

BULLETIN

**Corpus Christi
Geological Society**



and

**Coastal Bend
Geophysical Society**



**April
2015
ISSN 0739 5620**

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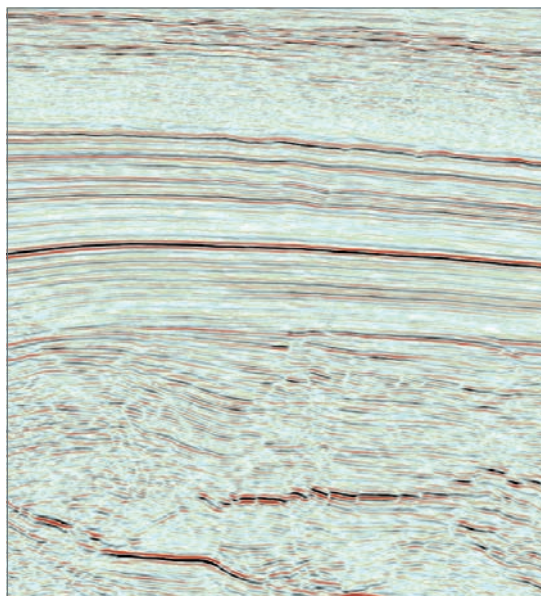
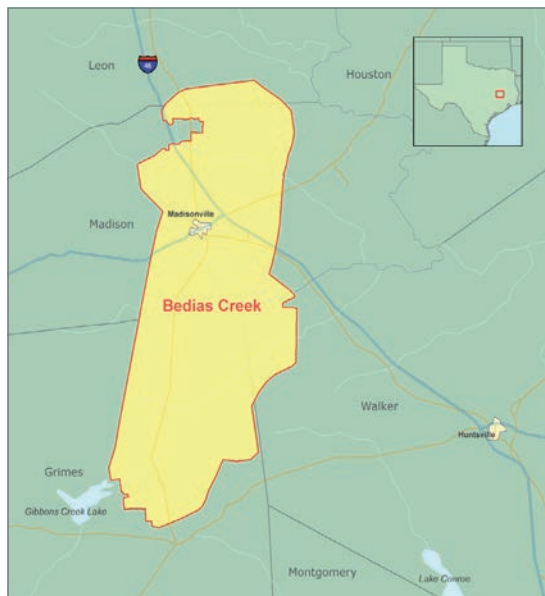
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2014-2015

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TABLE OF CONTENTS

Officers, Committees, and Chairpersons, CCGS, CBGS.....	2 & 3
Blood Drive.....	5
Calendar of Meetings and Events.....	6 & 7
CCGS President's Letter.....	9
CBGS President's Letter.....	11
Luncheon Meeting Announcement.....	12
Oliver Graves McClain Memorial.....	15
Education Outreach.....	20,21
February 2015 Collegiate Month.....	24
Woodson Godfrey of PaleoSource, our December 2014 luncheon Speaker's slides.....	26
Advertise in the bulletin.....	54
Geo Link Post.....	55
Type Logs of South Texas Fields.....	56
Order OIL MEN DVD.....	57
Wooden Rigs Iron Men.....	58
Professional Directory.....	59

*****BLOOD DRIVE*****

THE BLOODMOBILE – IN APRIL, 2015
WILL BE AT SOME CONVENIENT LOCATIONS
PLEASE CALL 855-4943 for those locations or see below

.....

ATTENTION!!!

We spoke to the Blood Center about locating us on their computers. They have us listed as C.C. Geological Society. Our number with them is 4254 & it would be helpful if you can give them that number also.

Thanks! Mike Lucente

.....

**FOR CURRENT SCHEDULES & LOCATIONS OF THE
BLOODMOBILES YOU CAN LOG ON TO:**

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CCGS/CBGS JOINT MEETING SCHEDULE 2014-2015

September 2014							October 2014							November 2014						
S	M	T	W	Th	F	S	S	M	T	W	Th	F	S	S	M	T	W	Th	F	S
	1	2	3	4	5	6				1	2	3	4							1
7	8	9	10	11	12	13	5	6	7	8	9	10	11	2	3	4	5	6	7	8
14	15	16	17	18	19	20	12	13	14	15	16	17	18	9	10	11	12	13	14	15
21	22	23	24	25	26	27	19	20	21	22	23	24	25	16	17	18	19	20	21	22
28	29	30					26	27	28	29	30	31		23	24	25	26	27	28	29
														30						

Sept. 10, 2014
5:30p.m.—8:30p.m.
Kickoff BBQ
Howard’s BBQ & Catering
1002 Antelope Street

Oct. 15—11:30a.m.—1:00p.m.
Speaker: Ken Williams—
Halliburton.
“Barostratigraphy”

Nov. 19—11:30a.m.—1:00p.m.
Speaker: Tony Hauglum--Rivera
Exploration. “Eagleford Update”

December 2014							January 2015							February 2015						
S	M	T	W	Th	F	S	S	M	T	W	Th	F	S	S	M	T	W	Th	F	S
	1	2	3	4	5	6					1	2	3	1	2	3	4	5	6	7
7	8	9	10	11	12	13	4	5	6	7	8	9	10	8	9	10	11	12	13	14
14	15	16	17	18	19	20	11	12	13	14	15	16	17	15	16	17	18	19	20	21
21	22	23	24	25	26	27	18	19	20	21	22	23	24	22	23	24	25	26	27	28
28	29	30	31				25	26	27	28	29	30	31							

Dec. 10—11:30a.m.--1:00p.m.
Speaker: Woodson Godfrey—
PaleoSource. “Distinguishing a
Resource Play

Jan. 21--11:30a.m.—1:00p.m.
Speaker: Lei Zhang—
Schlumberger. “Seismic
Inversion to Reservoir
Simulation”

Feb. 18—11:30a.m.—1:00p.m.
Speaker: Collegiate Month.
“Presentation by TAMUCC,
TAMUK and DelMar”

CCGS/CBGS JOINT MEETING SCHEDULE 2014-2015

March 2015							April 2015							May 2015						
S	M	T	W	Th	F	S	S	M	T	W	Th	F	S	S	M	T	W	Th	F	S
1	2	3	4	5	6	7				1	2	3	4						1	2
8	9	10	<u>11</u>	12	13	14	5	6	7	8	9	10	11	3	4	5	6	7	8	9
15	16	17	18	19	20	21	12	13	14	<u>15</u>	16	17	18	10	11	12	13	14	15	16
22	23	24	25	26	27	28	19	20	21	22	23	24	25	17	18	19	<u>20</u>	21	22	23
29	30	31					26	27	28	29	30			24	25	26	27	28	29	30
														31						

March 11—11:30a.m.—1:00p.m. Speaker: Fred Hilterman “Seismic Attribute analysis for the Gulf of Mexico”	April 15—11:30a.m.—1:00p.m. Speaker: Richard Adams—Carr Resources. The Lower Woodbine Organic Shale of Burlenon and Brazos Counties, Texas: Anatomy of a New “Old” Play	Distinguished Speaker--Mark Papa
--	--	-------------------------------------

Calendar of Meetings and Events **Calendar of Area Monthly Meetings**

- Corpus Christi Geological/Geophysical Society.....Third Wed.—11:30a.m.
- SIPES Corpus Christi Luncheons..... Last Tuesday—11:30a.m.
- South Texas Geological Society Luncheons..... Second Wed—noon San Antonio
- San Antonio Geophysical Society Meetings..... Fourth Tuesday
- Austin Geological Society..... First Monday
- Austin Chapter of SIPES.....First Thursday
- Houston Geological Society Luncheons..... Last Wednesday
- Central Texas Section of Society of Mining, Metallurgy & Exp..... 2nd Tues every other month
In San Antonio

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CCGS PRESIDENT'S LETTER

Happy April to you. Has it been raining since September? It sure feels like it. Lately, I've been covered up with work duties, and parenting. That being said, this month I will get strait to the details.

The luncheon speaker for this month is Richard Adams of Carr Resources. Please join us April 15th for his talk on the Lower Woodbine. Ken Orlaska with Geotrace has agreed to sponsor the luncheon bar and Pint Night. Please come out and join us Tuesday, April 14th at 5:30 for our monthly happy hour.


We have a few other events coming up. I hope everyone got the memo that the Family Fossil Hunt has been rescheduled due to weather. The event will now take place late April or early May. We will send out a notice as soon as we have a firm date. Please come out and join us. Also, student scholarships will be awarded this month at the luncheon. All students are encouraged to attend.

Just a quick reminder to send in your nomination forms for the CCGS Board of Directors. Thank you to those who have volunteered. The CCGS is *your* society.

Leighton Devine

CCGS President

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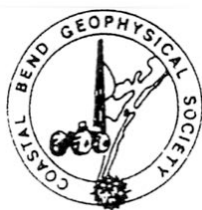
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CBGS President's Letter

News - CBGS Golf Tournament - October 23, 2015. Dawson Geophysical and Tidelands Geophysical merge. CGG cuts 400 jobs. Schlumberger cuts 9000 jobs. Global Geophysical emerges from Chapter 11. TAMU-K is looking for a Geophysics/Petro-physics professor. Have oil prices stopped the drop at about \$50? Interesting that the December 2014 seismic crew report has both US and Worldwide seismic crews increasing!!!!. Rigs and permits in Texas go down.

Business -

CBGS needs a couple of volunteers. One to sit on the CBGS Board as VP and provide advice/direction to CBGS. The other is to organize CBGS education events. Both these roles take little time and it keeps you connected with the geophysical community. Let me know if you are interested.

Education -

- GSH - [Webinar: An Introduction to Velocity Model Building](#) Speaker: Dr. Ian F. Jones (Mention CBGS when you register)
Mon 13-Apr-215 to Thurs 16-Apr-2015, 8:00 am 12:00 pm - New virtual course on Seismic Modeling, migration and velocity analysis
- 2014 SEG Convention Technical Program Recording: Available at the following link -[SEG Convention Technical Program Recordings](#)
- SEG has 450+ eLearning courses online from \$0.99 to \$150.00(most expensive I saw)

<http://www.seg.org/professional-development/seg-on-demand>

Parting Thought -Tell me and I'll forget; show me and I may remember; involve me and I'll understand - Author: Chinese Proverb

Monthly O&G Statistics

Seismic Crews - US Onshore	Current Month	Last Month	Difference	(Per SEG/Seismic Crew Reports Survey)
	Onshore/Offshore	Onshore/Offshore		
	47/21	44/21	+3	Dec (+8 crews worldwide)
	Current Month	Last Month	Last Year - Monthly	(Per Texas RRC, last reported)
Texas Production	MMBO/BCF	MMBO/BCF	MMBO/BCF	
Oil	71	74	70.7	Dec
Gas	627	649	682	
	Current Month	Yr to date - 2015	Yr to date - 2014	Jan
Texas Drilling Permits	1,102	1,102	1,791	
Oil wells	254	254	515	
Gas wells	90	90	121	
Oil and Gas wells	697	697	1,086	
Other	22	22	9	
Total Completions	1,997	1,997	3,607	Jan
Oil Completions	1,450	1,450	3,131	
Gas Completions	344	344	398	
New Field Discoveries	4	4	5	
Other	30	30	22	

-- Lonnie--CBGS President

Corpus Christi Geological Society & Coastal Bend Geophysical Society

LUNCHEON MEETING ANNOUNCEMENT

Wednesday, April 15, 2015

- Location:** Corpus Christi Town Club, 6th Floor (800 North Shoreline)
- Student Sponsor:** Core Lab (Juan Cabasos) and the CCGS
- Time:** 11:30 a.m. Bar, Lunch follows at 11:45 a.m., Speaker at Noon.
- Cost:** **\$25** (a \$3 surcharge if no reservation). No-shows will be billed.
- Bar:** Cash Bar or Sponsor TBA – email Allison@aaoperating.com
- Reservations:** Please by Monday before – email Allison@aaoperating.com
-

The Lower Woodbine Organic Shale of Burleson and Brazos Counties, Texas: Anatomy of a New “Old” Play

By Richard L. Adams, John P. Carr, and John A. Ward

The Lower Woodbine Organic Shale, in the southwest portion of the East Texas Basin, is a very organic-rich shale with high resistivity, a hot gamma ray response, and very good mud log shows.

This zone owes its high organic content and the resultant well-established oil production to its deposition in a silled basin, the product of a prograding delta from the north and northeast, a shelf-rimming Sligo/Edwards barrier reef complex to the south and southeast, a large basement high that affected water depth to the east, and a constricted area between the Sligo-Edwards Shelf Margin and the San Marcos Arch to the west. Within this silled basin, the zone grades from producing 30–35 gravity oil in northern Brazos County to dry gas in southernmost Grimes County.

In 2008, concurrent with the development of the “Eagleford play” in South Texas, Apache began a program recompleting wells from the underlying Buda and the overlying Austin Chalk into the Giddings (“Eagleford”) zone. The early recompletions were vertical completions with very small cumulative oil production. Later, they would drill several short lateral horizontal wells to better test this organic shale. The data from the Apache wells would prove to be invaluable in the current round of evaluation and drilling that began in 2012. Data such as oil gravity, gas-oil ratios, and organic shale isolith values, when combined with the completed lengths of the few horizontal completions and the regional geologic stress-strain field, allow for both a reservoir and an economic evaluation to predict where sweet spots should exist in this newly

continued on page 13

redeveloping play and how to best exploit them. Datasets from multiple plays confirm that the sweet spots are most often located in the high oil gravity portion of the oil window where the oil-generating shale is the thickest.

This play demonstrates the economic necessity of a proper evaluation of all data in a play before acreage acquisition. The play covers portions of several counties, but the best sweet spots will be much smaller.

The Woodbine and Eagle Ford were first defined in the Dallas, Texas, area in the late 1800s. The Maness was defined in 1945, from a cored well interval in Cherokee County, Texas. Correlations back to the outcrops and Cherokee County suggest that this productive interval is neither Eagle Ford nor the true Maness Shale. Therefore, following correct North American Commission on Stratigraphic Nomenclature (NACSN) practices, these organic-rich shales should be called the Lower Woodbine Formation and not the Eagle Ford Shale. The name Maness Shale only truly applies to a portion of the section below the high resistive oil-generating shale and above the Buda Limestone. The Maness is separated from the Woodbine over most of its area by the Lower Cretaceous Unconformity. By definition, the reservoir/source interval may be called a portion of the Pepper Shale Member of the Woodbine Formation. For clarity, the authors will refer to this restricted interval as the Lower Woodbine Organic Shale (LWOS).

ABOUT OUR PRESENTER

Rich Adams was born and raised in northern Indiana. He received a MS in Geology with Honors from Indiana University in 1973 and a MS in Geology from the University of Wisconsin- Madison in 1975. He worked for Exxon Company, USA in New Orleans from 1975 to 1979 and moved to The Woodlands, Texas to work for Mitchell Energy and Development Company from 1979 to 1999. In 2000 he joined Carr Resources, Inc. in Tyler, Texas, where he still works today.

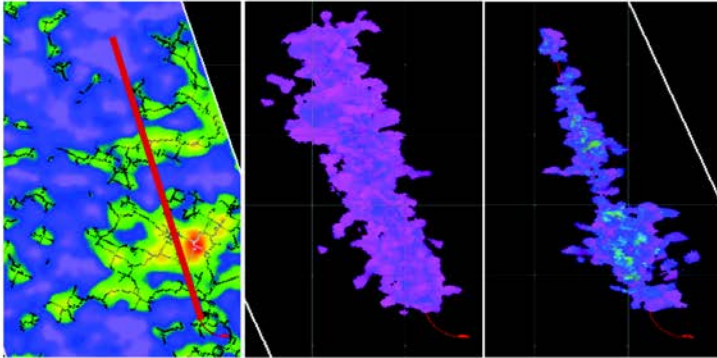
Rich has published several papers on the uses of basement tectonics in both exploration and development geology as well as papers on the regional Woodbine and Eagle Ford system. In his current employment with Carr Resources he and John Carr are actively exploring the East Texas Basin and surrounding areas using his ideas on basement tectonics to help guide the company's exploration effort.

Rich currently lives near Lindale, Texas with his wife Marsha. He enjoys hunting, fishing, golf, and, believe it or not, work.

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OLIVER GRAVES (O. G.) McCLAIN



The South Texas oil and gas industry lost a gem August 9, 2014 when Orville Graves (O. G.) McLain passed away at his home in Houston, Texas. O. G. was born March 20, 1911 in La Vernia, Wilson County, Texas to Gus and Willie Graves McClain. La Vernia is about 25 miles east and a little South of the center of San Antonio. O. G. graduated from Brackenridge High School in San Antonio in 1928. O. G. often described himself as a, “Farm boy.”

After graduating from high school, O. G. entered the University of Texas with the intent of studying geology. He transferred to The University of Oklahoma after two years at Texas. O. G. graduated from The University of Oklahoma in June, 1933 with a Bachelor of Science degree in geological engineering. He had gained experience in the oil field working as a roughneck on drilling rigs during summers while in school.

His first oil field job after receiving his degree was with a drilling company owned by George H. Echols from Houston, where he worked as a, “Toolie,” sort of an assistant tool pusher. The rig at the time was drilling what developed into the discovery well for Cuevitas Field in Starr County, Texas. The field was later put into Guerra Field and Guerra Field ultimately produced over four million barrels of oil from two different Jackson sands. O. G. moved with the drilling rig to the East Texas field where more wells were drilled. Echols drilled wells in a large area of South and East Texas, and O. G. moved with the rig.

After a brief stint in the U. S. Army Air Corps in 1934, O. G. returned to the oil field in South Texas with George Echols’ drilling company. He had met a man named Ed Sellers while working in East Texas. Ed Sellers was working for Mills Bennett Production Company and JRB

continued on page 17

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Moore in South Texas when they met again. Ed's company was drilling wells in Webb, Zapata and Duval Counties, and O. G. decided to change jobs and work as a roughneck on wells being drilled for the Mills Bennett group.

As most who have worked in the oil field know, occasionally there is a little time when not working, but your presence is needed because you may be needed in just a few minutes. O. G. liked to write poetry during some of these rare breaks and one is below. This one was undoubtedly written while working in Duval County, Texas and dated September 17, 1935.

The Free State of Duval

1.

Out of the nothingness and endless void
The rumbling and grumbling and crackling was heard
Of universal creation.

The suns and planets, beautifully mooned.
And cosmic dust, to endless wondering doomed,
Began their gyrations.

2.

In order to fill out one blank space,
The solar system the maker placed,
Quite concernedly.
He spotted there of firey hue
A sun, then Planets strew
Very haphazardly.

3.

A faulty job on planet three
Caused there a mighty gash to be.
Fates cruel bounty!
For in this gash the maker placed
An odd bit of cosmic waste
Called Duval County.

Working as a roughneck allowed him a few days off occasionally and he and Ed Sellers would go into Laredo when not working. It was there he met and married Annette Susan Bunn. They married August 26, 1936 in Laredo, Texas. Annette died September 7, 2007 after 71 years of marriage. Annette and O. G. are survived by three daughters, four grandchildren and seven great-grandchildren.

A thunder storm hit the rig on which O. G. and Ed Sellers were working in Duval County one afternoon. O. G. was in his tent and Ed Sellers, was visiting a roughneck and his wife in a tent about fifty yards away. There was a sudden, large flash of light and a very loud noise. O. G. went to check on his friend and the tent where he had gone to visit was flattened. All three of its

continued on page 19

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occupants were unconscious and O. G. immediately started applying first aid he had learned as a youngster. They revived the three, put them in cars and drove them to a hospital in Laredo where physicians said the first aid probably saved the three lives.

Unrest in Europe started about 1937 with the rise to power of the Nazi Party in Germany and the oil industry started to improve a little in the United States. O. G. moved to Houston in 1936 as a junior geologist for Mills Bennett Production Company, his first job as a geologist after graduating in 1933. That job moved him to Corpus Christi. He took a job with Southern Minerals Corporation in 1939, where he became chief geologist before deciding to become an independent geologist in 1946. He can be described as a very successful independent geologist. He was responsible for discovery of a dozen or more oil and gas fields, the largest and most important was Fulton Beach Field in Aransas County. He retained an interest in most of his discoveries.

James D. Burke, a World War II Marine captain and survivor of the Iwo Jima invasion, talked to O. G. in 1951 about becoming an independent geologist in Corpus Christi. Jim and O. G. formed a loose partnership and operated as McLain and Burke from 1951 until 1980 when O. G. retired and moved to Houston to be near family.

O. G. had been a member of the South Texas Geological Society before the Corpus Christi Geological Society separated from it. He then became a charter member of the Corpus Christi Geological Society where he served as secretary-treasurer from 1945 to 1947, as president from 1950-51, and remained active until his death. He was an honorary member of the Society and returned to Corpus Christi to attend meetings a few times after moving to Houston. He contributed articles for publication in the Corpus Christi Geological Society several years after his retirement.

He was a successful independent geologist who also served the community and the profession. He was a member of the Texas Water Resources Commission and the Lower Nueces River Water Supply District. He testified before the United State Federal Power Commission in 1965 in an attempt to get the price of gas deregulated. The oil and gas industry could use more men like Mr. O. G. McLain.

Ray Govett, Ph. D.
Petroleum Consultant
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Corpus Christi, Texas 78411
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EDUCATION OUTREACH



Mike Lucente and Casey Mibb explaining Ice Age Fossils to Ella Barnes students.

EARTH DAY—BAY DAY



Alan Costello and Mike Lucente at Ella Barnes Elementary School

continued on page 21

EDUCATION OUTREACH



Linda and Jerrold Simpson presenting Rocks in Our Everyday Lives at Ella Barnes.



Dawn Bissell with 2nd graders from Portland Baptist Academy.

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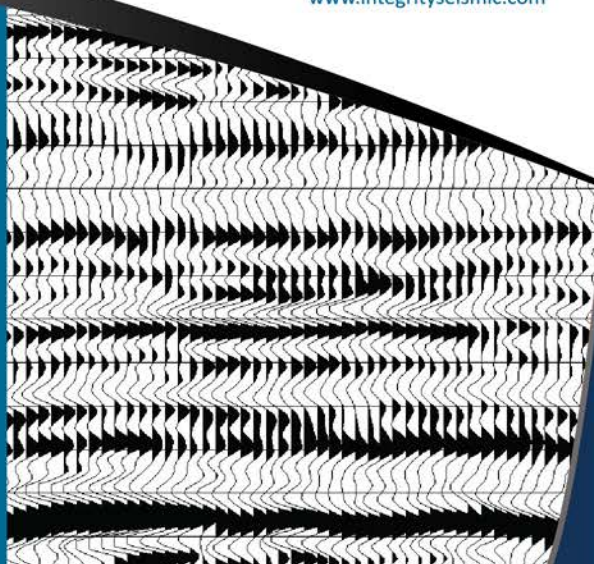
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February 2015 was Collegiate Month for the CCGS and CBGS.

Roger Steinberg, Del Mar College, **Tania M. Anders**, Texas A&M University Corpus Christi, and **Mark T. Ford** Texas A&M University – Kingsville were our speakers in February. Students **Sarah Beers** and **Daniella Herrera** from TAMUK and **Wendy Schwertner** from TAMUCC displayed posters explaining their recent research projects. The professors shared with the society about their academic programs, how our society contributes to their school, and how the CCGS can continue to help.

Of course the scholarships are of major assistance to the students, but our members involvement as guest lecturers, mentors, and providing internships also enhances their programs. We asked *How might the CCGS/CBGS help build a better program.* Below are some specifics from each school.

Del Mar:

- Scholarships
- Paid Internships (Most students have part-time jobs to pay for school)
- STEM seminar speakers (Science, Technology, Engineering, and Math)
- Equipment?

TAMU-CC:

- Donate material
 - Core, rock, mineral and fossil samples, books...
- Donate time
 - Presentations to students
 - e.g. Undergraduate Seminar
 - Be mentor to students (Internships!)
 - Field trips (business, out in field)
- Financial Support
 - Student field trips
 - Outreach and recruitment
 - Student research
 - Scholarship
- CCGS Luncheons (Juan Cabasos, Core Lab; and CCGS!!)

TAMU-K:

- Small research grants to help with undergraduate projects
- Research dissemination help
 - Student funding for conferences
 - CCGS student research conference?
- Increased opportunities for internships and mentorships

Remember this very local resource of colleges and universities. This is an opportunity to interact and shape the future of our professions.

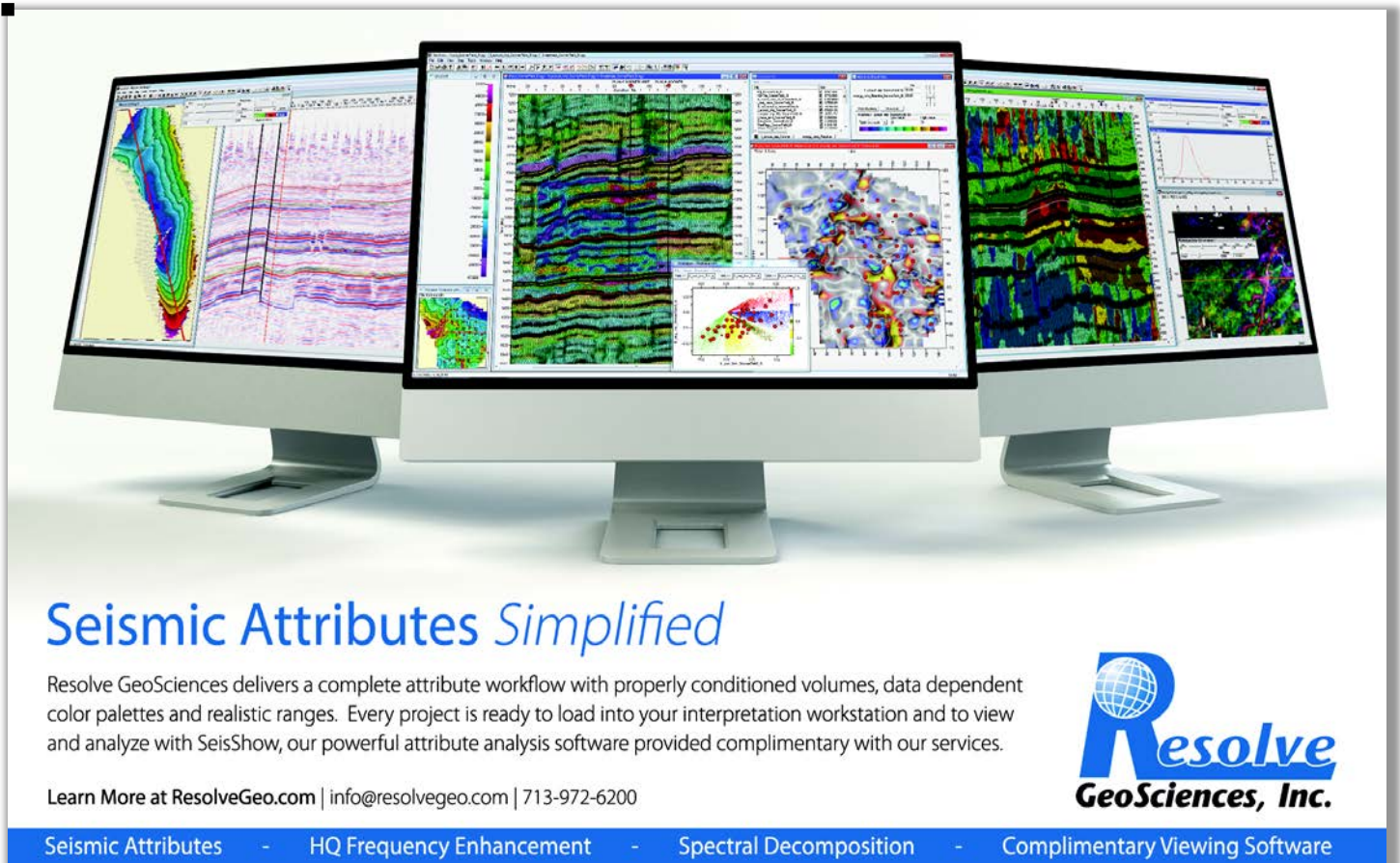
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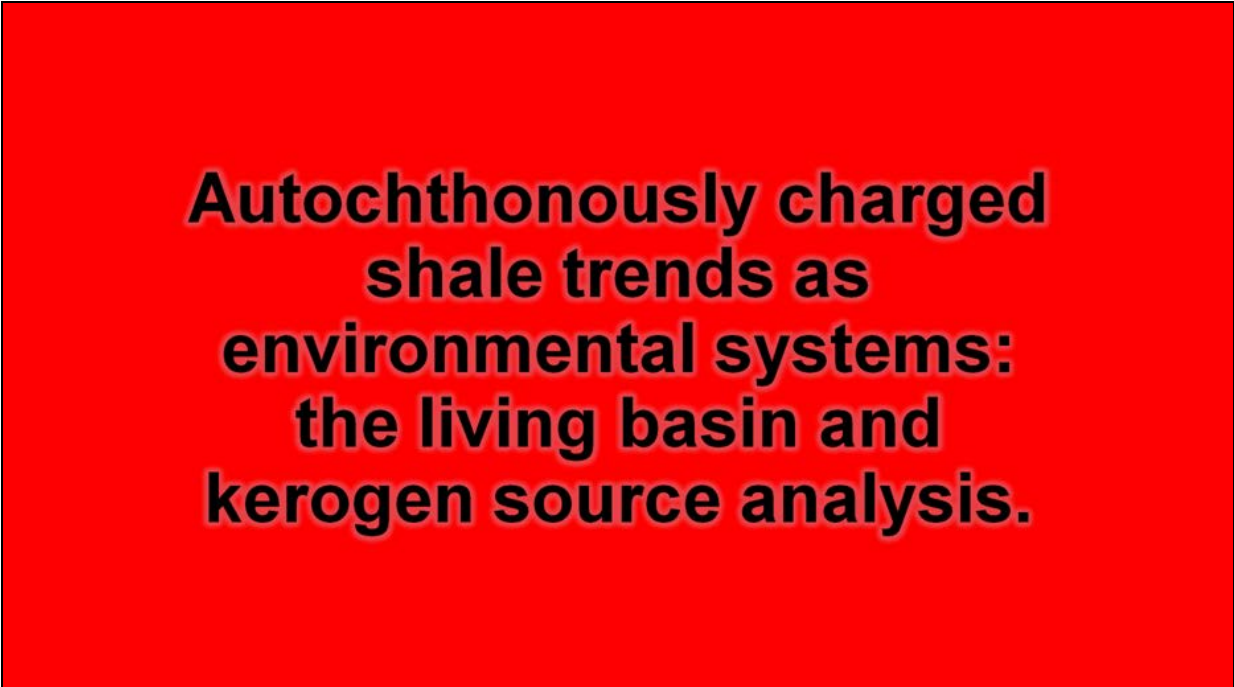
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Slide 1



**Autochthonously charged
shale trends as
environmental systems:
the living basin and
kerogen source analysis.**

This slide show and talk was originally presented at the CCGS Luncheon for December 10, 2014.

As it states above, this is meant to apply to autochthonously charged resource basins and their carbon or kerogen sources only. Strictly speaking, this is an anecdotal thesis and not a completed systematic study, although it appears consistent with the facts gleaned from multiple smaller studies.

Many of the images or slides were borrowed from websites, references are supplied. I claim no copyright except where noted and usually bearing the heading of my company PaleoSource.

continued on page 27

Source: www2.ohiodnr.com



This pictures an outcrop of the Marcellus Shale. Even at this resolution one can see a dominant feature of the Marcellus: extremely fine lamination on a millimeter by millimeter scale of graded beds. Even in thin section, the alternation of high and low energy deposition is apparent .

continued on page 29

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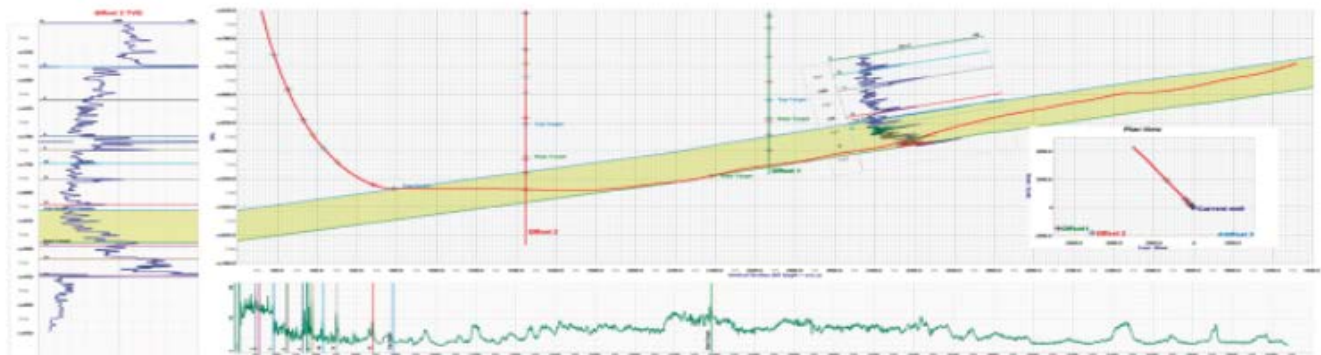
Proprietary software

TST interpretation for GR only jobs

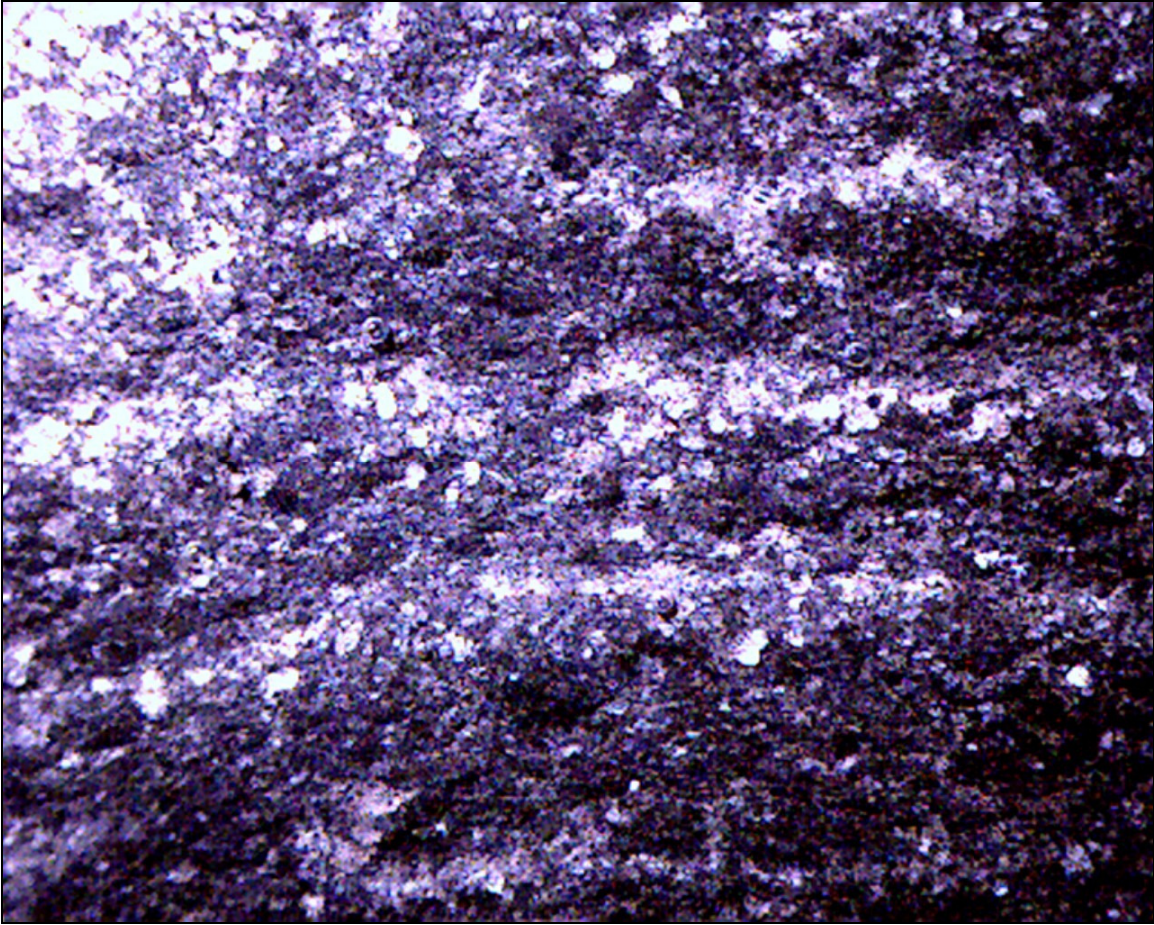
**Image displays / interpretation for jobs with azimuthal GR,
resistivity or density**

**Resistivity modelling / interpretation for jobs with LWD
propagation resistivity**

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Slide 3



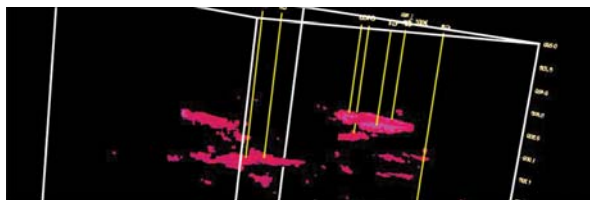
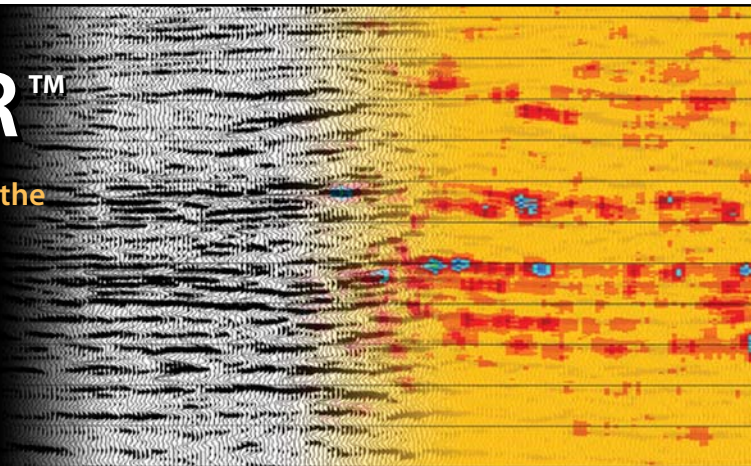
This is a stereoscopic view of a hand sample from the Lower Eagleford Formation. The dark bands are illitizing smectite clays in a calcite matrix and the finer, white bands are the recrystallized tests of planktonic foraminifera. This **microlamination** is an alternation of higher depositional energy from a terrigenous source with lower energy depositional bands from the water column. This was originally taken at 8x.

continued on page 31

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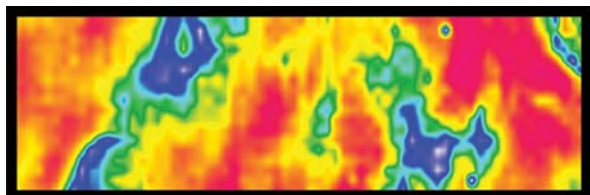
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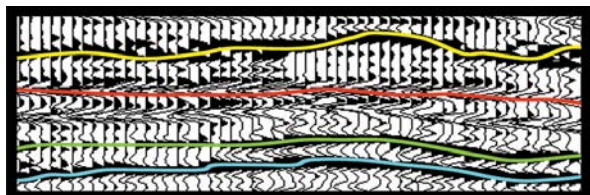
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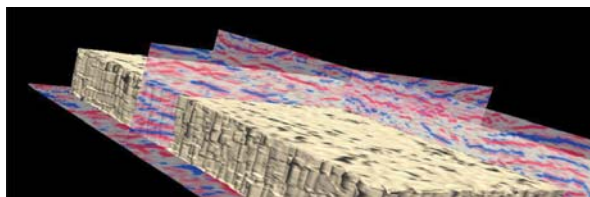
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Slide 4

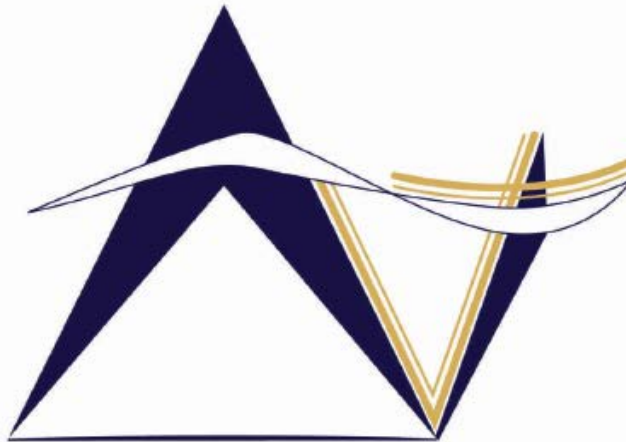
Source: www.post-gazette.com



This borrowed slide of the Marcellus Formation simply represents the scale at which we commonly view the microlamination that is found in all of the shale plays that I've studied so far. The lithology is often variable between predominantly calcite with shale, as in the Eagle Ford Fm, to fine clastics, as in the Marcellus Fm. The question arises as to the cause of this consistent character regardless of sediment source.

continued on page 33

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- Microlamination and graded beds
- Clastics and calcareous sediments
- Biogenics common
- Intermittent anaerobism
- Alternating sedimentary regimes

The observations:

1. Microlamination is common or universal to autochthonously charged formations whether characterized as shale plays, resource plays or source rocks.
2. This presence of calcite or other carbonates or clastics provides a seal or sealing matrix and makes the formation a candidate for fracking.
3. Biogenics, predominantly from terrigenous or near-shore sources abound in the form of molluscs or other bivalve invertebrates, echinoderms, plant remains, ostracods and other sources, abound in working shale plays.
4. Dark shales are often characterized as intermittent periods of anaerobism, often in direct contact with extremely aerobic fauna (note the Eagle Ford sample above). Even these “anaerobic laminae” may contain fauna of typically aerobic sources.
5. Lastly, there is a clear alternation in the energy regimes represented in the **microlaminae** of shale plays/resource plays.

continued on page 35

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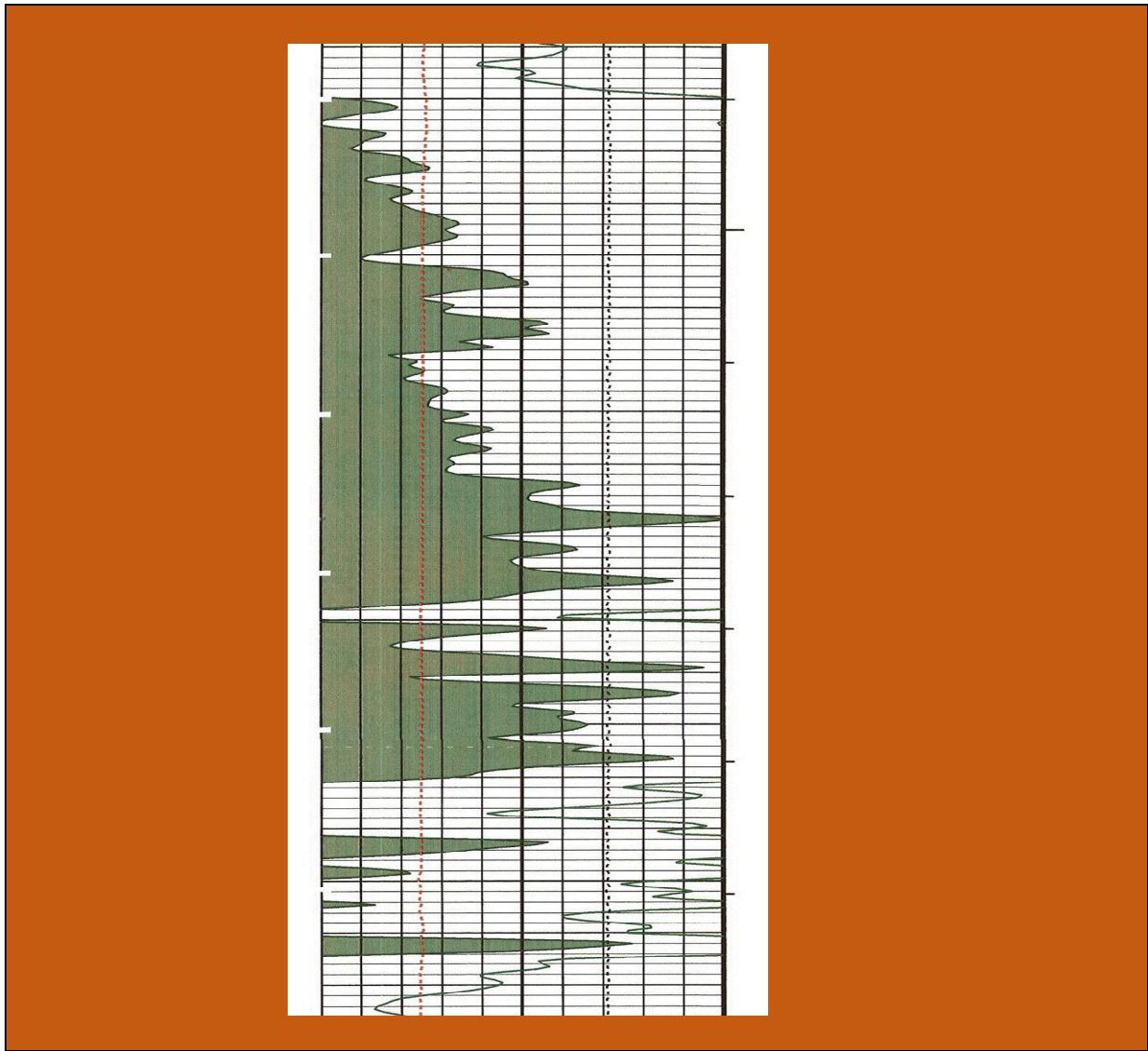
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Slide 6



The way we most frequently encounter the microlamination of shale/resource plays is in the pattern of gamma ray character as pictured here. As a matter of note, spectral gamma ray logs are preferred for basin analysis. The provenance of clastics provides a clearer picture of the source and, as you will see, of the expectations of product to be harvested from that basin.

continued on page 36

Slide 7

Source: science.kennesaw.edu



The borrowed picture of this fresh to brackish water marsh/swamp/wetlands is my proposed answer to the source of all the above observations. All of the characters listed on summary slide ten (10) are attributable to the succession of rain forest/wetlands and freshwater marsh to brackish and saline swamps along the marine coastline.

continued on page 37



Coastal swamps and wetlands are the most productive biological systems on Earth and the most effective carbon sequestration system, as well. They slow the progression of clastic sediments to the basins they surround, allowing for biotic processes that degrade organic matter (kerogen), providing an aerobic/anaerobic chemical cauldron prior to delivery via riverine “flushing” to the final basinal destination (microlamination and alternating sedimentary energy).

continued on page 38

Slide 9

Source: freshwater_marshes_usgov or www.ebabylone.com



The period of slowing or sequestration of sediments in the complex communities expose clays (shales) to long chain organic molecules that predetermine the final product options (kerogen type) available within a basin. Bonding that occurs between shale and organics also determines the nature of kerogen distribution to the basin and within the strata.

continued on page 39

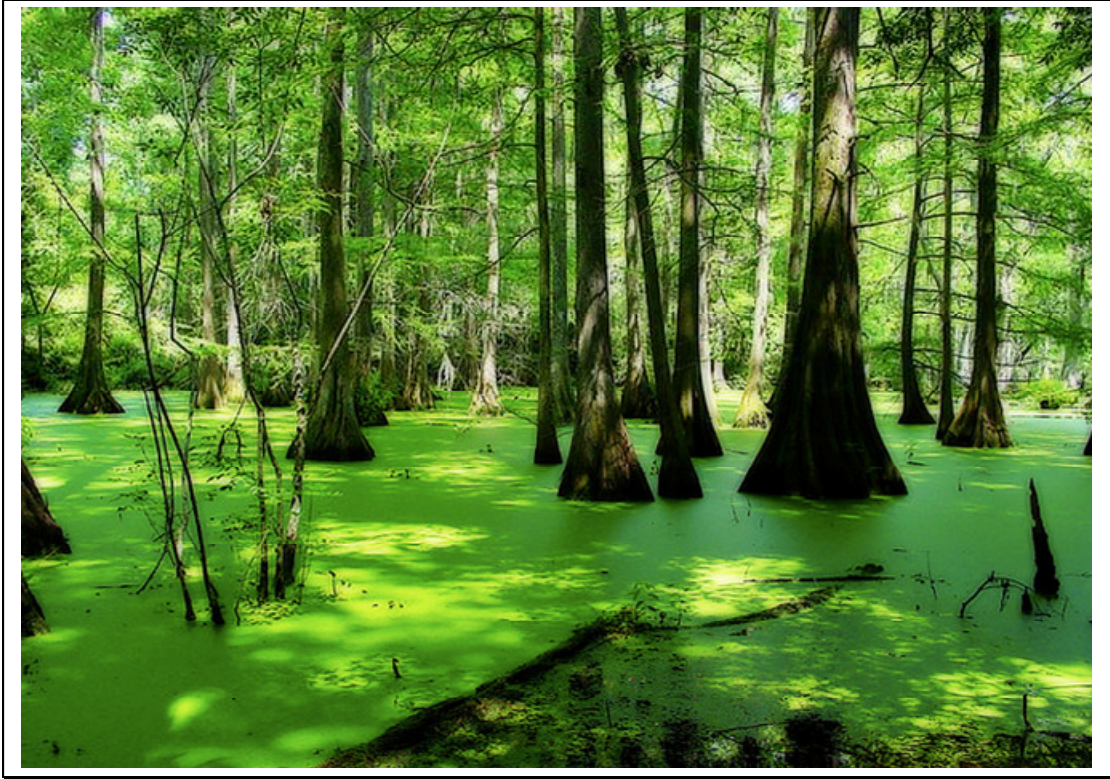
Marsh Effects

- Retention/ sequestration of clastic sediments
- Source of primary energy “fixing” – synthesis
- Ecosystem/ community for converting energy to complex organics – metasynthesis
- Central site of anaerobic environments

The first and second lines are issues addressed. Let's discuss the basis of the kerogen machine and the issues of intermittent anoxia.

continued on page 40

Source: freshwaterturtle.wikispaces.com



A number of the biological components that produce high quality (Type 2 and 1) kerogens are concentrated and synthesized around coastal marshes. Even planktonic flora (basically bacteria) and faunas are concentrated around areas with dense concentrations of nutrients. In a typical large basin, floating algae are concentrated around the basin margins where nutrient access is greatest (and wind current distribution helps here, too). Algae and anchoring vascular plants, photosynthesis and bacterial degradation are only part of the burgeoning kerogen producing community.

continued on page 41



Swamps and wetlands are complex and internally diverse systems, harboring oxidizing and anaerobic environments simultaneously with a great amount of interdependence. Photosynthetic products (including lignin or humic material) provide not only fuel for bacterial degradation, but constitute a base for a complex food chain that often supports the whole of a basinal ecosystem and determines its fossil kerogen.

continued on page 42



Forming complex, energy rich macromolecules, such as fat and protein, has a lot assistance. Thousands of extant species of molluscs, arthropods, protozoans and fungi and algae and so on contribute to the organic soup of wetland systems and the resultant kerogen. All of these species potentially feed into components of the fossil record, both directly and indirectly.

continued on page 43



Most of the anaerobic or anoxic shale laminae found in the basin are not necessarily *in situ*, but are formed along basin margins in the swamps that harbor the organics and associated shales. The anaerobic products here, often electrostatically bound to shales, are delivered fully cooked to their final resting place. The occurrence, volume and quality of the anoxic products here can be readily confirmed by donning waders. When you step into anoxia, you'll know it.

continued on page 44

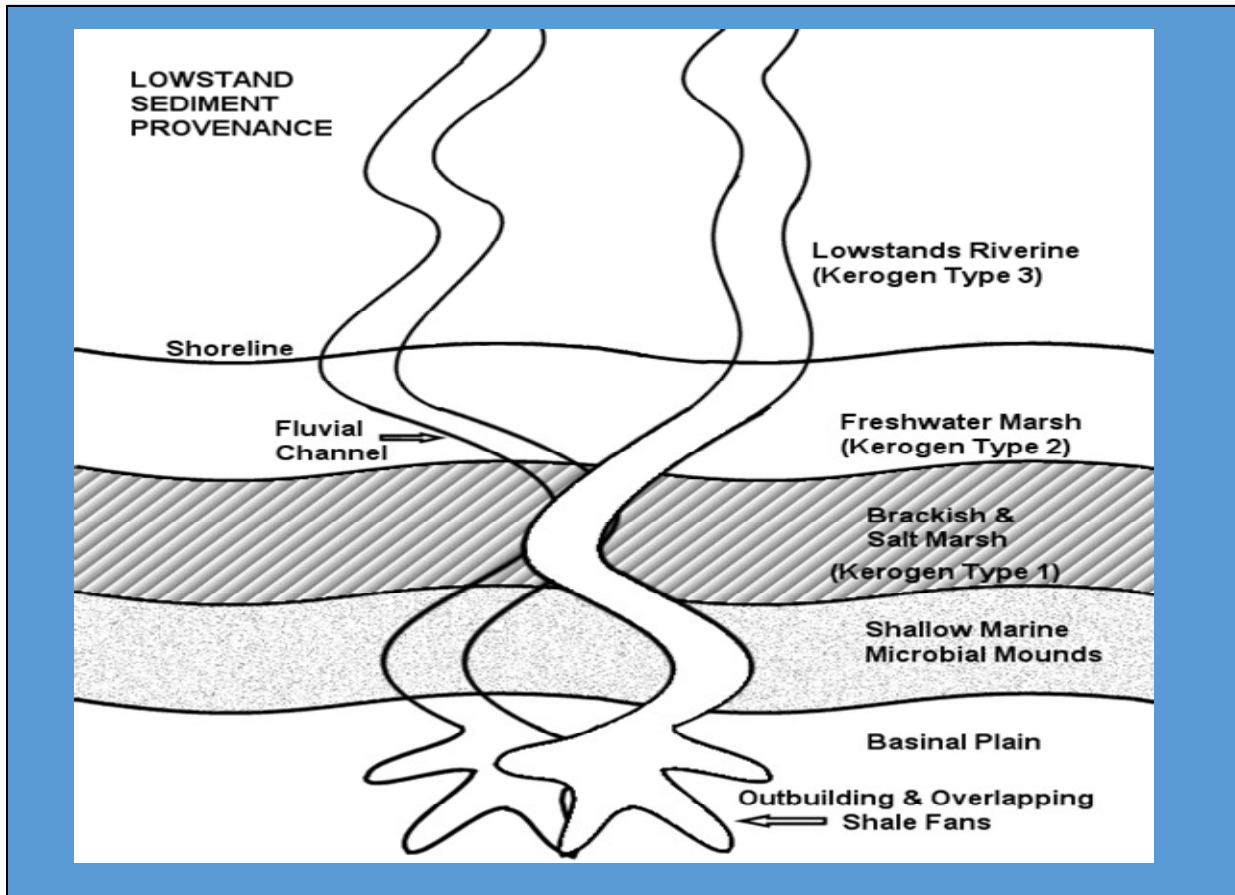
- Seasonal and atmospheric events produce depositional energy changes
- Seasonal and atmospheric events distribute sediments and products of anaerobism and metasyntesis
- Primary requirement - pluviogenesis
- Advantage to exploration – prediction of product by kerogen type
- Foundered (least altered) kerogen

Seasonal and atmospheric events provide the means to flush clastics and organics from the swamps where they have rested and formed; these events being rainy seasons, flooding, storms and tidal currents. The seasonal or intermittent nature of such events is reflected by the microlamination, graded beds and energy and source alternation reflected in shale play deposition.

It should be well in evidence that the primary factor without which all others are moot is rain. A freely moving and energetic hydrologic cycle is the best single indicator of potential for the formation of a shale play. Rain formation or **pluviogenesis** is critical, whether locally or globally, to shale/resource play formation. This leaves us, again, with paleontologic and additionally isotopic records pointing the manner and quality of kerogen formation.

This is the essential payoff to understanding these wetlands systems for the explorationist – an abundance of clues to the specifics of source, kerogen quality (type) and best distribution models; a predictive method of product and location.

continued on page 45



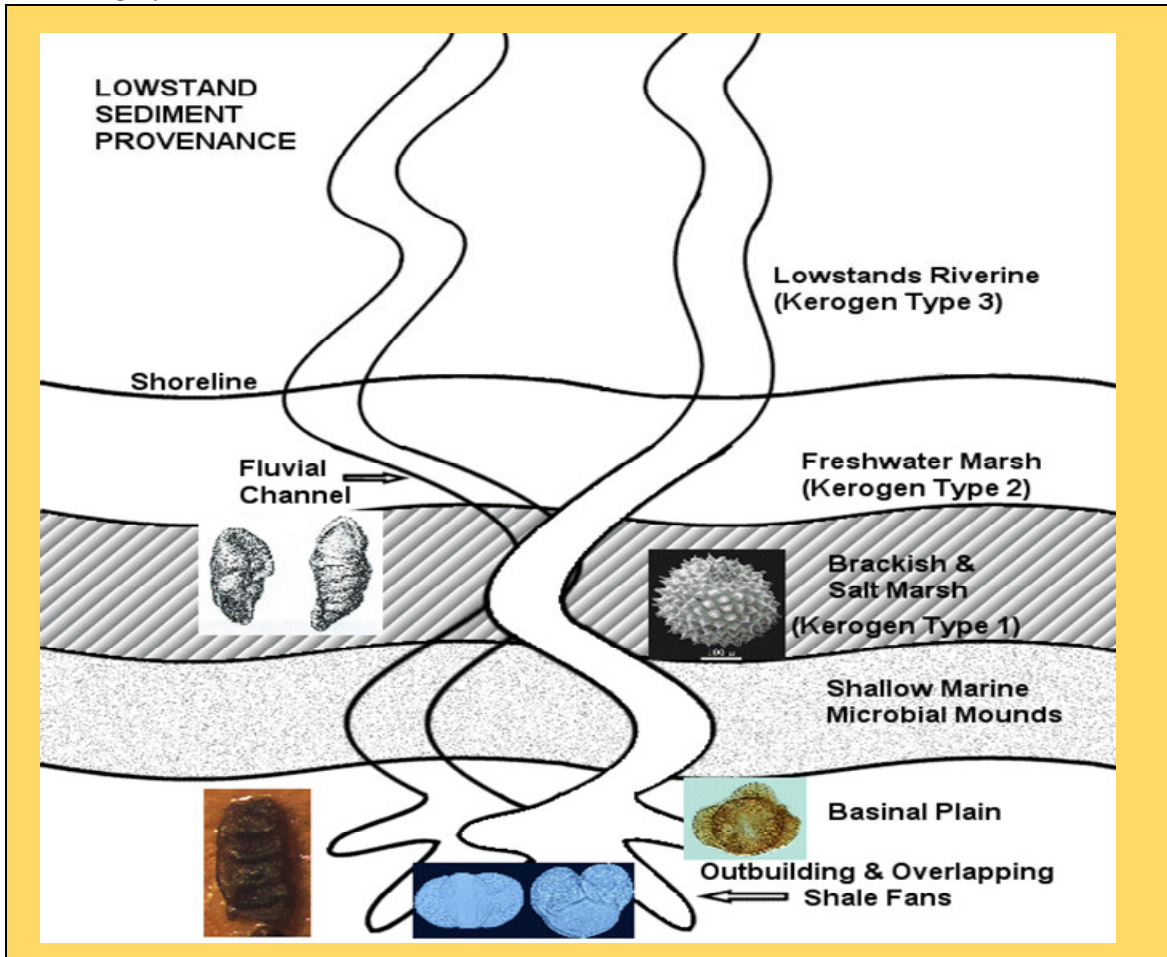
A typical lowstand sediment distribution model, highly generalized. The kerogen types most directly associated with the given biologic zone are listed. The first and foremost aspect of relative lowstand depositional systems is the tendency to minimize broad distribution of sediments from the transitional brackish and saline swamps, favoring a basinward movement and dominance of type 3 and, somewhat less, type 2 via channel and debris flows (outbuilding). This is typical of such plays as the Pearsall Group, associated with a long term relative low period in sea level. This typically yields gas with liquids. Some debris flows yield more limited source results, such as the Fayetteville, which produces only dry gas from humic sources of lowland plants.

continued on page 46

Slide 17

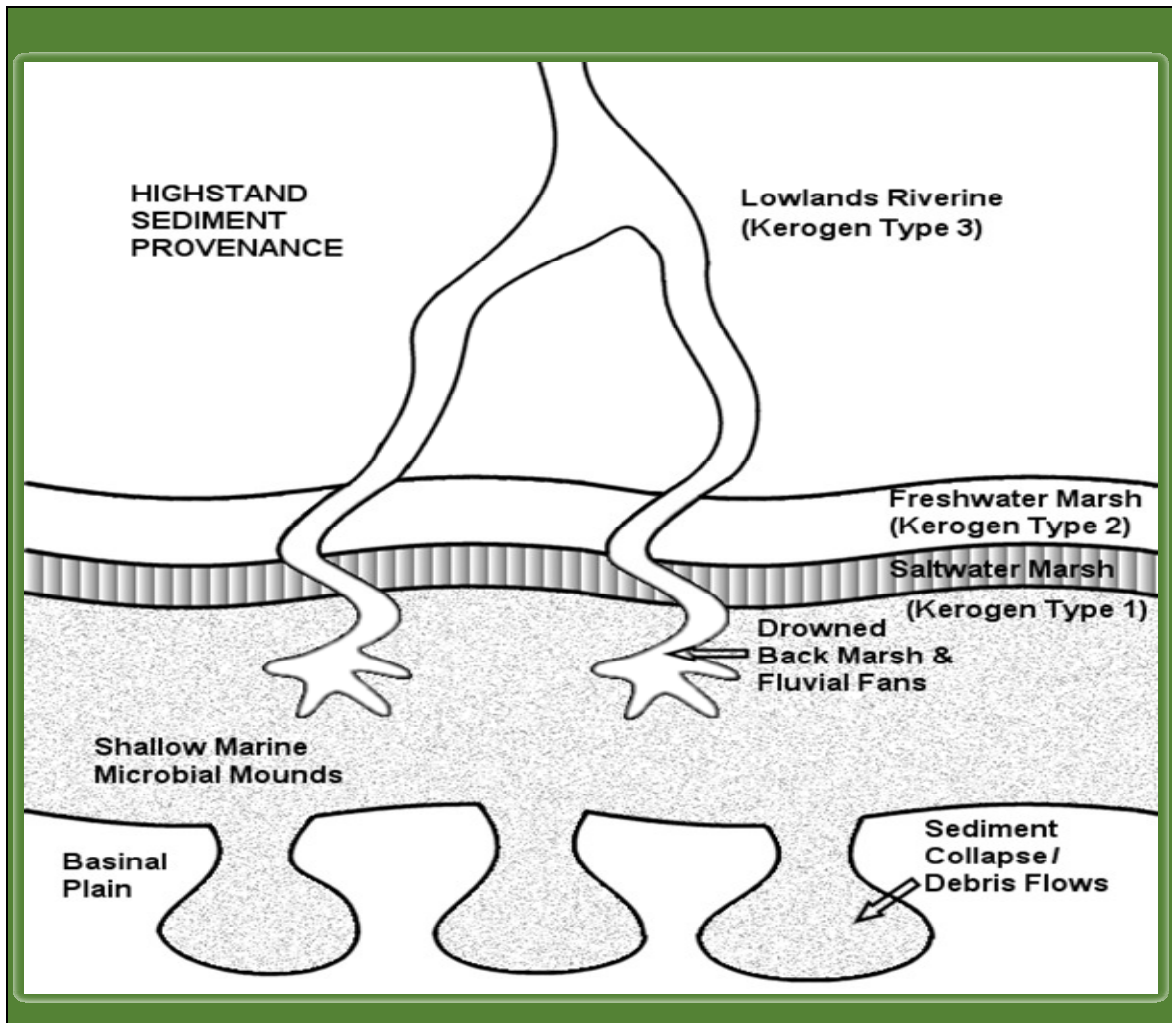
Sources: Starting in upper left, going clockwise -

H.B. Brady 1876 "Monograph of Carboniferous and Permian Foraminifera" London Paleontographical Society 167 p. Plate VIII. --- Schaechter.asmblog.orgb --- www.sciteclibrary.ru --- imgarcade.com ---
foram micrograph, no reference.



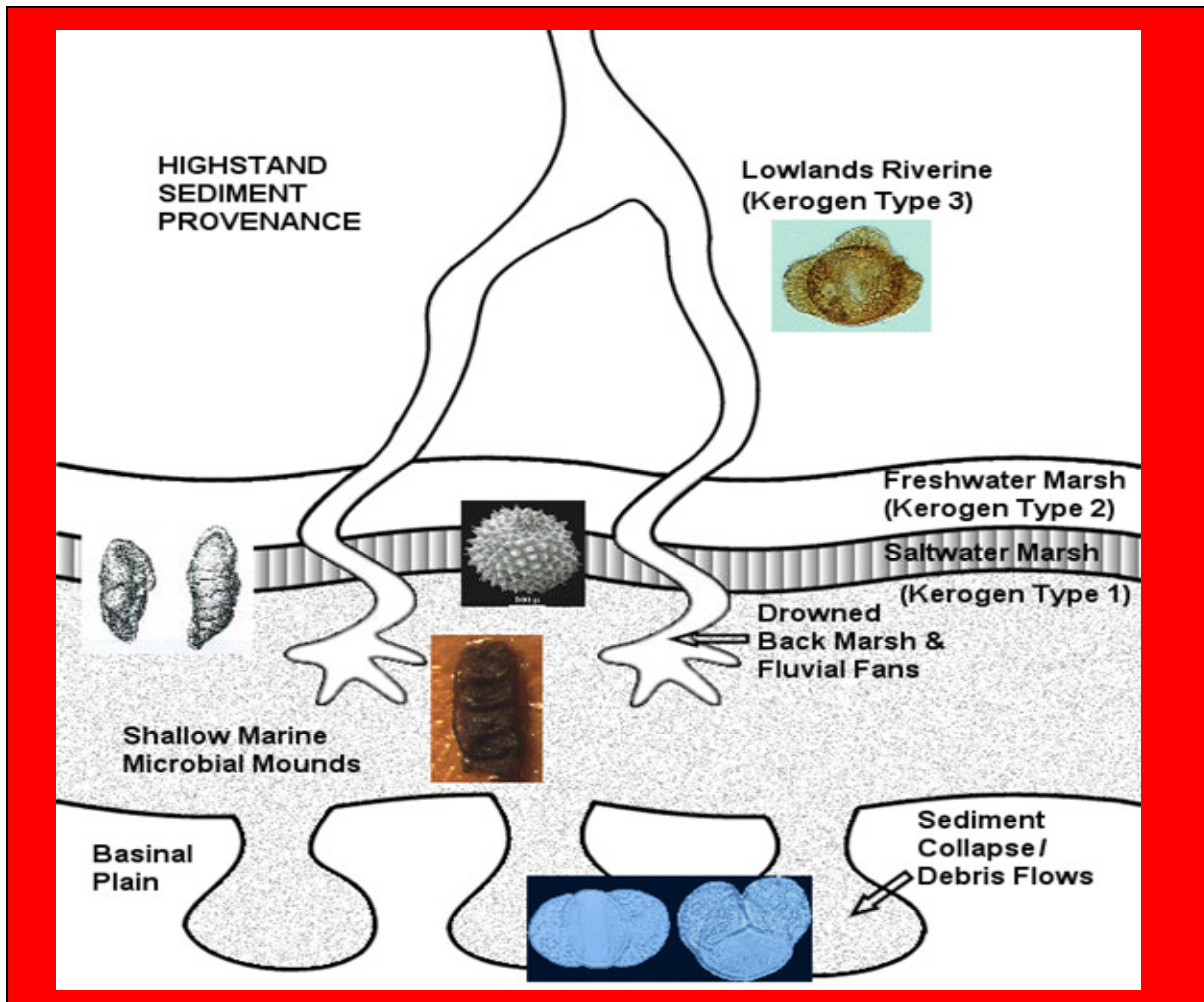
The lowstand depositional system is reflected by fossils, both faunal and floral. The pictures are examples the dominance of both in situ species, within their environments of origin (upper boxes) and reworked species (lower boxes) riding channel currents/ sediments. The distribution and dominance patterns of these **thanatocoenoses** (death assemblages) are clues to sediment/kerogen origins and the direction from which it comes, leading to predictive method for finding its maximum accumulation (sweetspot) and the product to be found (oil, gas, condensate).

continued on page 47



The highly generalized highstand depositional system: Channel accumulations are “drowned” back to backstepping progressions, foundering wetland and swamp sediments. Secondary distribution by mass slides and microlaminated debris flows become a prominent basin deposit.

continued on page 48



Foundered wetlands/swamp sediments during highstand deposition form thick microlaminated sequences of seasonal deposition containing rich type 1 and type 2 kerogen concentrations which may be secondarily moved basinward by collapse systems (mass wasting) and less often by liquefaction and gravity flows. Some components of humic kerogen are still winnowed into deep basinal environments by having very low density and remaining durably in suspension.

Some updip floral components (lowland origins) have broad distribution and very low dominance over the highstand shelf. Transitional environment foraminifera are narrowly distributed and may be used to identify collapse sediments.

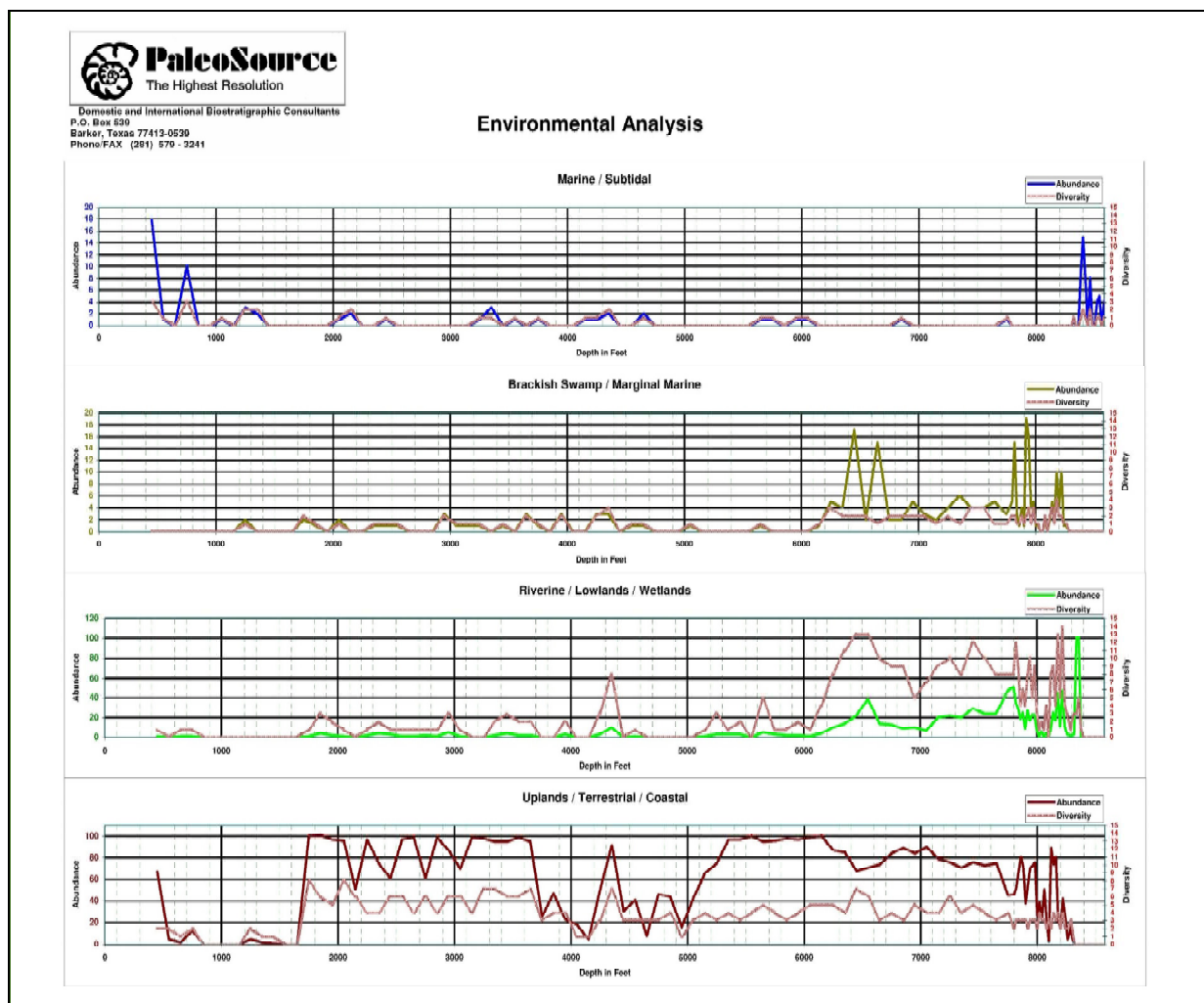
continued on page 49

Slide 20

The table is titled "Environment Analysis" and features the PalceSource logo in the upper right corner. It is a dense grid of data with several main columns. The first column is labeled "NAME" and lists various geological units and features. The second column is labeled "UNIT" and contains alphanumeric codes. The third column is labeled "LITHOLOGY" and describes the rock types. The fourth column is labeled "FACIES" and describes the depositional environments. The fifth column is labeled "CORRELATION" and shows the relationship between different units. The sixth column is labeled "REMARKS" and contains descriptive notes. The table is filled with rows of data, each representing a specific geological unit or feature, with corresponding codes and descriptions.

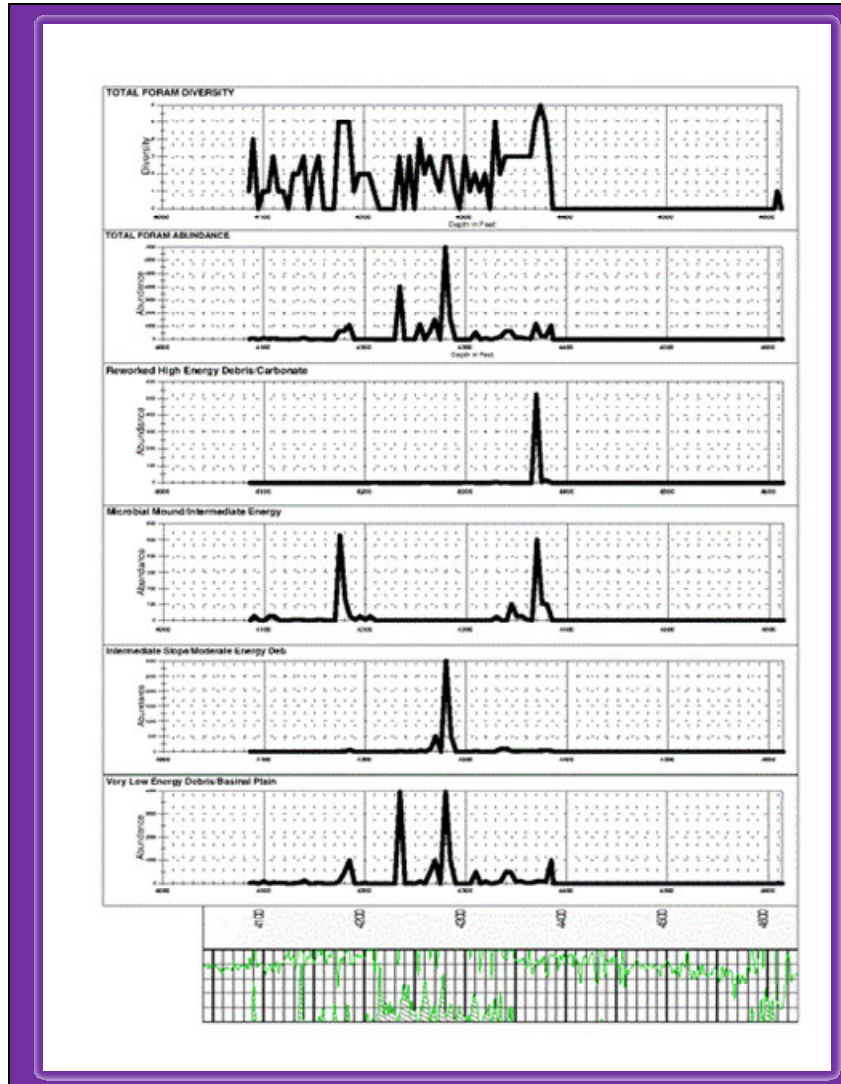
This example, taken from data on the Cline Fm, shows the environmental distribution of organisms by environmental source (see slide 21).

continued on page 50



The same composite data above displayed as normalized relative abundance. The lower curve is the abundance of those organisms associated with the dominance of humic (type three) kerogen. The large waves of abundance are typical of lowstand, outbuilding sediment sequences and gas proneness, which was the case here. The second curve from the bottom is abundance of organisms transitional from type 3 to 2 kerogen and the third curve from the bottom is abundance of organisms typically associated with type 2 kerogen environments. The uppermost curve is the relative abundance of type one kerogen environments. The tight, frequent spiking of the curves toward the right of the curves indicates microlamination and high gamma ray values. Oil potential is accurately predicted by the curves above as well as indicating its coastal source.

continued on page 51



The curves above indicate (from the top) foraminiferal data for 1) abundance, 2) diversity and 3,4,5) varied shelf marine trophic affinities and (lowermost curve) 6) humic trophic affinities. Note the gamma ray value curve at the bottom. The gamma ray anomaly starting two spaces from the left is characterized as a relative lowstand shale dominated by a sequence of rapidly deposited channel debris.

Foraminifera species are distributed by the sources of food they prefer (trophic affinities). When present in large numbers, you can determine what carbon source “brings them to the table”. In this set of curves, the lowermost curve suggests the dominance of humic kerogen source or gas proneness, which was the case. The dominance of humic sources only excluded the chance of significant liquid petroleum concentrations within the gamma ray zone.

continued on page 52

- Many of the characters common to shale plays (microlamination, intermittent anaerobism) are attributable to coastal marsh systems and their direct effects (clastic sequestration, high organic production)
- Swamp or wetlands sourcing determines the kerogen/hydrocarbon product (and depositional traits) available to these plays which can be determined by fossil content
- Foundered, low energy depositional systems have a rich potential, identified by the ancient marsh type (or bypass thereof) and location

Along with the summary above, remember the key is rainfall or the hydrologic cycle and lots of it. One of the most prolific periods of Earth was the Carboniferous. The Carboniferous was characterized by heavy rain fall, high atmospheric partial pressures (percentages) of carbon dioxide and oxygen; very warm and wet. So... (next slide)

continued on page 53

Source: scentoffpine.org (credited to British Antarctic Survey)

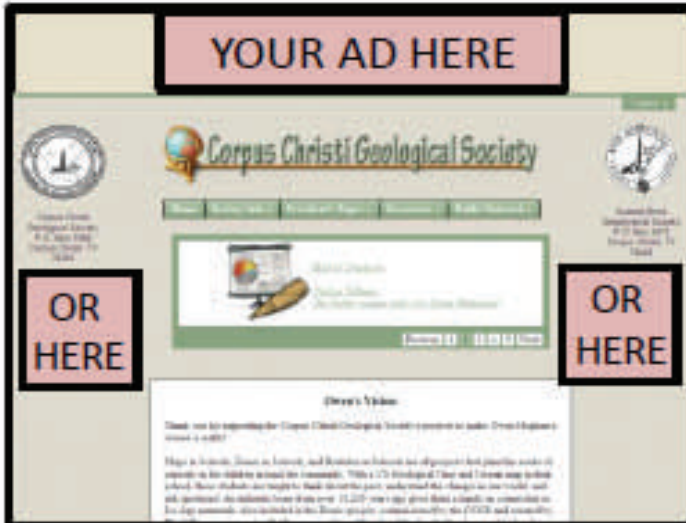


This final component of my talk has created the most controversy. On Randy Bissell’s encouragement and near insistence, I end my talk with a comment about circumstances around the Jackson Shale Fm or the “Fail Shale”. In the Late Eocene or Priabonian Stage Antarctica assumed its current position at the South Pole. This did several things, like forming new, deep cold water currents, but mostly it formed new continental glaciers. This glaciation formed a worldwide unconformity, known in the Gulf of Mexico as the Glide Plane which uses the unconformity as a decollement surface. The reason for the unconformity was that atmospheric water deposited upon Antarctica was simply taken out of play globally, yielding a severe lowstand. Once captured as Antarctic ice, the water could not return as rain. Remember: no rain or significantly less rain, no extensive swamp system to charge shale plays. Thus, the Jackson Shale has no associated swamp/wetlands system, has no high TOC of coastal origin, has no microlaminated bedding and none of the things that go with it. Welcome to the Neogene Ice Age!

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USGS TAPESTRY OF TIME AND TERRAIN <http://tapestry.usgs.gov> The CCGS is donating to all of the 5th and 6th grade schools in the Coastal Bend. Check it out--it is a spectacular map. You might want to frame one for your own office. The one in my office has glass and a metal frame, and It cost \$400 and it does not look as good as the ones we are giving to the schools.

FREE TEXAS TOPOS'S <http://www.tnris.state.tx.us/digital.htm> these are TIFF files from your state government that can be downloaded and printed. You can ad them to SMT by converting them first in Globalmapper. Other digital data as well.

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Burgentine Lake
Copano Bay, South
Estes Cove
Fulton Beach
Goose Island
Half Moon Reef
Nine Mile Point
Rockport, West
St. Charles
Tally Island
Tract 831-G.O.M. (offshore)
Virginia

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Mosca
Nomanna
Orangedale(2)
Ray-Wilcox
San Domingo

Tulsita Wilcox

Strauch_Wilcox

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Cage Ranch
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ERF
Gyp Hill

Gyp Hill West

Loma Blanca
Mariposa
Mills Bennett
Pita
Tio Ayola
Tres Encinos

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Heyser
Lavaca Bay
Long Mott
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Mosquito Point
Olivia
Panther Reef
Powderhorn
Seadrift, N.W.
Steamboat Pass
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Cabeza Creek, South
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St Armo

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Donna
Edinburg, West
Flores-Jeffress
Foy
Hidalgo

LA Blanca

McAllen& Pharr
McAllen Ranch
Mercedes
Monte Christo, North
Penitas
San Fordyce
San Carlos
San Salvador
S. Santallana
Shary
Tabasco
Weslaco, North
Weslaco, South

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Carancahua Creek
Francitas
Ganado & Ganado Deep
LaWard, North
Little Kentucky

Maurbro

StewartSwan Lake

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Texana, North
West Ranch

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Chaparosa
Thompsonville,N.E.

JIM WELLS COUNTY

Freebom
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Palito Blanco
Wade City

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Candelaria
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Hope
Southwest Speaks
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Lucille

Sierra Vista

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White Creek

White Creek, East

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Collegeport

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Brazil
Devil's Waterhole
Hostetter
Hostetter, North

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Arnold-David, North
Baldwin Deep
Calallen
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GOM St 9045(offshore)
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Mustang Island, West
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889S(offshore)
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West

Perro Rojo

Pita Island
Ramada
Redfish Bay
Riverside
Riverside, South
Saxet
Shield
Stedman Island

Turkey Creek

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La Rosa
Lake Pasture
Refugio, New
Tom O'Connor

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Commonwealth
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Geronimo
Harvey
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Hodges
Mathis, East
McC Campbell Deep/Aransas Pass
Midway
Midway, North
Odem

Plymouth

Portilla (2)

Taft

Taft, East

White Point, East

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El Tanque

Garcia

Hinde

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Lyda

Ricaby

Rincon

Rincon, North

Ross

San Roman

Sun

Yturria

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Marcado Creek

McFaddin

Meyersville

Placedo

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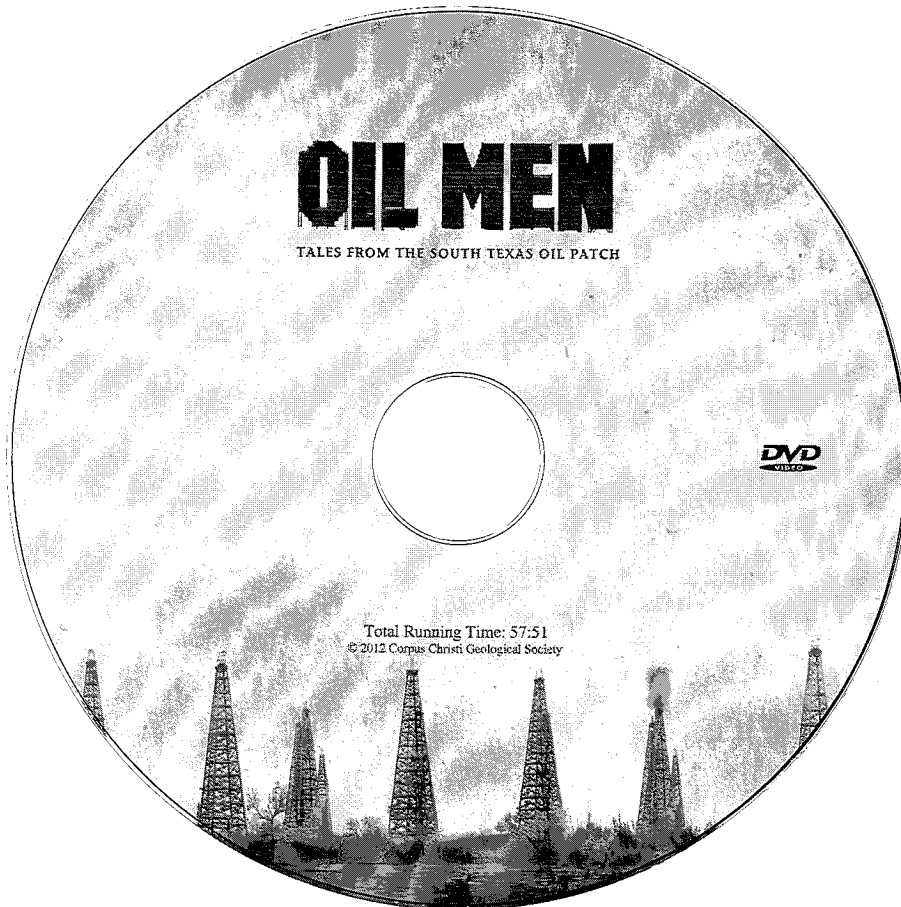
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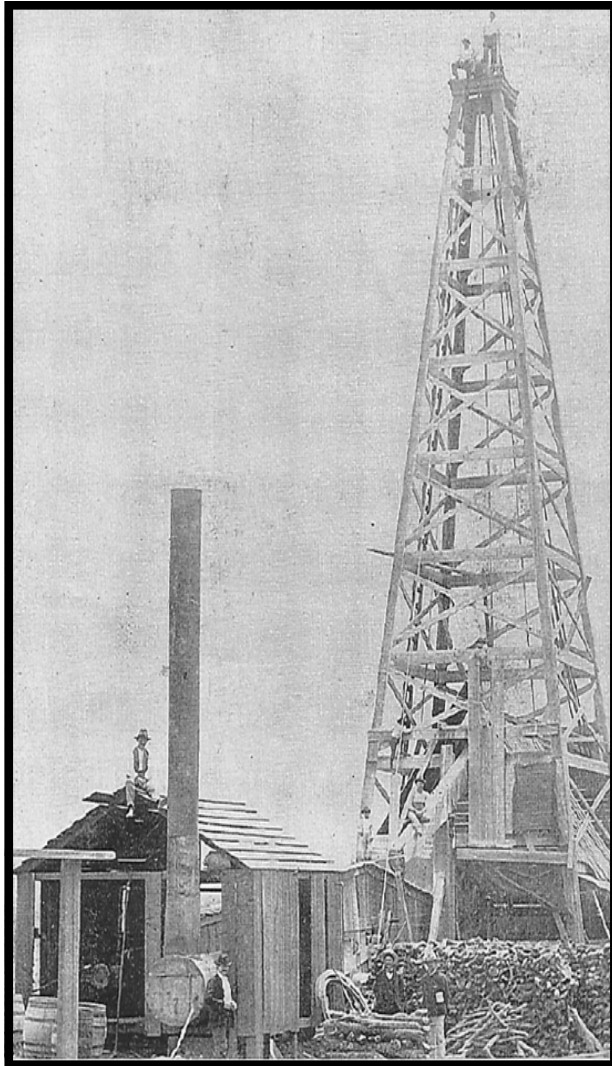


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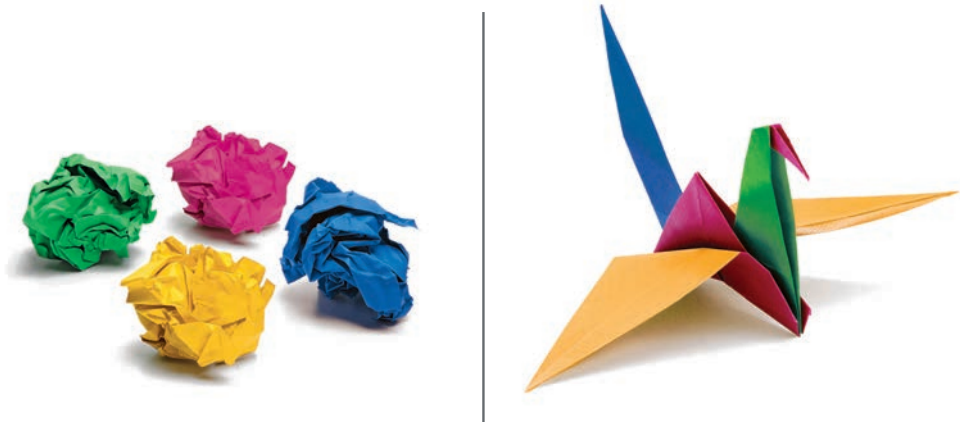
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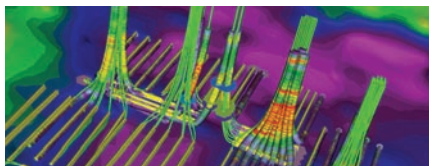
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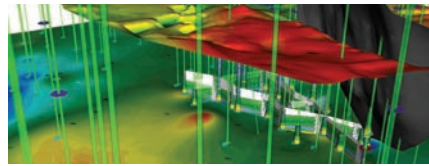
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