



PBS-SEPM NEWSLETTER



Photo by: Sandra Elliott

PBS-SEPM 2011-2012

January – February 2012

**Jan 17, PBS-SEPM
Luncheon Mtg, 11:30 am.
Midland Center**

Speaker: Dr. Steven
Sonnenberg, Colorado
School of Mines.

Topic: “The Niobrara
Petroleum System, a Major
Tight Resource Play in the
Rocky Mountain Region.”

**Feb 21, PBS-SEPM Lunch-
eon Mtg, 11:30 am.
Midland Center**

Speaker David Hume, PhD
Canadian Discovery

Topic: “Facies, Diagenesis,
Environments, Sequence
Stratigraphy and an Oil
Migration Model for the
Bakken System of the
Williston Basin.”

**March 6th, PBS-SEPM
Luncheon Mtg, 11:30 am.
Midland Center**

Speaker Dr. Rick Lewis
Schlumberger

Topic: “Key Reservoir and
Completion Parameters that
Define a Shale Reservoir.”

**Jan 10, WTGS
Luncheon Mtg, 11:30 am.
Midland Center**

Speaker: Simon N. Hughes,
Product Line Manager,
Wellsite Geochemistry,
Weatherford Surface Logging
Systems.

Topic: “RockWise Elemental
Applications Service.”

David W. Hume

Tues., February 21, 2012

11:30 am, Midland Center, Midland, TX

RSVP by 3pm Monday, Feb. 20th 432-683-1573 or email: wtgs@wtgs.org

Facies, Environments, Diagenesis, Sequence Stratigraphy and An Oil Migration Model for the Bakken Petroleum System of the Williston Basin.

¹David W. Hume, ²Graham R Davies.

1. Canadian Discovery Ltd. Calgary AB, Canada,
2. GDGC Ltd. Calgary AB, Canada

Abstract

Examination of about 100 Bakken cores from SE Saskatchewan and North Dakota has provided a regional framework for facies, depositional environments, early diagenesis and sequence stratigraphic comparisons and interpretations. Third-order residual structure mapping of the top Paleozoic surface becomes a key paleostructural base.

Nine major facies and multiple subfacies are recognized in the Bakken. A basal sandstone (previously referred to as the ‘Sanish’ now formally recognized as the ‘Pronghorn’) and three deeper subfacies are placed in an initial transgressive phase of the Bakken succession.

The Lower Shale/kerogen-rich mudstone of the Bakken is divided into three units that differ in geographic distribution, mineral composition, petrophysical characteristics, and TOC. The Lower Shale is interpreted to have been deposited in a dysaerobic, density and chemically stratified basin of moderate depth, with a fluctuating pycnocline. Silt-sand filled fractures in the Lower Shale show an apparent structural alignment, and suggest sediment source from below.



**Feb 14, WTGS
Luncheon Mtg, 11:30 am.
Midland Center**

Speaker: Dr. George Asquith,
Texas Tech University,
Lubbock, TX

Topic: "Ooid Grainstone
Reservoirs in Texas"

**Feb 20-21, Houston
Geological Society,
The Westin Houston,
Memorial City,
Houston, TX**

Topic: "Applied Geoscience
for Mudrocks System Char-
acterization to Help Improve
Exploitation of US Gulf
Coast Region "Shale Gas/
Oil" Reservoirs."

Check www.wtgs.org
for more details.

"With their
Four-dimensional
minds, and in their
interdisciplinary
ultra verbal way,
geologists can
wiggle out of
almost
anything."

-John McPhee

The Middle Member of the Bakken, with 7 main facies, records a complex succession of stressed offshore to storm wave influenced environments, to distal shoreface, ooid bars (adjacent to paleohighs), tidally-dominated settings with local stromatolites, and stressed 'estuarine' environments. At least two ravinement surfaces/sequence boundaries are recorded in the Middle Bakken, with deep truncation below one. Distribution of fine bioclastic sediment and early diagenetic calcite cements show a correlation to paleobathymetry defined by residual structure. Trends of storm-wave driven HCS-like bedforms and bioclastic event beds indicate a westerly-directed wind-wave system.

The Upper Shale/mudstone is again placed in a stratified basin setting. Bakken reservoir trends within this framework also show relationships at various levels to paleotopography documented by residual structure.

A new migration model for the Bakken Petroleum System in the Williston Basin has also been developed. This model defines three basic play types for the Bakken: a highly overpressured, high oil saturated resource play, an overpressured less oil saturated resource play and a normally pressured migrated oil play.

The distribution of these plays is controlled in large part by the occurrence of mature Bakken source rocks, Bakken stratigraphy and the magnitude and direction of fluid movement driven by both hydraulic head and fluid density differences in the Basin.

Taken in combination the geology and hydrogeology models can be used to diminish exploration risks by predicting areas of favorable reservoir development, and areas of oil charge for in-situ and migrated unconventional oil plays in Manitoba, Saskatchewan, North Dakota and Montana.

2011 Fire Devastation Looking East from Hwy 118
Across the 06 and Williams Ranch Flats North of Alpine, Texas



Photo by: Tanner Quigg

Bio – PBS-SEPM Speaker – Feb 21st, 2012**David Hume**

Dave Hume is a professional geologist with 30 years of experience. He received his Bachelor of Science in Geology from the University of Alberta in 1982. His expertise straddles sedimentology, sequence stratigraphy and geological modeling as it relates to the development of exploration and development prospects.



Prior to joining Rakhit Petroleum Consulting Ltd. (RPCL) – the predecessor to Canadian Discovery Ltd. (CDL) – in 1990, Dave was the senior geologist of an intermediate oil and gas production company in Calgary, where he gained direct experience in exploration and development geology and oil and gas operations. Dave later left RPCL to work as the senior stratigrapher with Trident Exploration for a year, and subsequently rejoined CDL as Director of Consulting Services and Multi-Client Studies.

During his Tenure with RPCL/CDL Dave has authored or contributed to over 500 studies in North America, South America, the North Sea, Asia and the Middle East. He has presented numerous papers to the CSPG, The AAPG, RMAG and the Geological Society in London. His current focus is a study of the oil potential of the Second White Specks Zone in the Colorado Group of the Upper Cretaceous in Western Canada.

Lenard Mountain
Boss Ranch Northeast of Marathon, Texas



Rick Lewis

Tues., March 6th, 2012

11:30 am, Midland Center, Midland, TX

RSVP by 3pm Monday, March 5th 432-683-1573 or email: wtgs@wtgs.org

Key Reservoir and Completion Parameters that Define a Shale Reservoir

¹Rick Lewis

1. Petrophysics Technical Manager, Unconventional Reservoirs for Schlumberger Oilfield Services

Abstract

Tens of thousands of wells have been drilled over the last eight years to exploit shale reservoirs. The resulting production from these wells, even from the same shale in the same basin, is commonly quite variable. The causes for the variability are due to differences in either the quality of the rock stimulated or in the stimulation itself. Wireline and core evaluation of thousands of these wells indicates that the quality of the rock is a significant factor, and it can be subdivided into two components: reservoir and completion quality.

Reservoir quality is defined primarily by the volume of hydrocarbon within the shale matrix and the permeability of this matrix. If the shale does not contain adequate volumes of hydrocarbon that can flow to created hydraulic fractures then the well will not be economic. The hydrocarbon in place is a function of effective porosity, hydrocarbon saturation, pore pressure and thickness. The permeability is a function of the volume of hydrocarbon-wet pores that reside primarily within the kerogen fraction of the reservoir, and the diameter of their pore throats. Permeability can be significantly enhanced if a conventional pore system with proper wettability conditions also exists.

Completion quality is the ability to generate and sustain a conductive hydraulic fracture that will permit hydrocarbon to flow from the matrix to the wellbore at economic rates. Completion quality is defined primarily by the state of stress in the formation, both far-field and near-field, where near-field is that volume whose stress field has been altered by drilling. Far-field stresses will impact hydraulic fracture containment, hydraulic fracture orientation, and fracture width. Near-field stresses will impact perforation efficiency, fracture width, near-well bore tortuosity, and potential fines production. Stresses are impacted by formation mineralogy, primarily clay content and clay type, and pore pressure. An additional completion quality parameter is hydraulic fracture complexity. Complexity is impacted by the presence, orientation, and morphology of natural fractures plus the anisotropy of the stress field.

A successful well should be landed in a zone with good near-field completion quality. Effective hydraulic fracture can be initiated in such zones and then grow into zones with both good reservoir quality and completion quality. A combination of both reservoir and completion quality is a vital necessary step to ensure that a well is economic. If the shale does not

have both reservoir and completion quality, then it will not be economic. And, ultimately, if one has to choose it would be better to have adequate reservoir quality and great completion quality, rather than the converse.

Bio – PBS-SEPM Speaker – March 6th, 2012

Rick Lewis

Petrophysics Technical Manager, Unconventional Reservoirs for Schlumberger Oilfield Services.



Rick was a developer of the gas shale evaluation workflow that was initially fielded nine years ago and has been applied to well more than 2000 wells in North America. In his current position, Rick manages a group responsible for the continual improvement for this workflow, and for its introduction and application to the international market. He is also the interface to the Schlumberger research and engineering groups for the development of evaluation technologies for unconventional reservoirs. Prior to this assignment, Rick was responsible for wireline interpretation development for the central and eastern United States. He is located in Oklahoma City. Rick has also worked for Shell Oil and the U.S. Geological Survey. He received a BS degree from UCLA and M.S. and PhD degrees from Cal Tech, all in geology.

Stephen A. Sonnenberg

Tues., January 17, 2012

11:30 am, Midland Center, Midland, TX

RSVP by 3pm Monday, Jan 16th 432-683-1573 or email: wtgs@wtgs.org

The Niobrara Petroleum System, a Major Tight Resource Play in the Rocky Mountain Region

Stephen A. Sonnenberg¹

¹Dept. of Geology & Geological Eng. Colorado School of Mines

ABSTRACT

The Niobrara Petroleum System of the U.S. Rocky Mountain Region is a major tight petroleum resource play. The Niobrara is self-sourced and reservoirs are low permeability chinks, shales, and sandstones. Source beds have total organic carbon contents that range from 2 to 8 weight percent. Source beds are thermally mature in the deeper parts of many of the Laramide basins in the Rocky Mountain region. Continuous or pervasive accumulations occur in thermally mature areas.

The Niobrara source rocks are dominantly Type II (sapropelic). Oil accumulations occur where source beds are still in the thermogenic oil window (e.g., Denver Basin). Thermogenic gas accumulations occur where the source beds have entered the gas generating window in deeper parts of basins (e.g., Piceance Basin). Biogenic methane occurs in shallow chalk reservoirs on the east flank of the Western Interior Cretaceous Basin.

In addition shallow gas fields are found in northern Montana. Natural fractures are important in controlling sweet spots in the play and form for several causes.

Several models create fractures in the Niobrara and include Laramide tectonics, Neogene extensional tectonics, solution of evaporates, hydrocarbon generation, and regional stress patterns.

The Niobrara is a technology reservoir that requires horizontal drilling and multi-stage hydraulic fracturing. The Niobrara petroleum system is present over most of the Rocky Mountain Region and is prospective in many areas.

**Bio—PBS-SEPM Speaker
Jan 17th , 2012**

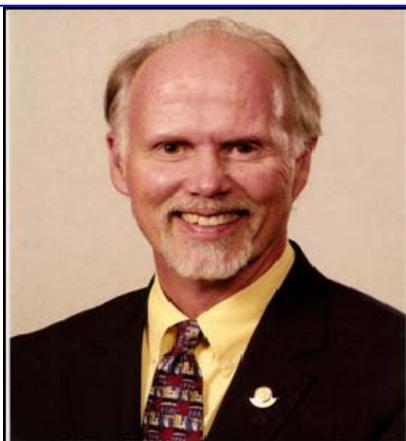
Dr. Steve Sonnenberg

Is the Professor of Geology and holds the Charles Boettcher Distinguished Chair in Petroleum Geology at the Colorado School of Mines.

He specializes in unconventional reservoirs, sequence stratigraphy, tectonic influence on sedimentation, and petroleum geology.

A native of Billings, Montana, Sonnenberg received BS and MS degrees in geology from Texas A&M University and a Ph.D. degree in geology from the Colorado School of Mines. Steve began teaching at Colorado School of Mines in 2007 after working in the petroleum industry for over 25 years.

Steve has served as President of several organizations including the American Association of Petroleum Geologists, Rocky Mountain Association of Geologists, and Colorado Scientific So-



"We live in a society exquisitely dependent on science and technology, in which hardly anyone knows anything about science and technology."

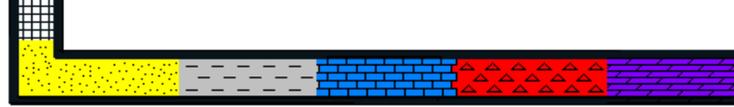
- Carl Sagan

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“The intuitive mind is a sacred gift and the rational mind is a faithful servant; we have created a society that honours the servant and has forgotten the gift.”

Albert Einstein



President's Column

David Thomas III



The current attack on the scientific oil and gas community is appalling. Not only are we dealing with the misuse of the Endangered Species Act to limit the activities that provide a livelihood for most of us in the Permian Basin, we are now being criticized for a technology that has lowered natural gas prices and provided a step change in our national security by the increase in oil production. That technology is multi-stage hydraulic fracturing. The environmentalists that have chosen to create negativity around this process have lodged yet another unscientific campaign and they have gained a large following with their rhetoric.

I am of the opinion the members of the scientific community need to individually invest time educating the public and insuring they have the proper information on which to base their judgments. The abundance of natural gas the country is currently experiencing is providing a clean source of reliable, accessible, affordable energy. The public needs to realize that energy production doesn't always create an unacceptable environmental impact. Moving the source of energy to produce electricity from oil and coal to natural gas has a very positive environmental impact. Gas fired power plants have 50% the emissions of coal and oil powered plants.

Emissions will further be reduced as we build the infrastructure for natural gas vehicles, the most environmentally efficient vehicles in the world. Even the current administration has recognized the benefit of natural gas. When provided the proper scientific data they completely reversed their prior position. The president has endorsed its use in vehicles stating, "We've got to take advantage of this incredible resource." He went on to say, "Think about an America where more cars and trucks are running on domestic natural gas than on foreign oil. Think about an America where our companies are leading the world in developing natural gas technology and creating a generation of new energy jobs; where our natural gas resources are helping make our manufacturers more competitive for decades. We can do this." This is a powerful example of how scientific data, properly presented, can change minds in the non-scientific community.

Without hydraulic fracturing, the current conversations surrounding natural gas and its future benefits for the environment and the domestic economy simply would not be taking place. Hydraulic fracturing has been practiced in our industry for over 65 years. The biggest concern surrounding fresh water contamination is and will continue to be well bore construction and maintaining mechanical integrity to below the depth of fresh water. The majority of hydraulic fracturing takes place far below the existing groundwater sources suitable to be an underground source of drinking water. The maximum principal stress is the overburden which is sufficient to contain vertical fractures from propagating through layers of rock, many which are ductile, much beyond the point of initiation.

Take time to educate a friend or neighbor so they can draw intelligent conclusions.

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Please remember to thank them for their support!

Do you have an idea for an interesting luncheon talk? Have a core workshop you'd like to present? Have some suggestions on how PBS-SEPM can better serve the geologic community?

Just click on the e-mail above and drop us a note – your PBS-SEPM Executive Board would LOVE to hear from you!



"An education isn't how much you have committed to memory, or even how much you know.

It's being able to differentiate between what you do know and what you don't ."

Anatole France

(1844–1924)

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If you are interested in a sponsorship opportunity, please call Paula Mitchell for more details at (432) 683-1573

Your Company Logo could be in this space showing your support of PBS-SEPM.
Your support lifts your corporate name within the Permian Basin .

Your Corporate Logo could be here.
Your logo will be on the website, in every newsletter, on the Power Point shown prior to every luncheon and in the calendar credits for one year June to May.

Upcoming Events and Scheduled Luncheon Meeting Lecturers

MARCH 6, 2012	Dr. Rick Lewis - Schlumberger Schlumberger	Key Reservoir and Completion Parameters that Define a Shale Reservoir
APRIL 17, 2012	Dr. Emily Stoudt, Toyly Abdullayev, & Dr. Bob Loucks UTPB & BEG: The University of Texas at Austin	Ellenburger Core Workshop with Dr. Emily Stoudt, Toyly Abdullayev, and Dr. Bob Loucks
MAY 15, 2012	Dr. Sal Mazzullo Wichita State University	TBA <i>Mississippian Carbonates</i>
JUNE 19, 2012	Dr. Seay Nance Bureau of Economic Geology of The University of Texas at Austin	Bone Spring Formation - Deep Water Successions of the Delaware Basin TX & NM
JULY 17, 2012	SUMMER BREAK	
AUGUST 21, 2012	SUMMER BREAK	
SEPTEMBER 18, 2012	Dr. Michael Pope Texas A&M University	TBA <i>Carbonate Slope Deposits</i>
OCTOBER 16, 2012	Dr. Michael Grammer Oklahoma State University	TBA <i>Carbonate Stratigraphy</i>
NOVEMBER 6, 2012	Dr. Rick Sarg Colorado School of Mines	TBA
DECEMBER 2012	CHRISTMAS BREAK	

**Registration Forms for the Core Workshop
are available online at**

www.pbs-sepm.org

**Or they can be picked up at the PBS-SEPM Luncheons
the third Tuesday of the Month at the Midland Center**

“Civilization exists by geological
consent, subject to change
without notice.”

-Will Durant

"PBS - SEPM Spring 2012 Field Trip"

"HOW STRESSED ARE YOUR RESERVOIRS?"

- FOLDS - FAULTS - FRACTURES -

WHY ARE THEY IMPORTANT?

(They affect practically everything pertaining to reservoirs: trapping, boundaries, drainage areas, fluid saturations, migration, flow rates, ultimate recoveries, and stimulation results)



Leaders: Richard Erdlac - Access Energy
Gilbert Barragan - Whiting Petroleum

Date: Thursday March 22, 2012 to Saturday March 24, 2012

Leave from parking lot east of Midland Center (subject to confirmation) at 7:30 am Thursday morning.

Cost: \$600 / person. All single occupancy.
Cost includes transportation, lodging, and all meals.

Areas Visited: Terrell County Surface Faults
Pecos County Marathon Deformation
Brewster County Big Bend Structural Elements

Group Limit: 25 people



PERMIAN BASIN SECTION SEPM



YOUNG PROFESSIONAL AND INTERN FIELD TRIP June 7-10, 2012

- Four day multi-disciplined field trip in the Guadalupe Mountains for geology, engineering and land young professionals and interns
- Trip led by Dr. Emily Stoudt and Dr. Robert Trentham from The University of Texas of the Permian Basin, who have a combined 55 years of geological experience in research, development and production in the Permian Basin
- Robert Campbell and Chris Fling will provide mentoring support in engineering and land and have comparable years of Permian Basin experience in their respective professions
- Goal is to educate participants in combining outcrop data with industry exploration and production techniques in a multi-disciplined environment
- Participants will have opportunity to observe world-class outcrops of shelf to basin deposits that are direct analogues to producing fields in the Permian Basin
- Lectures covering geology of west Texas, carbonates, sequence stratigraphy, quick and simple log calculations and land practices
- Classroom exercises on general land practices, sequence stratigraphy, log correlation, seismic interpretation and production analysis
- Break out sessions specific to each discipline

Participants will leave Midland, TX on June 7, travel to Carlsbad, NM, where they will stay at the Stevens Inn, and return to Midland, TX, the evening of June 10. Included in the costs: round trip transportation from Midland, three nights lodging, three breakfasts, three lunches, refreshments in the field, guidebook and handouts.

Limited space is available, so the first to register will be given priority.

Registration Forms are available online at

www.pbs-sepm.org

**Or they can be picked up at the PBS-SEPM Luncheons
the third Tuesday of the Month at the Midland Center**



HOUSTON GEOLOGICAL SOCIETY
Explore Our Connections

HGS Applied Geoscience Mudrocks Conference (AGC)

*Applied Geoscience for mudrocks system
 characterization to help improve exploitation of US Gulf
 Region "Shale Gas/Oil" Reservoirs*

Monday February 20th & Tuesday 21st, 2012
The Westin Houston, Memorial City
945 Gessner Road, Houston, Texas 77024
Tel: (281)-501-4300 – Fax: (281) 501-4306

**APPLIED RESERVOIR CHARACTERIZATION OF
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We're on the Web!
www.pbs-sepm.org

"When truth is evident, it is impossible for parties and factions to rise.

There never has been a dispute as to whether there is daylight at noon. "

*Francis Marie Arouet
de Voltaire,
(1694-1778)
French Writer 1764*

PBS-SEP is the Permian Basin Section of SEP – the Society for Sedimentary Geology. However, you do not need to be a SEP member or a geologist to join PBS-SEP.

Our non-profit society relies upon the efforts of dedicated volunteers to serve the geological community – primarily through educational events. These events include monthly luncheon talks, core workshops, annual field trips, and special geological publications.

Thanks to our Education Committee we are involved in MISD 5th grade geology presentations to interest elementary students in pursuing a career in geosciences. We would like to increase our exposure on college campuses – reaching out to future earth scientists through scholarships, discounted memberships, and offering full-time geology students the ability to participate in professional-grade field trips at little to no cost.

If you would like to join PBS-SEP, you may visit our website (www.pbs-sepm.org) to learn more about us, discover how to get involved and download a membership form.

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Individual sponsors are advertised on the PBS-SEP website and each Newsletter. Cost is \$85/year. If you are interested in an individual sponsorship opportunity, please call Paula Mitchell for more details at (432) 683-1573.

Your Business Card Could be here

Your card will be in every newsletter for one year June to May, on the Website, the Power Point shown prior to every luncheon and in the calendar credits.

Winter 'tis upon us, 'tis time to look at the

