



PBS-SEPM NEWSLETTER



September 2016

"We are like a judge confronted by a defendant who declines to answer, and we must determine the truth from the circumstantial evidence."

— Alfred Wegener

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3600 N. Garfield
Carrasco Room

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President's Column

I'm pleased to report our first luncheon meeting of the new year was a great success with over 50 in attendance. I especially want to thank luncheon speaker [Allen Donaldson](#) for sharing his geologic insights into the Oklahoma SCOOP and STACK plays with us. I admit kicking off a new year of luncheon talks at a new location is not for the faint of heart, but the planning and execution exhibited by your chairpersons, elected Board, and other volunteers transformed the idea into reality—and I offer my thanks to all who served behind the scenes in that effort. A great beginning and an exciting future for PBS-SEPM!

In case you missed the September 8 luncheon, rest assured we have many excellent talks slated for the upcoming year, and we look forward to seeing you at the next event. The remainder of our luncheon talks will be on our traditional day of the 3rd Tuesday of every month, and we will continue to meet at the Carrasco Room of Midland College. Our next talk will be on October 18th (details on p. 2). **Please register early** by website, phone, or e-mail no later than the Wednesday prior to the meeting (Oct. 12) for two reasons: (1) an accu-

rate headcount ensures we will have enough food and seating for those who wish to attend, and (2) those registering after the deadline will be charged a \$10 late registration fee to cover expenses (i.e., \$30 instead of \$20).

The membership drive is ongoing, and you have several options to renew. On our website you have the capability of renewing online via PayPal, debit, or credit card, or printing and mailing a form with your check for \$20. While you're on the website, be sure to update your profile information and take the opportunity to learn more about the society and how you can become more involved in shaping its future.

On the publication front, [Norman Frances](#) (1st VP) has inventoried all of our publications and located a few that were never digitized, which we are in the process of having professionally scanned. We will add those to future purchases of the Digital Publications DVDs, and are also planning to make those publication available for purchase online once the e-commerce portion of the website is added in the months ahead.

Our new office within the Midland Energy Library is slowly taking shape with the addition of various donated items—furniture, computers, printers, office supplies, etc. Thank you for your generosity!

The next major focus of the Board is to work with [Dr. Robert Lindsay](#) to help put together the special core workshop he will lead for us next Spring. Be on the lookout for those details.

Our society has made significant progress in the transition since becoming all-volunteer in June, but there are many tasks yet to do. We ask for your continued support of the society, as well as your patience as we work to complete the transition and establish a solid foundation for the society going forward.

See you on October 18th!

Cory L. Hoffman

PBS-SEPM President
2016-2017

Web: <http://www.pbs-sepm.org>

E-Mail: info@pbs-sepm.org

Phone: (432) 279-1360

Mailing Address:

P.O. Box 6054

Midland, TX 79704

Mark Your Calendars! [PBS-SEPM luncheons at Carrasco Room, Midland College]

SEPTEMBER 2016

- **28-29: WTGS Fall Symposium** (Midland Horseshoe)

OCTOBER 2016

- **11: WTGS Luncheon:** (11:30am-1pm), **Speaker: Dr. Robert Lindsay**, Lindsay Consulting, **Title:** Carbonate Porosity Families and Their Reservoir

Potential

- **18: PBS-SEPM Luncheon:** (11:30am-1pm), **Speaker: Dr. Michael D. Lewan**, Lewan GeoConsulting Corp., **Title:** Re-Evaluation of Thermal Maturity and Stages of Petroleum Generation for Barnett Shale in the Fort Worth Basin, Texas

NOVEMBER 2016

- 15: PBS-SEPM Luncheon:** (11:30am-1pm), **Speaker: Dr. John Lorenz**, FractureStudies LLC, **Title:** Natural Fracture Systems in the Spraberry Formation, Permian Basin

PBS-SEPM Luncheon Talk – October 18, 2016

Dr. Michael D. Lewan

“Re-Evaluation of Thermal Maturity and Stages of Petroleum Generation for Barnett Shale in the Fort Worth Basin, Texas”

Petroleum Geochemist/Geologist, Lewan GeoConsulting Corp.

Co-Author: M.J. Pawlewicz

Tuesday October 18, 2016 - [Midland College](#), [Carrasco Room](#), 11:30 a.m.

Abstract

The Barnett Shale in the Fort Worth basin represents the type “tight-gas shale” play, and has proven to be a significant energy resource. Although this unconventional gas play may commonly be used as an analog for exploration on a global scale, it is not completely understood with respect to thermal maturity and stages of petroleum formation. Through a collaborative effort with Chesapeake Energy, EOG Resources, Devon Energy, Quicksilver Resources, and the USGS, 104 samples of the Barnett Shale were collected from 102 wells and one outcrop within the Fort Worth Basin. Hydrogen index (HI; mg S₂/g TOC) and temperature at maximum S₂ yield (T_{max}; °C) from Rock-Eval analysis and measure reflectance (%Ro) were compared and evaluated in their overall ability to determine extent, stage, and type of petroleum generated within the Barnett Shale. T_{max} showed the poorest correlation between HI and measured %Ro, with no similarity to previously prescribed HI versus %Ro relationships. However, a good correlation between HI and measured %Ro was observed that agreed with other data sets and published relationships. Hydrogen indices and their calibration with the atomic H/C ratio of isolated kerogen from selected samples proved to be the most insightful parameter for evaluating thermal maturity and stages of petroleum formation. The resulting HI and %Ro maps show that major gas generation did not occur at %Ro values greater than 1.1 as previously suggested, but rather at %Ro values at or greater than 1.6 with equivalent HI values greater than 37 mg S₂/g TOC. The 1.6 %Ro is typically considered the start of secondary gas generation when oil cracks to gas. This higher %Ro limit is more consistent with other unconventional shale gas plays (e.g., Marcellus shale of the Appalachian basin) and limits the likelihood of shale-gas plays in less thermally mature basins (e.g., New Albany Shale in the Illinois basin).

Biography



Michael Lewan is a petroleum geochemist and geologist. After 24 years, he retired from the U.S. Geological Survey (Denver) in 2014, but continues as emeritus with experimental research on the origin of petroleum. He also consults on issues and areas unrelated to his USGS emeritus projects. Recently, he was the recipient of the AAPG 2016 Robert R. Berg Outstanding Research Award and the Rocky Mountain Association of Petroleum Geologist 2014 Outstanding Scientist Award. Prior to joining the USGS, he worked 13 years for Amoco Production Company at their research Center in Tulsa. It was during this time that he along with colleagues pioneered hydrous pyrolysis for simulating natural petroleum generation and expulsion in the laboratory. During this time, he was the recipient of the AAPG 1991 George C. Matson Best Technical Paper Award and AAPG Distinguished Lecturer. Prior to receiving his Ph.D. from the University of Cincinnati, he worked three years with Shell Oil Company in their New Orleans Exploration and Production Company as an offshore exploration geologists. He received an M.S. degree from Michigan Technological University (1972) and a B.S. from Northern Illinois University (1971).

“In rivers, the water that you touch is the last of what has passed and the first of that which comes; so with present time.”

— Leonardo da Vinci
(1452 - 1519)

“You cannot teach a man anything; you can only help him discover it in himself.”

— Galileo Galilei
(1564 - 1642)
Italian physicist, mathematician, engineer, astronomer, and philosopher.



PBS-SEPM Publication Carbonate Log Analysis Spreadsheet v. 4.0

By: Cory L. Hoffman
Designed for Microsoft Office Excel 2013



Carbonate Log Analysis Tool
NEW AND IMPROVED!

- Analyze up to 7500 data rows (depths)
- Color-code up to 5 different series of data points on plots
- GR, Sw, and porosity filters hide unwanted points on plots and analyses
- Quick Rt, Quick Rxo, Sonic Porosity, Total Porosity from raw input data
- Input data plotted: GR, N/D/Sonic/Total porosity, Rxo and Rt
- Performs 12 carbonate log analysis techniques simultaneously:
 - Secondary porosity using sonic or resistivity data
 - Archie Sw, PRI, Ratio Water Saturation, MHI, BVW
 - Variable 'm' Sw (Nugent, Borai, Focke&Munn, Shell, or user-defined)
 - Uses Rz technique if no Rxo device present
- Interprets results & highlights potential pay zones meeting user cutoffs
- Generates interpretive plots: Dew, Buckles (BVW), Pickett
- Includes guide to interpreting log analysis results

Core Data Analysis Tool

- Integrates capillary pressure and core perm/porosity data
- Winland R35 and K/Φ methods (port size) for rock quality
- Plots up to 20 capillary pressure curves
- Plots depth profiles of porosity, perm, K/Φ
- Plot multiwell Sw vs subsea to evaluate apparent OWC
- Includes guide to interpreting Winland R35 and K/Φ results

Ratio Index (PRI)	Quicklook PRI Interp.	Archie Water Saturation	Ratio Water Saturation	Swa/Swr Ratio Interpretation	Hydrocarbon Index (MHI)	MHI Using Rz	Quicklook MHI Interpretation	Bulk Volume Water BVW
PRI	PRI Interp.	Swa (m=2)	Swr	Swa/Swr	Swa/Sxo	Sw/SI	MHI Interp.	
0.018	OIL	20%	33%	Interparticle - Swa reliable	0.408	--	HC present + moved	0.018
0.021	OIL	26%	28%	Interparticle - Swa reliable	0.360	--	HC present + moved	0.021
0.016	OIL	16%	20%	Interparticle - Swa reliable	0.275	--	HC present + moved	0.016
0.006	OIL	29%	45%	Moldic/Vuggy/High ROS - Swr reliable	0.530	--	HC present + moved	0.006
0.019	OIL	26%	36%	interparticle - Swa reliable	0.427	--	HC present + moved	0.019
0.019	OIL	22%	19%	interparticle - Swa reliable	0.270	--	HC present + moved	0.019
0.004	OIL	23%	8%	interparticle - Swa reliable	0.138	--	HC present + moved	0.004
0.023	OIL	73%	68%	interparticle - Swa reliable	0.735	--	????	0.023
0.005	OIL	22%	5%	Bimodal/Fracture - Swa reliable	0.087	--	HC present + moved	0.005
0.002	OIL	19%	31%	interparticle - Swa reliable	0.390	--	HC present + moved	0.002

INTRODUCTORY PRICE: \$40 (all proceeds go directly to PBS-SEPM)

- Get 2 tools for 1 low price — spreadsheet includes carbonate log analysis AND core data analysis tools
- Flash drive contains current version (Excel 2013; v. 4.0) and previous version (Excel 2010; v. 3.2) of spreadsheet
- Price includes free upgrades within version class (v. 3, v.4, etc.) for each registered user

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For additional information contact: PBS-SEPM office (432) 279-1360 or info@pbs-sepm.org

PBS-SEPM Luncheon Talk – November 15, 2016

John C. Lorenz, Ph.D.

*“Natural Fracture Systems in the Spraberry Formation,
Permian Basin”*

FractureStudies, LLC

Co-Author: **Scott Cooper**

Tuesday November 15, 2016 - [Midland College, Carrasco Room](#), 11:30 a.m.

Abstract

Engineering tests in the 1950s and 1960s showed that Spraberry reservoirs in the Permian basin of West Texas generally have a strong, fracture-controlled, NE-SW maximum horizontal permeability trend, but fracture data from vertical and horizontal cores show that the Spraberry natural-fracture system has remarkable variability. Fracture patterns change both vertically and laterally, and fracture permeability is dynamic, changing with variations in reservoir pressure. Horizontal core from a US DOE project in the 1990s showed that at one location, the 1U Spraberry sandstone contains a partially mineralized, NE-SW striking set of extension fractures, where only 140 ft below, the 5U Spraberry sandstone contains a conjugate pair of NNE-SSW and ENE-WSW striking, un-mineralized, minimal-displacement, strike-slip shear fractures. Engineering tests indicate that units containing the conjugate fractures have less anisotropic drainage than units containing the set of parallel extension fractures. Moreover, they demonstrated that fracture-controlled permeability increased, and unexpected off-trend interference occurred, during injection into the underpressured reservoirs. Core from the interbedded shales is also naturally fractured but more heavily near the bottom than at the top of the shale beds. Examination of the natural fracture populations in more recent horizontal and vertical Spraberry cores has reinforced the conceptual model of strain partitioning, where extension fractures in one reservoir can be dynamically compatible with shear fractures in adjacent reservoirs. Parallel shear fractures can also form in isolation where a fault acts in place of the complimentary shear set of the ideal conjugate pair.

Biography



John has a background in, and has published on, sedimentology-stratigraphy, but for the last 31 years has focused on the origins, characteristics, and effects of natural fractures in hydrocarbon reservoirs. He has studied the interactions of fractures and in situ stresses in reservoirs on the North Slope of Alaska to North Africa, and points in between. John received a Ph.D. from Princeton University in 1981, and worked for Sandia National Laboratories in Albuquerque, NM (USA) for 26 years before becoming a consultant. He has been the Elected Editor of the American Association of Petroleum Geologists (2001-2004), and was the 2009-2010 President of AAPG.

“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 .”

“Chance favors the prepared mind.”

- Louis Pasteur
(1822-95)
French chemist and bacteriologist.

PPDC Special Course Offering!



Natural Fractures in Hydrocarbon Reservoirs

Instructor: Dr. John Lorenz

** November 2 day course **

Petroleum Professional Development Center

Mailing Address: 221 N. Main

Midland, Texas 79701

432-683-2832; Fax: 686-8089

ONLINE REGISTRATION: <http://www.midland.edu/ppdc>



November 16-17, 2016

8:00 am - 5:00 pm

\$750, PBS-SEPM Members¹

Wednesday-Thursday

Midland College PPDC Building

\$850, Non-Members

Entrance: 105 W. Illinois Ave.

1.6 CEU's

Course Description:

This class is designed to provide the industry geologist and engineer with a working knowledge of fracture characteristics and variability as they affect production in hydrocarbon reservoirs. This is a hands-on, applied course in fracture interpretation, description, analysis, and effects. The two-day course starts with an exercise in which students assess samples of different types of fractured rock and core. We return to these samples half way through the course to show students the salient features that most missed earlier but can now recognize. Other exercises include assessing fracture strikes in oriented core, and assessing fracture distributions and intensities from core data. The class includes a self-study module using a teaching collection of 50 examples of natural and induced fractures in core.

Various types of fractures, including regional and structure-related fractures will be discussed, as well as the distributions of fractures in different lithologic and structural settings. The course will expose students to the characteristics of the most common types of fractures, how to measure and assess fracture populations, and their likely effects on reservoirs. Students will learn to distinguish natural from induced fractures in core, how to determine the reliability of a core-orientation survey, and how valuable fracture datasets can be collected from archived, incomplete, un-oriented core. The course includes examples from field and subsurface case studies, *including examples pertinent to Permian Basin resource plays*. Fracture systems are highly variable, thus the course does not teach cookbook techniques but rather teaches the concepts needed to understand fracture systems.

Learning Outcomes:

Geologists who take this class will acquire an appreciation for the variety of characteristics of natural fractures. They will learn how to look for and measure subtle fracture characteristics in core, and to assess the important but complementary differences between cores and image logs. Students will learn how different types of fractures can affect permeability systems in reservoirs, and how to assess the potential for interaction between natural fractures and hydraulic stimulation fractures.

Instructor:

John C. Lorenz, Ph.D. John has a background in, and has published on, sedimentology-stratigraphy, but for the last 31 years has focused on the origins, characteristics, and effects of natural fractures in hydrocarbon reservoirs. He has studied the interactions of fractures and in situ stresses in reservoirs on the North Slope of Alaska to North Africa, and points in between. John received a PhD from Princeton University in 1981, and worked for Sandia National Laboratories in Albuquerque, NM (USA) for 26 years before becoming a consultant. He has been the Elected Editor of the American Association of Petroleum Geologists (2001-2004), and was the 2009-2010 President of AAPG.

Midland College is an Equal Opportunity Employer/Educator. Midland College is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award certificates and associate and baccalaureate degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4500 for questions about the accreditation of Midland College.

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DVD III - Core Workshops (82, 83, 85, 98) & Special Publications (A, 88-28, 96-39, 84)

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For additional information **contact: PBS-SEPM office** (432) 279-1360 or info@pbs-sepm.org.

PBS-SEPM Executive Board (2016-2017)

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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 & drop us a note, your PBS-SEPM Executive Board wants to hear from you!

"Science is facts; just as houses are made of stone, so is science made of facts; but a pile of stones is not a house, and a collection of facts is not necessarily science."

- Jules Henri Poincaré
(1854-1912)
French mathematician

Corporate Sponsorships (2016-2017)

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Your support lifts your corporate name within the Permian Basin.



PBS-SEPM is grateful for the generosity of these fine corporate sponsors!

"No one is useless in this world who lightens the burden of it for someone else"

If you are interested in a sponsorship opportunity, please call PBS-SEPM for more details at (432) 279-1360 or e-mail info@pbs-sepm.org.

- Benjamin Franklin



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We're on the Web!
www.pbs-sepm.org

“..In reply, I can only plead that a discovery which seems to contradict the general tenor of previous investigations is naturally received with much hesitation.”

Charles Lyell,
British Lawyer, Geologist,
(1797 - 1875)

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

Our non-profit society relies entirely 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. Additionally, we are involved on the 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-SEPM, you may visit our website (www.pbs-sepm.org) to learn more about us, download a membership form, and learn how to get involved.

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“Volunteering is an excellent way to provide meaning in your life and help give back to your local community.”

Peter Muggerridge