



# THE OHIO GEOLOGICAL SOCIETY

*An Affiliate (1963) of the American Association of Petroleum Geologists (AAPG)*

The Newsletter of the Ohio Geological Society

October 2001

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## PRESIDENT'S COLUMN

Well, I hope everyone's life is starting to return to normal after last month's tragedy. For our part of trying to get things back to normal, we will be holding our annual joint meeting with the Appalachian Geological Society on Tuesday, October 30, at the Holiday Inn in Marietta, Ohio. This is the third year in a row that OGS and AGS have held a very successful joint meeting. OGS and AGS will be hosting the AAPG Distinguished Lecturer, Dr. Roger Slatt, University of Oklahoma, who will be speaking on *Outcrop/Behind Outcrop Characterization of Deepwater (Turbidite) Petroleum Reservoir Analogs: Why and How*. This is a really fascinating talk on describing detailed stratigraphy in 3-D at the outcrop level and then applying that information into the subsurface. The meeting will start at 11:30 a.m., with lunch being served at 12 p.m. Please call Ron Rea at (740) 548-7348 to make reservations by 12:00 p.m. on Monday, October 29.

The PTTC workshop on *Optimized Horizontal Well Technology*, which was originally schedule for September 17, has been rescheduled for November 1 at the H.R. Collins Lab at Alum Creek State Park. PTTC will offer an opportunity for Appalachian basin operators to attend an excellent workshop on modernized exploitation technology, with a special emphasis on horizontal well design. Advanced drilling and completion technologies also will be discussed, as well as how to build asset teams and management tools. This workshop is Part A of a reduced 2-day workshop, with Part B to follow in mid December. Both will be offered at a reduced registration fee that is approximately 10% of the normal fee. More information on this workshop can be found on the PTTC website at <http://karl.nrcce.wvu.edu> Or you can contact Doug Patchen at West Virginia Geological Survey at 304-594-2331 or e-mail Doug at [dpatch@wvunrccce.nrcce.wvu.edu](mailto:dpatch@wvunrccce.nrcce.wvu.edu)

A couple of other events are coming up soon. On **October 26**, the Ohio Geological Survey will be having a banquet to award the Survey's Mather Medal award. The award will be honoring the combined 77 years of contributions to Ohio geology and particularly ground water resources by Al Walker and Jim Schmidt, long-time employees of ODNR, Division of Water. Al Walker and Jim Schmidt were the first geologists to map in detail the groundwater aquifers in the state. They are going to be honored for this and their other accomplishments at a banquet at the Ohio State University's Fawcett Center. For more information, please contact Mark Wolfe, Ohio Geological Survey at 740-548-7348, ext. 26, or by e-mail at [mark.wolfe@dnr.state.oh.us](mailto:mark.wolfe@dnr.state.oh.us). The Water Management Association of Ohio (WMAO) will be having their annual meeting **November 7-8**, at the Holiday Inn East, Columbus, Ohio. For more information, please contact Lenn Black, ODNR Division of Water, 614-265-6758 ([leonard.black@dnr.state.oh.us](mailto:leonard.black@dnr.state.oh.us)). Finally, OOGA, on **November 14**, will be having the Appalachian Producers Marketing Seminar at the Adam's Mark Hotel, Columbus, Ohio. Sponsored by the Ohio Oil and Gas Association and the Independent Oil and Gas Associations of WV, NY and PA. For more information, please contact Tom Stewart at (740) 587-0444 or my e-mail at [tstewart@ooga.org](mailto:tstewart@ooga.org)

## UPCOMING OGS MEETINGS AND EVENTS

The Ohio Geological Society and the Appalachian Geological Society will be having a joint meeting **Tuesday, October 30, at the Holiday Inn in Marietta, Ohio.** The Holiday Inn is located off Exit 1 of I-77 on the east side of the Interstate. Phone number is (740) 373-1762. We will meet at 11:30 a.m. for a social reception, at 12:00 p.m. lunch will be served and the talk is from 12:45 p.m. to 1:45 p.m. Lunch will be the All American buffet and the cost is \$15.00. Please call Ron Rea at (740) 548-7348 to make reservations by 12:00 p.m. on Monday, October 29.

### **2001-2002 AAPG Distinguished Lecture - Roger M. Slatt, University of Oklahoma, Norman, OK**

#### **Abstract: Outcrop/Behind Outcrop Characterization of Deepwater (Turbidite) Petroleum Reservoir Analogs: Why and How**

Increased emphasis on exploration for deepwater (turbidite) reservoirs during the past 25 years has resulted in many discovered fields. The current trend is for companies to fast-track field development, with minimum drilling, no workovers or intervention, increased use of subsea tiebacks, optimal individual well rates and ultimate recoveries, and expanded perforated intervals. To accomplish this requires a good understanding of the architecture of these reservoirs, and early prediction of their production performance based upon reservoir simulation.

Geologic models that are used for simulation are often built using a limited number of appraisal wells, which may hinder accurate bed correlations, and 3D seismic, which may not resolve sub-seismic scale geologic features that control production, and thus the economic viability of the project. During the past few years, quantitative characterization of outcrops has supplemented subsurface data in the model-building process. However, to adequately document important reservoir properties at the wellbore, interwell and reservoir scales requires studying large, continuous outcrops, preferably in 3D. Unfortunately, such outcrops are rare, so that incomplete characterizations of reservoir analogs are normally the end product. In addition, mud-prone, thin-bedded deposits, which form a major portion of global deepwater reservoirs, normally do not provide as good an outcrop exposure as do sand-prone, thicker-bedded deposits. Thus, accurate characterizations of the thin-bedded deposits are difficult to achieve. Incomplete models, or use of the wrong model for simulation, have given rise to **one school of thought** that regards outcrop data as being of limited value.

Despite these shortcomings, a **second school of thought** considers quantitative outcrop characterization as providing valuable information, particularly at the critical interwell scale. Information on shale- and sandstone-bed continuity, vertical connectivity, internal geometry and hierarchy of architectural elements, as well as stratigraphic variations in permeability are all important input attributes for understanding well performance, as well as for geostatistical modeling, upscaling geologic parameters, and providing well log recognition criteria for predicting continuity away from a wellbore.

Several tools and techniques are used to characterize outcrops. Photomosaics and immersive 3D visualization photoimaging provide a means of capturing architectural information in an electronic format amenable to overlay onto seismic sections or between wells. Logging, coring, and collecting seismic reflection data behind outcrops, as well as collecting gamma ray, sonic velocity, and permeability profiles along outcrop faces provide data that can be directly compared with subsurface well logs and seismic. Ground-penetrating radar (GPR) provides the only means currently available for continuously imaging small-scale features behind an outcrop face.

These techniques have been successfully applied to outcrops of three mud- and mud/sand-prone deepwater (turbidite) deposits. Studies of the Upper Cretaceous **Lewis Shale** (southwest Wyoming) have provided: (a) a high-frequency sequence stratigraphic framework for detailed correlation purposes; (b) borehole image criteria to distinguish sheet from leveed-channel sandstones; (c) quantitative 2D bed continuity and connectivity information; (d) GPR images of the complex nature of the critical boundary between channel and levee/overbank deposits; and (e) a framework for development of a partial 3D model of sheet and leveed channel deposits at reservoir scale. Studies of the Lower Pennsylvanian **Jackfork Group** (Arkansas and Oklahoma) have provided: (a) a sequence stratigraphic framework; (b) interwell-scale 3D geologic models of channel and sheet sandstones, including one which has been subjected to 'reservoir' simulation; (c) quantitative bed continuity data at the interwell scale; and (d) GPR imaging for stratigraphic detail and paleocurrent analysis. Studies of the Late Miocene **Mt. Messenger Formation** (New Zealand) have provided: (a) a sequence stratigraphic framework; (b) dipmeter criteria to distinguish channel, proximal- and distal-levee deposits; (c) detailed thin-bed continuity and connectivity data; and (d) internal architecture of levee and channel-fill strata from outcrop and high-resolution seismic images.

Although complete 3D outcrop geologic models of these deepwater (turbidite) deposits at reservoir scale are still elusive, the results provide important information that is directly applicable to interpreting and predicting well as for geostatistical modeling, upscaling geologic parameters, and providing well log recognition criteria for predicting continuity away from a wellbore.

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Although complete 3D outcrop geologic models of these deepwater (turbidite) deposits at reservoir scale are still elusive, the results provide important information that is directly applicable to interpreting and predicting performance of analog reservoirs. Characterization of outcrops using the combination of tools and techniques described here should continue with the ultimate goal of providing the necessary quantitative information to help guide fast-track development of deepwater (turbidite) reservoirs.

# PUBLICATIONS

The in-print publications of the Ohio Geological Society may be purchased from the Ohio Division of Geological Survey. Members of the Society receive a discount; the member price is in parentheses (M:). For more information, write the Ohio Geological Society, P.O. Box 14304, Columbus, OH 43214.

**OGS 1. Guidebook to the Middle Devonian rocks of north-central Ohio**, by A. Janssens. 30 p., 1970. \$2.50. (M: \$2.00).

**OGS 2. Geology of Silurian rocks, northwestern Ohio**, by C. F. Kahle and J. C. Floyd. Guidebook for First Annual Meeting, Eastern Section, American Association of Petroleum Geologists. 91 p., 1970. \$7.00 (M: \$6.00).

**OGS 3. Seminar on industrial self-help programs for natural gas supplies**, edited by Arie Janssens. 55 p., 15 figs., 1 table, 1977. \$3.50 (M: \$3.00).

**OGS 4. Clinton sandstone papers presented at the Ohio Oil and Gas Association Winter Meetings 1961 to 1978** (abridged reprint of 1980 volume). 228 p., 1985. \$25.00 (M: \$20.00).

**OGS 5. The new Clinton collection--1985**, edited by Jack Gray, Andy Maslowski, Warren McCullough, and W. E. Shafer (2nd printing). This edition includes a transcript of "Deeper Clinton-Medina drilling in southeastern Ohio" from a March 1986 Ohio Geological Society meeting. 257 p., 1985. \$25.00 (M: \$20.00).

**OGS 6. Principles of seismic exploration**. A collection of papers from a seminar presented at the 1987 AAPG Eastern Section meeting. 1987. Out of print.

**OGS 7. Computer-aided analysis of geologic data**, edited by Lawrence H. Wickstrom. A collection of papers from a seminar presented at the 1987 AAPG Eastern Section meeting. 100 p., 1987. \$15.00 (M: \$12.00).

**OGS 8. Maps and cross sections of the Cambrian and Lower Ordovician of central Ohio**, by G. G. Shearrow. 31 p., 8 pls., 1987. \$12.00 (M: \$10.00).

**OGS 9. An update on Ohio's subsurface geology**. Proceedings from the October 1993 technical symposium held in Canton, Ohio. 11 papers, separately paged, 1993. \$25.00 (M: \$20.00).

**OGS 10. The Ohio Geological Society anthology, the Morrow County, Ohio "oil boom" 1961-1967 and the Cambro-Ordovician reservoir of central Ohio**, edited by William E. Shafer. 452 p., 1994. \$65.00 (M: \$55.00).

**OGS 11. Major natural gas plays of the Appalachian basin and surrounding areas**. Proceedings from the October 1994 technical symposium held in Canton, Ohio. 11 papers, separately paged, 1994. \$25.00 (M: \$20.00).

**OGS 12. Structural influences on oil and gas reservoirs**. Proceedings from the October 1995 technical symposium held in Canton, Ohio. 14 papers. 129 p., 1995. Out of print.

**OGS 13. Enhanced recovery--historical development and future potential in Ohio and the Appalachian Basin and Integration of geology and geophysics in exploration**. Proceedings from the October 1996 technical symposium held in Akron, Ohio. 16 papers. 209 p., 1996. \$25.00 (M: \$20.00).

**OGS 14. Ohio Geological Society Fifth Annual Technical Symposium**. Proceedings from the November 1997 technical symposium held in Akron, Ohio. 11 papers. 117 p., 1997. \$25.00 (M: \$20.00).

**OGS 15. Petroleum Seismology in the Digital Age**. Course notes from the Ohio Geological Society's 3-D Seismic Seminar presented at the 1998 AAPG Eastern Section meeting. \$20.00 (M: \$15.00).

**OGS 16. Fossil Collecting in the Silica Formation at Sylvania, Ohio**. Guidebook for the 1998 AAPG Eastern Section meeting. 16 p., 1998. \$7.00 (M: 6.00).

**OGS 17. Into The New Millennium: The Changing Face of Exploration In The Knox Play**. Proceedings from the Sixth Annual Fall Symposium held in Akron, Ohio, October 1999. 12 papers. 120 p., 1999. \$25.00 (M: \$20.00).

To order any of the Society's publications call or write: The Geologic Records Center, Ohio Geological Survey, 4383 Fountain Square Drive, Columbus, Ohio 43224-1362. Telephone (614) 265-6576. E-mail: [geo.survey@dnr.state.oh.us](mailto:geo.survey@dnr.state.oh.us).

#### **Meetings and Events:**

**October 23 - PTTC Workshop: A Case Study of an Upper Devonian Sandstone Oil Reservoir;** Morgantown, WV.  
Contact: 304-293-2867 ext. 5446

**October 26 - Mather Medal Award;** The Ohio Geological Survey will be presenting the W.W. Mather Medal to Alfred C. Walker & James J. Schmidt, at the OSU Fawcett Center. The award will be honoring the combined 77 years of contributions to Ohio geology and particularly ground water resources by Al Walker and Jim Schmidt, long-time employees of ODNR, Division of Water. Al Walker and Jim Schmidt were the first geologists to map in detail the groundwater aquifers in the state. 6:00 p.m. Social Time, 7:00 p.m. Dinner. Cost is \$26. Reservations must be made by October 19, 2001. For more information, please contact Mark Wolfe: Phone: 740-548-7348, ext. 26, FAX: 740-657-1979 e-mail: mark.wolfe@dnr.state.oh.us

**November 1 - PTTC Workshop: Keys to Optimized Exploitation in Marginal Areas,** with Maurer Technology Inc. On November 1, PTTC will offer an opportunity for Appalachian basin operators to attend an excellent workshop on modernized exploitation technology, with a special emphasis on horizontal well design. Advanced drilling and completion technologies also will be discussed, as well as how to build asset teams and management tools. This workshop is Part A of a reduced 2-day workshop, with Part B to follow in mid December. Both will be offered at a reduced registration fee that is approximately 10% of the normal fee. The workshop will be held in Delaware, Ohio in the Horace R. Collins Laboratory in Alum Creek State Park. Contact: 304-293-2867 ext. 5446

**November 5-8 - Geological Society of America Annual Meeting;** Boston, MA. For More Information: Call: (303) 447-2020 or 1-800-472-1988, Fax: 303-447-0648, E-mail: meetings@geosociety.org

**November 7-8 - WMAO Annual Fall Conference.** Holiday Inn East, Columbus, Ohio. For more information, please contact Chair: Lenn Black, ODNR Division of Water, 614-265-6758 (leonard.black@dnr.state.oh.us). Website: <http://www.ohiowater.org/wmao/webwmao.htm>

**November 8 - PTTC Workshop: Field-Oriented Research Projects for Independents.** PTTC will bring together six independent operators who are conducting field-oriented research projects funded by DOE. Case studies of all six projects will be presented, two of which are Appalachian basin projects funded through the Stripper Gas Well Program. Summaries of the following will be presented: Low Cost Methodologies to Analyze and Correct Abnormal Production Declines in Stripper Gas Wells (James Engineering), Advanced Technologies for Stripper Gas Well Improvement (Holditch Reservoir Technologies), On-Lease Power Generation (American Warrior), Water flooding (Coral Production company), Developing Marginal Expenses Oil Well Wireless Surveillance System (Hunter Living Trust; Hunter Edison Oil Development), and Solving Declining Production Problems (MNA Enterprises LTD). The workshop will be held at the Holiday Inn in Washington, PA. Contact: 304-293-2867 ext. 5446.

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