds. Bioturbation is present in the highstands along the northern margin of the basin and organic-rich, laminated pyritic shales mark the maximum flood events.

Marcellus Shale Deposition and Gas Production, *John Ward, PetroEdge Energy LLC*

PetroEdge started drilling Marcellus Shale wells early in the play working in New York, Pennsylvania and West Virginia. One of the early maps built to assist in selecting areas for acreage acquisition and drilling was a gross thickness map. From the very beginning of the pla y

Abstracts

A critical question emerged. What is more important rock quality or gross thickness? The issue was particularly vexing because some of the early success in the play was in Southwest Pennsylvania and Northwestern West Virginia where the rock thickness is relatively thin, less than 80 feet. Did this mean that areas with Marcellus greater than 200 feet would yield more than twice as much gas?

To look at this issue a series of maps were made to look at the distribution of pore volume in the Marcellus based on legacy borehole log data and sparse core control of rock and geochemical properties. Like all shale estimation of porosity is complicated by the effect of uranium rich low density organic material (kerogen) on the density and sonic logs. Using established procedures it is possible to unscramble this relationship to use the logs to estimate both total organic content (TOC) and kerogen corrected porosity. With porosity known and a cutoff established it is possible to calculate the net pore volume and a net to gross ration. These maps show that some of the Marcellus pore volume in the thick portion of the isochore is reduced by a loss in rock quality leaving some of the areas either without increase in production proportional to rock thickness or with a decrease in productive capacity.

Early work on the logs demonstrated regional trends in apparent density of the kerogen that show increasing density with increasing thermal maturity as predicted from laboratory data. As the importance of organic porosity in shale structures became better understood, it became apparent that the TOC map could be of more importance as an indicator of the capability of the shale to generate porosity, than it is as and indicator of gas generation. Subsequent mapping illustrated the role of organic content in regional porosity development. It looks like the combination of increasing quartz input from the eastern source coupled with greater thermal maturity limits porosity development in those areas of the Marcellus with low net to gross ratio. These diagenetic processes led to a shale rock body with a distribution of density, velocity and rock moduli that seem to be controlled by the same combination of depositional and diagenetic system that control pore volume.

The Marcellus has trends for pressure compartmentalization and fracture behavior that appear correlated to stratigraphic features that locally override regional pore volume trends.

Regional Depositional Analysis Upper Permian "Yates" Gas Sands, Permian Basin, Texas, *Lee Higgins, Lynx Production Co***.**

The Upper Permian sequence sandstone, siltstone, clay, anhydrite and dolomites know as the Yates Formation may be the proverbial "sleeping giant", covering a large portion of Gaines, Andrews, Terry and Yoakum Counties in west Texas. Comprised of aeolian sands deposited within an evaporate sequence, the detailed lithology, petrophysical properties and aerial productivity are poorly understood. To date, over 312 BCF of high nitrogen Yates gas has been produced from these four counties. Proration units range in size from 40 to 640 acres with individual gas well accumulations of up to 7 BCF. Remaining recoverable gas could be three or four times current cumulative production emphasizing the importance of this widely misunderstood reservoir.

Tops for the several Yates sands and markers were correlated for over 4000 wells producing structure and gross isopach maps. Analysis of the gross sand packages indicate thickening of individual zones as sands are shed eastward off the Central Basin Platform into the Midland Basin. Sand packages can be correlated for over 2500 square

miles. Detailed core analysis has resulted in an understanding of the Yates pay sands which has led to the development of a proprietary petrophysical technique that estimates the relationship between phi-h and EUR within the Robertson Yates Trend in Gaines County.

Historically, in many areas of the Permian Basin, Yates gas has been considered 'trash gas" because of its high nitrogen content. However, recent technology coupled with operational efficiency and higher gas prices have made exploration and development of Yates gas economically attractive. Nitrogen content of the Yates gas is variable and ranges up to 33% in the subject area with relatively low btu (960) content. However, once nitrogen is extracted, btu content of the remaining gas increases to approximately 1200 resulting in significant liquids value.

Kelly and Snake Bite Fields – Horizontal Ellenburger Play, Edwards County, TX, *Stephen Shaw, Firstview Resources, LLC*

This talk will include a discussion of the process behind the discovery of each field, and will describe some of the geology and techniques that made it possible to find this oil and gas.

Kelley (Ellenburger) and Snakebite Fields both produce from karsted Ellenburger within the top 300 feet of the upper dolomite unit that occurs in the north-central part of Edwards County, Texas. Kelley Field was discovered first and was originally mapped using 2-D swath seismic lines. The discovery well was a vertical test, and it lead to additional 2-D data acquisition, then subsequent 3-D data. The main field development was done using horizontal wells because the cave collapse material and cave sediment, that characterize the upper Ellenburger, make a very heterogeneous reservoir.

Snakebite Field is a sharp, normally faulted structure. Exploiting it with horizontal wells was tricky, even with 3-D data, because of apparent reversal of structural movement that controlled some of the fault blocks.

The 3-D data was very important in the development of both fields because the eroded surface of the Ellenburger often does not conform to true structure.

Benzene Detection from Barnett Shale Natural Gas ,
Lori Siegleman, W&W Environmental Group

In January of 2010 Texas regulators announced detecting high levels of benzene at one out of every five sites tested in the Barnett Shale. According to The Texas Commission on Environmental Quality (TCEQ), benzene levels exceeded the recommended safe levels at approximately ¼ of the sites tested and two of the sites tested needed immediate action. Although hundreds of compounds were analyzed, the TCEQ focused on benzene, which is a known human carcinogen. Due to media attention and the urban location of the Barnett Shale wells, there has been an increase in testing around wells and compressor stations. This presentation is a discussion of the impact of Barnett Shale wells to local air quality, the TCEQ studies conducted and planned next steps, the discussion of various testing and screening methods, the sources of benzene exposure and the potential effect of benzene exposure to urban populations.

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Shale Reservoirs - Simiar, Yet So Different,
Murray Roth, Transform Software and Services

Recent estimates of recoverable gas from unconventional shale reservoirs in the US exceed .5 qcf(quadrillion cubic feet) (USGS 2009) with potential for another .1 qcf in Canada (NEB). While broadly distributed, North American shale gas basins generally follow a trend of thrust belts and a Mississippian/Devonian shale fairway from Western Canada and

into the Western, Southern and Eastern United States (Figure 1). The Laramide Thrust Belt bounds the Horn River and Montney Play in British Columbia and Alberta, as well as many of the Western US shale gas fields, including Jonah and Pinedale. Starting in South Texas, the Ouchita Thrust Belt bounds Southern US gas basins including: Eagle Ford, Barnett, Woodford, Haynesville and Fayetteville. Finally, the merger of the Ouchita and Appalachian Thrust Belts define the broad extents of the Marcellus shale gas basin.

North American shale gas reservoirs currently rank as 6 of the largest 22 global gas fields (Figure 2), based upon estimated recoverable reserves, with average recovery factors of about 20%. Innovations in horizontal well drilling and completions, supported by 3D seismic, microseismic, FMI/FMS and other measurements, are unlocking North American gas supplies for the decades ahead. However, volatile commodity markets and dramatic variability in well production rates make economic shale gas production a challenge. This large well production variability, even within the same field, challenges our intuition about the simple, consistent nature of shale formations and the gas within..

With a motivation to understand why "all gas shales are not created equal" - this study integrates published data, type logs, accessible seismic and microseismic data along with 5 years of experience across most significant North American shale gas basins. Our tabulation of shale gas reservoir characteristics and well log analysis highlights key production differentiators including depth, thickness, porosity, pressure and TOC (Table 1). While basins and reservoir characteristics clearly vary - this does not explain significant well-to-well gas production variations. Part of this variability in production performance is related to evolutionary and company-to-company differences in fracturing "best practices". Surprisingly, after nearly 30 years of development and over 10,000 wells, wellbore lengths and completions parameters in the Barnett Shale of Texas can vary by factors of two or more - pointing to the challenge and non-uniqueness of production optimization.

It is our work with 3D seismic and microseismic, however, that clearly supports the concept of shale gas "sweet-spot" fairways and converse "dead zones". Whether it is faulting in the Woodford, karst collapse chimneys in the Barnett, natural fracturing in the Marcellus or clay/silica content in many plays - seismic and microseismic data provide valuable calibration and prediction tools for mapping productive/nonproductive fairways. Multiple data examples from key North American shale gas plays will be used to illustrate the unique characteristics of the most and least prolific gas producing regions.

Eagle Ford Shale Prospecting with 3D Seismic Data

Galen Treadgold, Weinman Geoscience
Steve Sinclair, Matador Resources

The Eagle Ford Shale in South Texas is one of the more exciting shale plays in the United States at the current time. Recently published reports of well tests describe gas well rates exceeding 17 mmcf/d and oil rates in excess of 500 bopd and unconfirmed rates of 1500 bopd. Acreage least rates continue to climb as more positive results come from drilling within the trend. A key issue for the exploration companies is finding where to focus acreage acquisition and optimize drilling plans for optimal gas and oil recovery. Our paper will first consider the geologic contest of the Eagle Ford and then look at the geologic drivers for locating a productive well. With improved understanding of local rock properties, focus shifts to geophysical tenchinques, in particular, comparing and contrasting the value of seismic attributes in building a successful exploration plan.

Abstracts

Seismic Attributes: So Many Tools, So Little Time
Martin Selznick, Rosewood Resources

Recent technological advances in pre- and post-migration seismic data extractions now provide a substantial list of techniques that can be routinely utilized to better visualize subtle stratigraphic signatures. These fundamental geophysical tools not only help to reduce drilling risk, but they provide the means to find previously overlooked prospects and productive fairways. As with any technological advances, seismic attributes present new hurdles to overcome. In addition to standard seismic pitfalls, time & budget constraints also can pose problems. Data mining for potential stratigraphic reservoirs is very time consuming, but if performed properly, it can lead to numerous new project pathways for economic success.

In order to be able to take full advantage of the latest imaging technologies, the scope of the project should be carefully considered so that the entire column of stratigraphic reservoir potential can ultimately be mapped. Even before a new 3D survey reaches the interpreter's desk, one should have a firm geological picture of which depositional system tracts are going to be mapped, and what the potential reservoir geometries could be. Seismic attributes, both on horizons and thin stratigraphic volumes, should be carefully scrutinized for not only the best ties to wells, but also to make geologic sense with respect to local and regional deposition, as well as structural fabric. These are the keys to finding not simply an isolated prospect, but in identifying new productive trends and fairways which will lead to greater economic success.

Microseismic Advances in Resource Plays with Low Thermal Maturity, *Doug Walser, Pinnacle Technology*

Various resource plays (hydrocarbon-bearing shales and combinations of low vitrinite reflectance/low TOC shales and conventional volumetric depletion reserves) have been found to be commercial, or marginally commercial. Advances in microseismic technology over the last 2 – 3 years have allowed fracture mapping of highly laminated alternating sequences of fast and slow velocity lithological units. These advances have assisted in dramatically lowering liquid hydrocarbon shale play learning curves. Methods to quantify the contribution of the mobile "resource" hydrocarbon relative to the conventional volumetrically depleted reserves will be discussed. Specific examples will be presented, and a brief description of the process improvements will be covered.

Detailed Rock Evaluation and Strategic Reservoir Stimulation Planning For Optimal Production in Horizontal Gas Shale Wells
Camron Miller, Schlumberger

Heterogeneity in lateral wellbores is primarily controlled by vertical variations in rock characteristics and wellbore geometry. Rock properties and fracture distribution within gas shale reservoirs have significant implications to horizontal stimulation. A lateral and associated pilot wellbores in the Barnett Shale are analyzed with triple combo, geochemical, advanced sonic and borehole imaging tools. Strong relationships between drilling-induced fractures, minimum horizontal stress and mineralogy are observed. These data are integrated and used to subdivide the reservoir based on lateral heterogeneity. This technique can guide lateral stage organization and perforation placement. A large number of fractures are observed on borehole images. Transverse, drilling-induced fractures are the most abundant fracture type. These are discontinuous features propagating from the top and bottom of the hole with a low apparent dip. Natural fractures occur with much less

frequency. These features also have a low apparent dip and are typically more continuous around the wellbore. Most natural fractures are healed, some are re-opened. Inspection of mineralogy, minimum horizontal stress and fracture data on a compressed scale allows for straight forward zoning and eight zones are identified. Summations of minimum horizontal stress, vertical Poisson's ratio, horizontal Young's modulus, clay content and calcite volume are performed. Correlation between minimum horizontal stress and transverse drilling-induced fractures is strong and inversely proportional. These fractures are less frequent in zones with high Poisson's ratio and/or high horizontal Young's modulus (i.e., clay-rich intervals and/or zones with lots of calcite). Mineralogy, minimum horizontal stress, mechanical properties and drilling fracture density are all highly correlative on a large scale. High drilling-induced fracture density suggests high rock failure potential; thus a more efficient stimulation. In the absence of geohazards, staging intervals based on detailed rock analyses increases the potential for maximum reservoir contact and optimal gas drainage. Induced hydraulic fractures propagate in the path of least resistance therefore it is crucial to isolate high stress zones from low stress zones and naturally fractured zones from unfractured zones in order to maximize stimulation effectiveness. Once the lateral wellbore is properly staged, perforation points that best promote hydraulic fracture initiation and conductivity within each zone are selected using a similar approach.

Using Surface Seismic to Improve Gas Shale Profitability
David Paddock, Schlumberger

Shale plays have increasingly become recognized as geological plays demanding new insights from data. This one-hour presentation provides an overview of the integrated use of 3D seismic data for exploration and development in major shale plays in the continental U.S., with applicability worldwide. The presentation provides a petrophysical, geophysical and geomechanical background of the major shale plays and discusses how to high-grade using seismic. The presentation includes discussion of the following plays:

* Barnett
* Marcellus
* Fayetteville
*Woodford
* Eagle Ford
* Bakken
* Haynesville

Multi-Scale and Multi-Disciplinary Approach to Unconventional Reservoir Characterization: Example of Hydraulic Fracturing Treatments in a Horizontal Barnett Shale Well
Joel LaCalvez, Schlumberger

Over the last few years the Barnett Shale formation has been the focus of tremendous attention. Large amount of data has been collected in this technology- and economics-driven play to develop local knowledge which to some degree is now being exported and adapted to its numerous cousins worldwide. We present the results of an on-going study associated to a multi-stage stimulation project in the Fort Worth Basin. A several thousand feet lateral was drilled along the direction of σ_h and had one offset well from which the fracture treatment was monitored using microseismic mapping. A sonic scanner log was run in the cased horizontal wellbore. The toe section of the lateral displays the highest stress normal to the borehole and therefore likely has the highest degree of stress anisotropy. Predicted planar narrow hydraulic fracture networks are confirmed by subsequent real-time microseismic data.

Abstracts

Conversely, the heel section of the lateral displays the lowest amount of stress in the σ_H direction and hence the lowest anticipated stress anisotropy. A fracture initiated in this section of the wellbore should create a wide complex hydraulic fracture network also confirmed by microseismic data. A variety of seismic attributes (e.g., effective curvature, anisotropy, etc.) has been used to predict pre-existing fracture probabilities and orientations. Striking correlations with microseismic response is observed and relates to pre-existing calcite filled fracture networks observed from cores. If the pre-existing fractures act as preferential planes of weakness (lower tensile strength than virgin shale) the expectation is to observe a long narrow fracture fairway to form parallel to the fractures and regional stress field as confirmed by microseismic data. Treatment pressure data shows a drop in pressure consistent with a simple hydraulically induced fracture fairway due to the alignment of pre-existing fractures. Converse consistent observations are made heel-ward. From a stimulation point of view, immediate implications are that more stages would have been required toe-ward to access the bypassed zones. For reservoir modeling purposes, we build an interpretation model based on a newly developed plane extraction method considering the uncertainty ellipsoid associated to hypocentral locations and prior knowledge of expected fracture orientations. In addition to plane interpretation, we consider each microseismic event's orientation relative to the interpretation, giving some insight into the fracturing mechanism using P/Sh values. The number and location of the major planes is determined quantitatively, but does not constitute an unambiguous deterministic result. We carry forward the complete probabilistic interpretation to the production prediction stage using the techniques of multiple realization simulation that are today commonplace in reservoir engineering.

Congratulations!

A.I. Levorsen Memorial Award for Best Paper, 2009 SWS Convention:
Lyn Canter"Facies of the Middle Bakken, Mountrail County, North Dakota"

A.L. Cox Poster Award, 2009 SWS Convention*:*
Saswati Chakraborty "Study of Calcite Cement in a Submarine Fan Complex, South Wells Member of the Cherry Canyon Formation, Delaware Mountain Group, Western Delaware Basin"

Special thanks to Desk and Derrick for handling the registration for the convention! We appreciate you!

We also want to thank our Student Volunteers!

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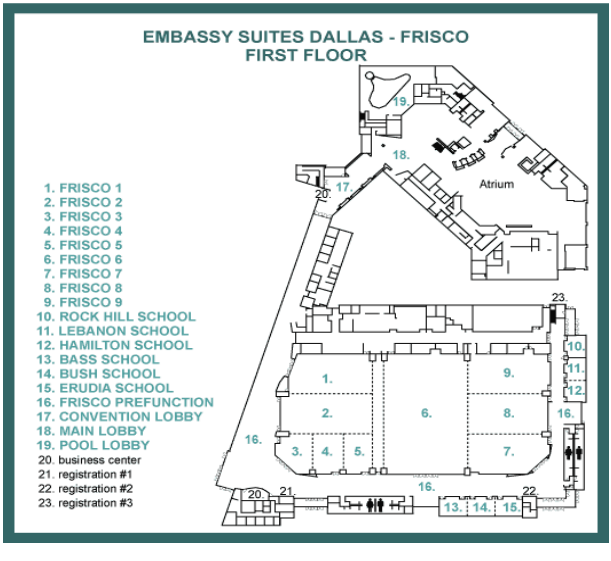
Welcome to the Embassy Suites Dallas-Frisco Hotel, Convention Center & Spa!

The Exhibit Hall and Speaker Sessions will be held at the hotel, as will the All Convention and All Division Luncheons! The hotel is steps away from the Dr. Pepper Ballpark, where we will meet to watch baseball Sunday afternoon, and the Monday evening Icebreaker will also be held at the hotel.

You don't need to leave the hotel if you don't want to, but if you do, numerous restaurants surround the hotel, as well as world class shopping, including Stonebriar Centre and IKEA. During your stay at the Embassy Suites, visit the Spa Botanica -a leader in luxury and relaxation.



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