

## FEBRUARY 2008

### MGS Luncheon February 26<sup>th</sup>

**Speaker:**

**Dr. Katherine Giles**  
AAPG Distinguished  
Lecturer

**Topic:**

**Tracking the Migration  
of Salt Diapirs Using  
Halokinetic Sequence  
Stratigraphy**  
(See Abstract pg. 3)

**All MGS meetings are  
held at the Billings  
Petroleum Club at  
11:45 a.m. unless  
otherwise noted.**

**Members who do not  
receive an e-mail  
reminder can RSVP  
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### PRESIDENT'S LETTER – Bob Schalla



It's February and all is well. Gas prices are finally moving up a little and oil has retreated back from what might justifiably be considered an unreasonable peak. It seems it was just a few short years ago that some Minnelusa crude was selling for less than ten bucks a barrel. What a great business!

In past columns I have discussed the society's plans for future field trips and publications. This month I'll give you an update on what the Continuing Education Committee has been working on.

For starters, Andy Hennes and Brad Thompson have been working with Committee chairman Joe Carlisle to bring another PTTC sponsored 2-day workshop to Billings. This school, which is tentatively scheduled for the first week of May, will be taught by Eric Dahlberg. The course title will be "Applied Hydrodynamics in Petroleum Exploration". We are hoping that this topic will have broad appeal and will attract not only petroleum geologists and engineers, but possibly people involved in ground water and environmental geology as well. The price is likely to be \$250 for MGS members and \$300 for non-members. Watch for an announcement in a future newsletter.

In addition to the PTTC course, the Committee is also working on a half-day seminar put on by Core Labs that will address the new technologies they have to offer, especially in regard to the Bakken and other current plays. In addition we may also get a half-day presentation by Schlumberger aimed to bringing everyone up to speed on the latest developments in open and cased-hole logging. So tie all of this in with the field trips we have planned and it looks like it will be a fun and productive summer.

Now for my non-sequitur of the month ...when all else fails, I go out in the backyard and "rassle" the mule (two outa three falls, ... she usually wins).

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## And Now for Some Science Trivia!

### How much space dust falls to Earth each year?

Estimates vary, but the USGS says at least 1,000 million grams, or roughly 1,000 tons of material enters the atmosphere every year and makes its way to Earth's surface.

### How far does regular dust blow in the wind?

A 1999 study showed that African dust finds its way to Florida and can help push parts of the state over the prescribed air quality limit for particulate matter set by the U.S. Environmental Protection Agency. The dust is kicked up by high winds in North Africa and carried as high as 20,000 feet (6,100 meters), where it's caught up in the trade winds and carried across the sea. Dust from China makes its way to North America, too.

### How much surface area does Earth contain?

There are 196,950,711 square miles (510,100,000 square kilometers).

### How much of the Earth's land surface is desert?

About one-third.

### What is the fastest surface wind ever recorded?

The fastest "regular" wind that's widely agreed upon was 231 mph (372 kph), recorded at Mount Washington, New Hampshire, on April 12, 1934. But during a May 1999 tornado in Oklahoma, researchers clocked the wind at 318 mph (513 kph).

### How much gold has been discovered worldwide to date?

More than 193,000 metric tons (425 million pounds). If you stuck it all together, it would make a cube-shaped, seven-story structure that might resemble one of Donald Trump's buildings.

### What are the most extreme locations in the United States, compass-wise?

This one is a bit tricky, and as it turns out three or even four of the answers may catch you off guard. The westernmost point is the aptly named West Point of Amatignak Island, Alaska. The northernmost point is Point Barrow, Alaska. The southernmost point is the southern tip of the island of Hawaii. The easternmost point -- go ahead, take a guess! -- is Pochnoi Point at Semisopochnoi, Alaska. Huh? Look at a world map. The tip of the Aleutian Islands lies on the other side of the 180-degree longitude line --- the International Dateline -- putting Pochnoi Point barely but officially in the Eastern Hemisphere.

Source: Space.com



## AAPG Abstract

### Tracking the Migration of Salt Diapirs Using Halokinetic Sequence Stratigraphy by Katherine Giles

(Editor's note: Dr. Giles will be speaking at the Feb. 26<sup>th</sup> MGS luncheon.)

The progressive migration of diapiric salt bodies can be interpreted using stratal and structural relationships present in the sedimentary packages that surround them. Distinctive near-diapir growth stratal packages associated with vertically moving passive diapirs are referred to as "halokinetic sequences". Halokinetic sequences are angular unconformity bounded, growth-stratal packages that form due to temporal variations in relief over passively rising diapirs. These stratal packages document the dynamic interplay between salt movement and adjacent sedimentation.

Two end-member types of halokinetic sequences (Type A and Type B) have been recognized on outcrop in the shelfal strata of La Popa salt basin, Mexico. The types differ in depositional facies, maximum degree of internal folding, amount of fault reactivation on unconformities, overall sedimentation rate, and distance of halokinetic sequence termination from the salt/sediment interface. Type A sequences are associated with periods of overall very low sediment accumulation rates typical of marine transgression on the shelf. They contain basal, diapir-derived debris flows encased in outer shelf fine-grained sandstones deposited by hyperpycnal flows that are abruptly overlain by outer shelf black shales. These strata are locally tightly folded with truncation angles of up to 90° at sequence boundaries. Sequence boundaries show significant fault reactivation during later halokinesis and evidence of brittle shear. Type A sequences terminate directly against the diapir. Type B sequences are associated with periods of moderately high sediment accumulation rates typical of marine regression on the shelf. They contain basal, lower shoreface sandstone that shallow upward to tidal and lagoonal sandstone. These strata display minimal folding with truncation angles that are <15°. There is little or no reactivation of the sequence boundaries during later halokinesis. Type B diapir-proximal sequence terminations are spatially separated from the diapir by an average of 250m.

Both styles of halokinetic sequences are seen on seismic lines and can be used to "fingerprint" the fluctuating conditions present near the diapir during migration. The characteristics of the two types of sequences and their stratal arrangement into composite sequences have important implications for reservoir quality, geometry, continuity, and charge potential in diapir-related traps.

In the distal part of the Hidalgoan foreland basin in NE Mexico three, isolated carbonate platforms nucleated on seafloor topography created by vertically rising passive diapirs. The platforms developed in both the Late Cretaceous (Maastrichtian) and early Paleocene and are composed of heterozoan fauna dominated by coralline red algae, benthic foraminifera, sponges, and bivalves. Carbonate facies type and architecture of each platform was distinctly influenced by the complex interplay of both short-term local conditions surrounding individual diapirs and by long-term regional conditions that affected the entire shelf. Local conditions included windward-leeward platform geomorphology, possible cold seeps at the salt-sediment interface, and halokinesis. Regional conditions included eustatic sea-level fluctuations, foreland basin tectonism, and siliciclastic sediment supply to the outer shelf via hyperpycnal flows. No single factor dominates the system, but each plays a recognizable role in the final outcome of facies type, geometry, and initiation and demise of the platform.

Platform facies are distributed asymmetrically across individual diapirs, reflecting windward versus leeward margin paleogeographic setting and differential minibasin subsidence related to salt withdrawal. Carbonate facies form the base of angular unconformity bounded carbonate/siliciclastic cycles called halokinetic sequences. The cycles reflect local variations in net diapiric-rise rates versus local sediment accumulation rates and vary in number and character between the different diapirs and between the windward and leeward margins of each diapir.

The presence of heterozoan faunal assemblages forming the platforms may be in response to high nutrient levels from local methane seeps forming at the salt-sediment interface and from continental runoff. The platforms form in the upper parts of parasequence sets developed within the transgressive systems tract (TST) of 3<sup>rd</sup>-order distal-deltaic siliciclastic depositional sequences. Hidalgoan shortening of La Popa basin formed large wavelength salt-cored detachment folds. Diapirs that lie in the hinges of folds were shortened or "squeezed" significantly more than diapirs that lie on the limbs of folds. Squeezed diapirs generated much higher and broader topographic relief and are dominated by extensive, thick, shallow water (<15m deep) sponge, red algal reef and grainstone bank facies, whereas limb diapirs contain thin, deeper water (>30m deep) silty, red algal packstone facies reflecting lower carbonate production rates in a deeper water setting.

# **SAVE THESE DATES!!!**

An MGS and PTTC sponsored short course titled “Applied Hydrodynamics in Petroleum Exploration & Production will be held **May 1<sup>st</sup> and 2<sup>nd</sup>**. Eric Dahlberg will be the instructor.

More details in next month’s newsletter.

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## **SCHOLARSHIP INFORMATION**

### **COLLEGE STUDENT SCHOLARSHIP ANNOUNCEMENT**

The Billings Section of the Society of Petroleum Engineers (SPE), Inc. is pleased to announce the availability of scholarships to qualified Montana Tech and Montana State students enrolled in a petroleum related engineering curriculum. These scholarships are not need based. The recipients will be chosen based upon academic merit, extracurricular activities, and written essays. Two \$1500.00 scholarships will be awarded in the spring of 2008 – one to a student entering his or her sophomore year and one to a student entering his or her junior or senior year. The funds will be paid to the students upon verification of enrollment in an accredited engineering program. Applications must be received by March 19, 2008. Applications received after this date will not be considered. Scholarship applicants will be notified by mail by April 25, 2008. Contact [billings.spe.org](http://billings.spe.org) for a scholarship application.

### **HIGH SCHOOL STUDENT SCHOLARSHIP ANNOUNCEMENTS**

#### **BILLINGS SECTION SCHOLARSHIP**

The Billings Section of the Society of Petroleum Engineers (SPE), Inc. is pleased to announce the availability of scholarships to qualified high school seniors intending to enroll in a petroleum related engineering curriculum. All high school seniors that are residents of Montana are eligible to apply. These scholarships are not need based. The recipients will be chosen based upon academic merit, extracurricular activities, recommendations, and written essays. Four \$1000.00 scholarships will be awarded in the spring of 2008 and will be paid to the student’s account at their school upon verification of enrollment in an accredited engineering curriculum. Applications must be received by March 19, 2008. Applications received after this date will not be considered. Scholarship applicants will be notified by mail by April 25, 2008. Contact [billings.spe.org](http://billings.spe.org) for a scholarship application.

#### **GUS ARCHIE SCHOLARSHIP**

The Gus Archie Memorial Scholarship is supported by the Archie Fund of the SPE Foundation. Each year the SPE Foundation, working through the SPE Section Scholarship Support Program, awards the Archie Scholarship to the most outstanding incoming freshman enrolled in an accredited petroleum engineering program. All high school seniors, regardless of residency status, intending to enroll in a curriculum leading to an undergraduate degree in petroleum engineering are eligible.

The Archie Fund endows each scholarship at \$5,000 per year. The program contemplates support of an individual student through four years of university study, provided that he or she makes satisfactory academic progress. The program ordinarily requires a GPA of 3.0/4.0 or higher for the current semester and a GPA of 3.0/4.0 or higher on a cumulative basis. Students rotate off the program after 4 years of scholarship support. Applications must be received by March 19, 2008. Applications received after this date will not be considered. Scholarship applicants will be notified by mail by April 25, 2008. Contact [billings.spe.org](http://billings.spe.org) for a scholarship application.

# MGS PAST PRESIDENT'S DINNER



**Past president Jay Shearer receives  
congratulations on a job well done  
from current president Bob Schalla.**

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## *Wyoming Leads in Royalty Revenue*

Wyoming led all other Rocky Mountain states in federal royalty revenues paid in fiscal 2007. In all, the Minerals Management Service paid out \$1.9 billion to 34 states.

"These revenues from mineral production on federal lands play a crucial role in many state budgets," said Randall Luthi, director of MMS. "The funds support everything from education infrastructure improvements and capital projects."

Wyoming's share of the royalties from oil and gas production totaled \$925,261,906, leading all other states. Other states to receive royalty payments were: Utah, \$135,429,659; Colorado, \$122,940,226; Montana, \$39,158,279; North Dakota, \$13,775,447; and South Dakota, \$1,007,068. Source: Oil Patch Hotline

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- Feb. 7-8**                    **NAPE North American Prospect Expo, Houston, TX**
- April 20-23**                **AAPG Annual Convention, San Antonio, TX**
- July 9-11**                   **RMS-AAPG/COGA Meeting, Denver, CO**
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