



**Joint Session with SPE  
Radisson - Green Tree  
11 November 2008**

**Guilt and Absolution in Naturally Fractured Reservoir  
Characterization: The Cause and Devilish Effect of Heterogeneity**

*presented by*

**Wayne Narr**

Chevron Energy Technology Co.

**Abstract:**

The behavior of naturally fractured reservoirs (NFRs) is typically difficult to predict due to extreme heterogeneity of their flow-related character. This unpredictability affects most aspects of field management; surprises can accompany each well.

From our well-based scale of observation, we sample and test reservoir fracture systems below their representative elemental volume (REV). This is the ultimate cause of the unpredictability of their flow behavior. Heterogeneity is caused by the complex and variable geometry and connectivity of the plumbing system of the reservoir (well, fractures, and matrix). Connectivity is a function of:

- a) Orientation of a well relative to reservoir fracture sets,
- b) Spacing of fractures in each set,
- c) Spatial variability of the fracture system,
- d) Effective length of fractures,
- e) Fracture height, and
- f) Fracture-matrix interaction (effective porosity, transfer).

What do we know, what might we know, and what are the limits of our knowledge? Which of the controlling variables can we understand and measure, to help predict aspects of reservoir performance? The one idea that I would like members to take away from is lecture is:

because we sample the reservoir below its REV, there are limits to what can be known from downhole data alone; it must be placed into a larger context. Our understanding of these data requires that the NFR be interpreted in light of a) competent geologic understanding of fracture systems, integrated fully with b) sound, creative, engineering insight of observed flow behavior. This approach does not guarantee salvation, but it improves the odds.

**Biography:**

Wayne is a Research Consultant on the Reservoir Simulation Research Team at Chevron Energy Technology Company in San Ramon, CA.

He is a structural geologist, and works on both technology development and consulting projects involving characterization of naturally fractured



reservoirs. His earlier industry experiences include a variety of structural geology interpretation work, mainly involving complexly deformed fold-thrust belts, as well as related technology appraisal and development. Previous positions at Chevron include leadership of the Structural Geology Team, and exploration geologist, with focus on Northern South America.

Prior to this he held both exploration and research positions at Gulf Oil Corporation. Wayne earned a Ph.D. in geology from Princeton University (1990), an M.Sc. from University of Toronto (1978), and a B.S. from Pennsylvania State University (1976).

**For reservations to this informative and entertaining evening, please complete the attached reservation form.**

## WHAT IS THE PAPG?

PAPG is a non-profit organization founded in 1984 to provide a forum for Petroleum Geologists in the Pittsburgh Area to meet socially and discuss technical topics relative to the exploration and development of reserves in the Northern and Central Appalachian Basin. PAPG is an affiliated association with AAPG (American Association of Petroleum Geologists) and has representation in the House of Delegates. Educational opportunities are provided via field trips, seminars and AAPG Sectional meetings, sponsored solely by PAPG or in conjunction with the PTTC (Petroleum Technology Transfer Council), PGS (Pittsburgh Geologic Society) and SPE (Society of Petroleum Engineers).

Although PAPG is predominately a geologic organization, numerous industry professionals including geophysicists, engineers, lawyers and landmen are among PAPG's members and find the interaction at meetings and educational opportunities beneficial to their professions. PAPG also encourages student membership and participation.

Meetings are typically held monthly from September through May in locations within 50 miles of downtown Pittsburgh. From time to time, meetings are held in conjunction with SPE and PGS.

## NEWS AND EVENTS

**PAPG Website:** Visit the website at <http://www.PAPGrocks.org>.

### **Mark your calendar now for these upcoming events:**

**October 30<sup>th</sup> 2008, Bridgeville PA**

**Young Petroleum Professionals - Happy Hour**

**The Bottleshop Café - 5:30pm**

**RSVP to Kirby Walker - [walker26@pittsburgh.oilfield.slb.com](mailto:walker26@pittsburgh.oilfield.slb.com)**

**December 11<sup>th</sup> 2008, Pittsburgh PA**

**2008 PAPG/SPE Annual Holiday Party**

**Penn Brewery**

**More Detail to come.**

**January 15<sup>th</sup> 2009, Pittsburgh PA**

**January PAPG Meeting**

**Dick Smosna - Sedimentological Studies from the Dominion-WVU Co-Op Program - With Examples from the Murrys ville, Bradford and Weir.**

**February 19<sup>th</sup> 2009, Pittsburgh PA**

**February PAPG Meeting**

**Connie Jump - Bakken Shale**

**March 2009, Pittsburgh PA**

**March PAPG Meeting**

**Susan Humphris - AAPG Dist Lecturer - Relationship Between Volcanism, Tectonism and Hydrothermal Activity Along the Mid Ocean Ridge System.**

**April 15<sup>th</sup> 2009, Pittsburgh PA**

**April PAPG Meeting**

**Nathan Bennett - History and Future of Oil and Gas Drilling in the PA State Forest System.**

### **Employment Opportunities:**

#### **Geophysicist**

West Virginia University, Dept of Geology and Geography

Morgantown, WV

For More information visit <http://www.geo.wvu.edu/content/geophysics-tenure-track-position-available>

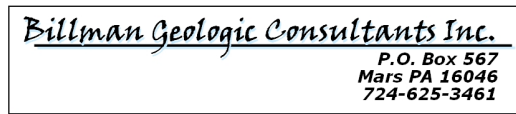
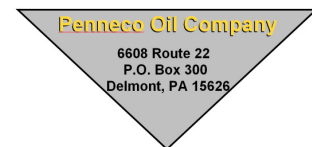
For more details on this listing and other listings visit the classified section of [PAPGrocks.org](http://www.PAPGrocks.org)

***Have information you want to share with the organization?***

***Please contact the secretary to add the information to the next newsletter.***

## SPONSORS

The PAPG wishes to thank the companies who have contributed to the PAPG 2008-09 season.



### Sponsor Information

*If you or your company would like to sponsor the PAPG and help support the continuation of our Meetings, Field Trips, and other events, we ask that you send a donation to the PAPG. Any contribution of \$100.00 or more by any group or individual will be recognized on our website, in the monthly newsletter, and at scheduled monthly meetings.*

*We ask that you show your support for the PAPG by a contribution and your continuing attendance at the monthly meetings.*

*We appreciate your continued support.*

**Contributions may be sent to: PAPG, PO BOX 16352, GREENTREE PA 15242-0352**

## CONTACT THE PAPG

### PAPG Officers:

- President:** **Jim Pancake** --Equitable Production Co.  
Phone: 412-395-3912  
Email: [jpancake@eqt.com](mailto:jpancake@eqt.com)
- Vice President:** **Eric Ober** -- Texas Keystone, Inc.  
Phone: 412-388-0917  
Email: [eober@texaskeystone.com](mailto:eober@texaskeystone.com)
- Secretary:** **Dave Boyer** -- Texas Keystone, Inc.  
Phone: 412-434-5616  
Email: [dboyer@texaskeystone.com](mailto:dboyer@texaskeystone.com)
- Treasurer:** **Tracee Imai**-- Schlumberger DCS.  
Phone: 412-787-5403  
Email: [timai@slb.com](mailto:timai@slb.com)
- AAPG Delegate:** **Doug Patchen** – Petroleum Technology Transfer Council  
Phone: 304-293-2867 ext 5443  
Email: [doug.patchen@mail.wvu.edu](mailto:doug.patchen@mail.wvu.edu)

## PAPG 2008-2009 DUES

### **PAPG dues for the 2008-2009 season are now DUE!**

*The membership form is attached to this newsletter. Please fill the form out **completely** so that we can ensure that we have your latest contact information. We are planning to publish a membership directory this year and your updated information is crucial.*

# NOTICE OF NOVEMBER 2008 MEETING PITTSBURGH ASSOCIATION OF PETROLEUM GEOLOGISTS

**DATE:** Tuesday 11, September 2008

**PLACE:** Radisson Hotel - Greentree  
101 Radisson Drive, Pittsburgh, PA 15220  
412-922-8400

**TIME:** 5:00 PM – Social Hour (w/ Cash Bar)  
6:00 PM – Dinner  
7:00 PM – Speaker

**TOPIC:** “**Guilt and Absolution in Naturally Fractured Reservoir Characterization: The Cause and Devilish Effect of Heterogeneity.**”

**SPEAKER:** Wayne Narr - Chevron Energy Technology Co.

**COST:** \$30.00  
\$10.00 Students  
(Checks payable to SPE)

**DINNER OPTIONS:** Romano Battered Orange Roughy  
or  
Chicken Milanese

**RESERVATIONS:** Call, email, fax, or mail this reservation form by November 6, 2008 to:

**Barbara A. Purks**  
412-787-5403 (phone)  
412-787-2906 (fax)  
bpurks@pittsburgh.oilfield.slb.com

---

---

NAME(S) \_\_\_\_\_

COMPANY  
\_\_\_\_\_  
\_\_\_\_\_

DINNER CHOICE(S)  
\_\_\_\_\_



**P·A·P·G**

Pittsburgh Association of  
Petroleum Geologists

An AAPG Affiliated Society

www.papgrocks.org

## **APPLICATION FOR MEMBERSHIP AND MEMBERSHIP RENEWAL**

PLEASE INDICATE YOUR MEMBERSHIP STATUS BY CHECKING THE APPROPRIATE BOX:

PROFESSIONAL - RENEWAL

STUDENT - RENEWAL

PROFESSIONAL – NEW MEMBERSHIP

STUDENT - NEW MEMBERSHIP

The **PITTSBURGH ASSOCIATION OF PETROLEUM GEOLOGISTS** membership year runs from JUNE 1 through MAY 31. Monthly meetings are usually held the second Thursday of the month from September through May.

**Professional Dues are \$25.00 per year**

**Student Dues are \$10.00 per year**

**NEW APPLICATION:** If you have never been a member of PAPG, please fill out the remainder of the form, obtain the signatures of two members to sponsor you, and mail check, payable to PAPG, to the address below.

**RENEWAL:** Please fill out the mailing address/directory information below if your contact information has changed and submit dues, payable to PAPG, to the address below.

**Mail completed form and dues payment (checks only - Payable to PAPG) to:**

Dave Boyer  
Texas Keystone, Inc.  
560 Epsilon Drive  
Pittsburgh, PA 15238

### **MAILING ADDRESS / DIRECTORY INFORMATION – PLEASE COMPLETE ALL INFORMATION**

NAME \_\_\_\_\_ DATE \_\_\_\_\_

COMPANY / UNIVERSITY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

JOB TITLE: \_\_\_\_\_

EMAIL: \_\_\_\_\_ **Please fill this in – help us save those mailing costs!**

PHONE: ( ) \_\_\_\_\_ - \_\_\_\_\_

FAX: ( ) \_\_\_\_\_ - \_\_\_\_\_

**WOULD YOU BE INTERESTED IN PAPG PARTICIPATION?:** Officer Speaker

**WOULD YOU LIKE YOUR CONTACT INFORMATION PLACED  
IN THE MEMBERSHIP DIRECTORY (available to members only?)** Yes No

### **TWO SPONSORS REQUIRED for NEW MEMBERS**

Name \_\_\_\_\_ Date \_\_\_\_\_

Name \_\_\_\_\_ Date \_\_\_\_\_