

November 2006

MGS Luncheon  
Meetings Schedule  
for November 2006

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

**Friday, Nov. 3rd** - AAPG  
Distinguished Lecturer:  
Marian Warren, Encana -  
“*An Exploration Case  
History: How we made a  
high-impact gas discovery  
in a maturing basin (west-  
ern Canada)*”, \$13.00,  
spaghetti and meatballs,  
coffee, iced tea and dessert.

**Wed., Nov. 8th** - AAPG  
Distinguished Lecturer:  
Stephen Creaney,  
ExxonMobil “*Global  
Petroleum Evaluation -  
The Role of Integrated  
Regional Analysis*”, \$13.00,  
hot roast beef sandwich,  
coffee, iced tea and dessert.

**Wed., Nov. 15th** - Joint  
MGS - Billings Geophysical  
Society meeting: Scott  
Stockton, Vector Seismic  
Processing “*A New Seismic  
Signal Processing Tech-  
nique - Vector High Fidelity  
(VHF)*”, \$11.00, soup and  
sandwich buffet.

Members who do not  
receive an e-mail reminder  
can RSVP by phone by  
calling Doretta Brush at  
Ballard Petroleum  
(406) 259-8790.

## President's letter...

Dwight D. Eisenhower stated “I have always found that plans are useless, but planning is indispensable.” In that spirit of fluid planning, in my new role as MGS President, I seek to increase the number of technical meetings, broaden the types of presentations, and expand our membership.

In addition to supporting talks scheduled by the Billings SPE, MGS encourages its members to volunteer for presentations. These do not have to be presented on PowerPoint. We have equipment to support presentations using overheads, 35-mm slides, and maps or other wall displays. Our presentations need not be limited to petroleum geology. We encourage talks on groundwater, environmental issues, industrial minerals, regional and local geology, and non-geological topics of interest.

The Montana Geological Society has benefited from participating in the AAPG Distinguished Lecture Series, and this year we have scheduled all seven talks. Abstracts for these talks and biographical information on the authors can be found at the [aapg.org](http://aapg.org) website. The speaker's schedule determines the date, so that presentations will not always occur on our regular meeting day of Wednesday. The following is the 2006 AAPG schedule and author's name: Friday, November 3 (Warren); Wednesday, November 8 (Creaney); and Monday, December 4<sup>th</sup> (Hudec). AAPG lectures in 2007 will be scheduled within the following two-week periods: February 19 to March 2 (Dixon), February 29 to March 9 (Bachtel), March 5 to March 23 (Mallet); and March 12 to March 23 (Lowenstern).

We will soon announce our plans for the annual Christmas party to be scheduled in December. We are now planning field trips for next spring and summer and welcome your input and ideas.

I look forward to an interesting year and an opportunity to broaden the scope of our organization to include groundwater, environmental, and other geologists in our area.

Jay Shearer

# Montana Area News

## Area Drilling Remains Steady as Crude Oil Prices Decrease

(excerpted from the Glendive Ranger Review)

Although the differential per barrel for crude oil produced in this area has increased, there hasn't been a slow down in drilling as of yet, according to industry representatives. The benchmark for comparison in prices of crude oil is the West Texas Intermediate price, said Dave Galt, executive director with the Montana Petroleum Association. That price was \$58.50 a barrel on March 22, the price for Williston Basin sweet crude was \$49.25, a difference of \$9.25 per barrel, according to information from the MPA.

Galt said that the closure of a Denver refinery and Canadian imports coming into the pipeline are two things adversely affecting the differential price per barrel. With the Denver refinery closure that crude oil is sent into the same market as the crude oil from Montana and North Dakota and contributes to the fact that pipelines are full right now. The additional supply of Canada crude is growing and contributing to the problem. Crude oil production in 2005 from northeast Montana has doubled since 2004, Galt said. According to North Dakota's Department of Mineral Resources, western Canada crude and condensate production is set to rise from 2.2 million barrels a day last year to 2.6 million barrels a day in 2007 and 3.6 million barrels a day in 2015. A lot of that is coming down here, Galt noted.

The differential is what producers are focused on, said Dave Ballard with Ballard Petroleum of Billings. The differential is based on a combination of transportation costs to refineries and what the local market value of crude is, Ballard said. There is also a variation in price based on gravity, or sulfur content, of the crude. The price differential has been getting larger since December, but the rig counts are staying about the same in this area, so the price fluctuation hasn't affected drilling in this area yet.

Editor's note: End of September price index for West Texas Intermediate was \$62.75/bbl.  
The Oct. 11 price index for Williston Basin Sweet through Plains Marketing was \$36.75/bbl.



### History of Geology

Sir Charles Lyell was born in Scotland in 1797. He attended Oxford University and studied mathematics, law and geology. After attending a lecture by William Buckland his enthusiasm for geology was ignited and became his life's ambition, sending him around the world and leading to the publication of 12 editions of one of the most influential geologic works of all time.

Lyell rebelled against prevailing geologic theories of his day. His theory became summarized by the saying, "the present is the key to the past", meaning that the current geologic processes we view in operation today have been occurring at the same rate throughout earth's history. He believed it was necessary to create a vast time scale to explain the earth's geologic history. This concept was called *Uniformitarianism*.

Lyell authored *The Geological Evidence of the Antiquity of Man* and 12 editions of *Principles of Geology*. He was knighted for scientific accomplishment in 1848 and became a Baron in 1864. Lyell is often referred to as the "father of modern geology".

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## Huge Growth in Stone Market



Dimension stone is natural rock material quarried to produce blocks or slabs that can be used directly in construction. It is used for a variety of building applications, from monuments, building facing, flagging, curbing, flooring and stair treads to countertops, roofing and more. The market in the U.S. for dimension stone is exploding and demand for the product has increased five fold since 1980. In 1980 the U.S. used about \$250 million worth of dimension stone. In 2003 that figure rose to over \$2.5 billion.

The increase in demand is largely due to a growing interest in natural stone for residential construction, urban architecture and institutional construction. Natural stone, though heavy, is strong, extremely durable and maintenance free, and most people just like the way it looks.

U.S. production has remained relatively level through this time period and the market is largely being met by imports. A significant opportunity exists for domestic producers to open new quarries or reopen existing quarries and be competitive with transportation cost advantages in a booming and growing market.



### Global Petroleum Evaluation - The Role of Integrated Regional Analysis

#### Stephen Creaney

ExxonMobil Exploration Co., Houston, Texas  
AAPG Distinguished Lecturer

The evaluation of petroleum systems for new opportunities requires a fully integrated approach to Geoscience often on a broad regional scale. Over the last two decades our ability to execute such studies has been significantly improved by a combination of Geoscience advances and the massive increase in the data handling capability of computer systems.

Modern regional studies incorporate an understanding of geodynamics and structural development with an integrated understanding of sediment accumulation and distribution. The occurrence of source rocks and the timing of load generally control the subsequent evolution of petroleum systems. We refer to the study of this integrated process of basins forming, filling and maturing as Genetic Basin Analysis. As an example the geological evolution of Russia through time provides a good illustration of crustal scale (India collision with Asia), far field processes (transmission of compressional folding and faulting through accretionary crust) impacting the development of petroleum systems (maturation, trap formation and migration) in some of the most productive basins on Earth. In contrast the load-driven processes associated with recent deposition in the Gulf of Mexico provide an end-member example of a basin which is filling and charging today.

The advent of Geographic Information Systems has provided a computing platform perfectly suited to storing and manipulating regional scale, map-based data. By treating maps as data and interacting mapped datasets we can handle very large datasets, observe broad trends in geologic parameters etc.

This presentation will describe the concept of Genetic Basin Analysis and how it results from fully integrated geologic analysis combined with petroleum systems analysis. It will also describe how Geographic Information Systems are used in regional analysis to facilitate this integration as well as provide the platform for spatial analysis of geologic data.

### BLM Names New State Director

#### BLM Billings—

Bureau of Land Management Director Kathleen Clarke has named Gene Terland as the agency's new State Director for Montana and the Dakotas. Terland is a Montana native and holds degrees in fish and wildlife management from MSU. Terland has been BLM's Associate State Director in Utah since 2003. He began his career in Oregon in 1974. He has also served in Idaho and Alaska. Terland will report to Billings before the end of November. He replaces Marty Ott, who retired last year, and will be joined by another Montanan, Associate State Director Howard Lemm, who was named to the post last week. In Montana and the Dakotas, BLM has responsibility for 8.3 million acres of public land and 50 million acres of subsurface mineral estate.



## An Exploration Case History: How we made a high-impact gas discovery in a maturing basin (western Canada)

**Marian Warren**

Encana, Calgary, Alberta, Canada

Haas-Pratt Funded AAPG Distinguished Lecturer

EnCana's 2001 gas discovery at Ferrier, Alberta in the lower Mississippian Banff Formation was a significant new pool discovery in a long-active, competitive part of a maturing basin. Subsequent development of the pool has produced > 50 Bcf equivalent gas + condensate, at gross production rates of up to 100 mmcfe/day. The gas has been produced from dolomitized crinoidal grainstone reservoir, with up to 30% porosity and several hundred mD to several Darcies permeability.

Most drilling east of the foothills in western Canada pursues stratigraphic plays. Earlier drilling in the Ferrier area focussed on subcrop plays in younger Mississippian carbonates, and on overlying Mesozoic clastic plays. A few deepened wells encountered dolomite porosity in the Banff formation, significantly down-dip from its subcrop edge, culminating in local development of three 20-30 Bcf pools in the 1990s. Further exploration drilling encountered only wet porosity or tight limestone.

We used a regional, interdisciplinary exploration approach to high-grade the most prospective play fairways. EnCana's discovery, the largest pool in this new play, was significantly down-dip from known wet porous trends. Our strategy focussed on defining regional stratigraphic, structural and diagenetic fairways, in order to locate 3-D seismic surveys to best image the Banff porosity. Conventional amplitude and AVO analysis, coupled with a regional sequence stratigraphic model, have been critical in distinguishing Banff Formation shales from reservoir, and thus dramatically reducing the initially high reservoir risk on this play. We adjusted our exploration approach and business strategy as our understanding of other play risks, reserve distribution and play fairway evolved.

Marian Warren, a, geologist with EnCana Corporation in Calgary since 2002, has worked on projects in France, Chad and the Alberta foreland basin. Her study, *A High-Impact Gas Discovery in a Maturing Basin*, received the AAPG Best Paper Award in 2004.

### Rocky Mountain Region

#### Active Rig Count

State	9/22/06	9/15/06	8/25/06	9/25/05
Arizona	0	0	0	0
Colorado	96	94	95	79
Idaho	1	1	1	0
Montana	19	17	21	25
Nebraska	0	0	0	0
Nevada	2	1	2	3
New Mexico	23	24	16	16
North Dakota	37	38	34	29
South Dakota	3	3	2	4
Utah	45	44	45	26
Wyoming	112	109	109	86
Regional Total	338	331	325	266
U.S. Total	1754	1737	1756	1451

from Baker Hughes Inc.

# Giant Chevron Oil Discovery Gulf of Mexico

Many people in the petroleum industry are aware of the giant Gulf oil discovery Chevron announced in September. The Jack #2 well at Walker Ridge Block 758, located approximately 275 miles southwest off the New Orleans coast, was drilled in over 7000 feet of water to a subsea depth of 28,175 feet. The well flowed at a rate of 6000 bbls per day. Chevron estimates the area could hold between 3 billion and 15 billion barrels.

More than half a dozen world records for test equipment pressure, depth and duration in deepwater were set during drilling of the Jack well. Perf guns were fired at world record depths and pressures. Drill stem test tools set world records also, conducting the deepest extended drill stem test in deepwater history.

The zone tested in the Jack well represents only about 40 percent of the expected pay interval in this reservoir. The test was conducted during the second quarter of 2006, and the 6000 bbls per day reported rate was a sustained flow test. Chevron is the largest leaseholder in the Gulf of Mexico and is currently developing its \$3.5 billion Tahiti project, located in Green Canyon Block 640, which is scheduled to commence production sometime in 2008. Many industry and government spokesmen have high expectations that the continued development of giant Gulf projects like Tahiti and Walker Ridge will add substantially to the nations domestic oil reserves and relieve dependence on foreign supplies.

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## A New Seismic Signal Processing Technique - Vector High Fidelity (VHF)

**Scott Stockton**

Vector Seismic Data Processing  
Denver, Colorado

The modern seismic method has been increasingly relied on to detect hydrocarbon traps of greater subtlety than ever before. Advances in direct hydrocarbon detection, via AVO, horizontal anisotropy through azimuthal velocity analyses, and direct fracture detection have placed an increased demand on superior fidelity of seismic data, both in terms of signal-to-noise ratio and bandwidth.

Conventional post-stack processing in most exploration areas consists of using time-variant spectral whitening followed by either FXY Decon or Radon Filtering to mitigate the undesirable effects of the spectral balancing.

Previous attempts by Zinsner and others to extrapolate the spectral bandwidth of seismic data have met with mixed results due, in part, to the phase instability inherent in the presence of additive noise – particularly at higher frequencies.

Vector High Fidelity (*Patent Pending*) is a multi-channel process aimed at solving these problems.

The standard seismic trace can be described as:  $S = ? * r + n$ ;

where: S = the seismic trace,

? = the wavelet,

r = the reflectivity series of the earth, and

n = added random noise.

Vector High Fidelity (VHF) utilizes the statistical redundancy available in modern seismic data to make robust determinations of both the noise and the wavelet. This, combined with proprietary algorithms which allow exploiting of the high dynamic-range in floating-point recorded seismic data, allows robust estimation of the detailed reflectivity series. Several examples – both post-stack and pre-stack are shown.

Scott Stockton began his career thirty-five years ago in seismic data processing with Seismograph Service Corporation advancing through several positions from Seismic Analyst, through Center Manager to Regional Processing Manager and Manager of Software Development. He joined Professional Geophysics, Inc. in 1976 where he co-founded their Denver office and lead the company into seismic speculative surveys including design, acquisition, processing and interpretation. In 1987, he became Geophysical Operations Manager for Union Pacific Resources where he ran their field operations world-wide. Scott joined Vector Seismic Data Processing in 2004 as Rocky Mountain Regional Manager. He earned a B.S. in Geophysical Engineering in 1971 and an M.S. in 1976 from the Colorado School of Mines

## *Word of the Month*

How would we have made it through college without a *Dictionary of Geologic Terms*?

Crystalloblastic - a crystalline texture due to metamorphic recrystallization.

A characteristic of this texture is that the essential constituents are simultaneously crystallized and are not formed in sequence, so that each may be found as inclusions in the others.

# REMINDERS

Nov. 1-2	2006	Montana Board of Oil and Gas Conservation hearing (application deadline Oct. 5) Billings
Nov. 5-8	2006	AAPG International Conference and Exhibition, Perth, Australia
Nov. 7	2006	North Dakota state lease sale (nomination deadline Sept. 8) Bismarck
Nov. 9	2006	Colorado BLM lease sale, tentative date (expression of interest deadline July 7)
Nov. 14	2006	Colorado state lease sale (tract request deadline Sept. 15) Denver
Nov. 14	2006	Wyoming Oil and Gas Conservation Commission hearing (application deadline Oct. 30) Casper
Nov. 15-17	2006	8 <sup>th</sup> Annual Unconventional Gas Conference, Calgary
Nov. 18	2006	Rockbusters Ball and Awards presentation, Littleton, CO
Nov. 21	2006	Utah BLM lease sale, tentative date, Salt Lake City
Nov. 28	2006	Montana BLM lease sale, tentative date, Billings
Dec. 5	2006	Wyoming BLM lease sale, tentative date, Cheyenne
Dec. 6	2006	Montana state lease sale (nomination deadline Sept. 26) Helena
Dec. 12	2006	Wyoming Oil and Gas Conservation Commission hearing (application deadline Oct. 30) Casper
Dec. 14	2006	Montana Board of Oil and Gas Conservation hearing (application deadline Nov. 16) Billings
Feb. 12-16	2007	AAPG Winter Education Conference, Houston
April 1-4	2007	AAPG National Conference, Long Beach, CA

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## U.S. Oil Stockpiles Record High as Demand Declines

The U.S. demand for petroleum declined in August compared to a year ago, mainly in deliveries of jet fuel and residual fuel oil, offsetting rising gasoline and diesel deliveries. As summer gas prices reached record highs across the U.S., well over \$3 per gallon in most areas, U.S. consumption declined slightly. But with price drops near the end of August, consumption rebounded and continued to incline. Lower prices at the pumps boosted gasoline demand and deliveries in August rose 1.7 percent above August 2005 figures. In its Monthly Statistical Report for August, API reported that the U.S. stockpiles of crude oil and refined petroleum products were at their highest levels for the end of August in several years due to high imports and record domestic refinery production. U.S. production of gasoline hit its highest level ever at 9.3 million bbls per day as gasoline stocks stood at their highest end-of-summer level since 1998.

Highway diesel fuel continues to show the strongest growth among the major petroleum products. All other refined products, except gasoline, showed sharp declines. Petroleum deliveries fell 2 percent compared to August 2005. A 3 percent drop in jet fuel deliveries and a huge 37 percent decline in residual fuel oil demand led to the overall decline. Residual oil demand crashed as industrial users and electric utilities switched to cheaper natural gas, which has dropped on the NYMEX futures index from over \$14 per MCF in December 2005 to \$6.46 in October 2006.

Deliveries of low-sulfur highway diesel rose a strong 9 percent in August as economic growth pushed demand for freight transport of products. Though crude oil inventories dropped for the fourth consecutive month in August, with month end inventories of 333.2 million bbls, this was the highest August level since 1998, due to increased refinery output. Refined product imports reached their highest end-of-summer level ever, according to API, averaging 3.56 million bbls per day of gasoline and diesel, up 5.5 percent from a year ago.

### **PRICES**

**October 20, 2006**

NYMEX CRUDE OIL \$56.82/bbl

NATURAL GAS SPOT \$7.241/MMBTU HENRY HUB

source: [www.wtrg.com](http://www.wtrg.com)

## MEMBERSHIP RENEWALS AND E-MAIL LUNCHEON REMINDERS

By now all MGS members should have received their “2007 Membership Renewal” form in the mail. If you have not, please contact Bob Schalla at (406) 294-3525 or [covecreekresources@msn.com](mailto:covecreekresources@msn.com). If you received a renewal form with another member’s information on it, please cross out the incorrect information and fill-in the form with your information. Remember annual dues go up to \$ 25.00 for regular members if paid after January 1, 2007.

As noted in the October Newsletter the MGS is no longer making a “call around” to remind members of upcoming meetings. Local members will receive an e-mail reminder, members without e-mail or those who do not receive a reminder (*we are still working the bugs out of the system*), are encouraged to RSVP to Doretta Brush at Ballard Petroleum (406) 259-8790, at least 24 hours prior to the meeting. Please do RSVP if you plan to attend, as the Petroleum Club has a limited amount of flexibility with lunch numbers and holds us to the head count we submit.

## NEW AND RETURNING MEMBERS

The MGS would like to welcome several new and returning members.

Jay Hanson	-	MT Bureau of Mines and Geology, Billings
Lawrence Jones	-	Professor of Geology, Rocky Mountain College
Aaron Wandler	-	Geologist, Nance Petroleum, Billings
Michael Mitchell	-	Navigator Energy, Saint Simons Island, GA
James Barber	-	Hanna Oil & Gas, Fort Smith, AR



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# MGS PUBLICATIONS

MGS - NRGDC Northwestern Geologic Service Sample Logs (MT,ND, SD) <i>Over 2500 sample logs on CD-ROM (regional sets also available)</i>	\$2500.00
2000 Guidebook: <i>Northern Montana &amp; the Montana/Alberta Thrust Belt</i> (2 vol. set) <i>50th Anniversary Symposium</i>	125.00
1998 <i>8th International Williston Basin Symposium</i>	55.00
1998 <i>Core Workshop guide for Williston Basin Symposium</i>	30.00
1997 <i>Big Horn Symposium Guidebook</i>	50.00
1997 MGS-TRGS Field Conference Guide: <i>The Edge of the Crazies: Where the Mountains Meet the Plains</i>	25.00
1996 AAPG Rocky Mountain Section Meeting <i>Expanded Abstracts Volume</i>	25.00
1995 Guidebook: <i>Seventh International Williston Basin Symposium</i>	100.00
1993 Guidebook: <i>Energy &amp; Mineral Resources of Central Montana</i>	54.00
1991 <i>6th International Williston Basin Symposium</i>	55.00
1991 Guidebook: <i>Geology &amp; Horizontal Drilling of the Bakken Formation</i>	50.00
1991 Field Trip Guides; <i>Beartooth Mountains</i> <i>Sequence Stratigraphy of the Eagle ss at Billings</i>	7.50
1989 Guidebook: <i>Geologic Resources of Montana</i>	80.00
1986 Guidebook: <i>Geology of the Beartooth Uplift and Adjacent Basins</i>	45.00
1985 Symposium: <i>Montana Oil &amp; Gas Fields</i>	55.00
1978 <i>Economic Geology of the Williston Basin</i>	100.00
1971 <i>Catalog of Stratigraphic Names</i>	10.00
1969 Guidebook: <i>Economic Geology of Montana</i>	8.50
1951 <i>BGS 2nd Annual Central Montana Field Conference</i>	12.50
1950 <i>BGS 1st Annual Field Conference</i>	12.50

**PHONE ORDERS: Doretta Brush (406) 259-8790**

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