



MONTANA GEOLOGICAL SOCIETY

NEWSLETTER

MGS Vol. 53 No. 2

February 2009

**MGS Meeting 11:45 AM
WED, Feb 18th, 2009**

**Gerald Dickens, Ph.D.
Rice University, Houston, TX.**

"Early Cenozoic Climate and
Carbon Cycling: The Sedimentary
Record of Global Warming
and Massive Carbon Input."

See abstract on Page 4.

Members who do not
Receive an e-mail
Reminder can RSVP by
calling Doretta Brush
at Ballard Petroleum
(406) 259-8790

All meetings are held at
the Billings Petroleum
Club at 11:45 a.m.

**Beer-Thirty Presentation
February 13th, 2009**

**Joern Hauer, Ph.D Candidate
University of Montana**
Sedimentologic and
Stratigraphic Analysis
of the Eagle Sandstone
near Billings, Montana

Coming Up:

March 2nd Paul Link Ph.D.
Luncheon – Permian Phosphoria
Beer-Thirty – The Belt Supergroup

April 7th PTTC and the MGS Present:
By-Passed Pays and Plays with Bill
DeMis

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PRESIDENT'S LETTER – PAT LEMKE

February, 2009

Once again, may I use the MGS President's letter platform to soapbox on a key issue that has more than a few of us in the oil and gas industry hot? Like many in the Billings area who chose to stay and ride out tough economic cycles, I was born and raised in Montana. Outdoor sports are my passion. That's one reason I became a geologist. To have an understanding of the processes that shape mountain ranges adds a dimension to the outdoors that makes it more fulfilling. I consider myself a conservationist. In our industry, environmentalist is a bad word.

In his blazing expose' *Playing God in Yellowstone*, Alston Chase documents a century of failed environmental policy and resource mismanagement in our nation's first national park. Chase, a PhD graduate from Oxford and Harvard, was hired as a park historian. In researching the park's history he had access to exclusive Park Service documents and as the story unraveled he uncovered scandals of unbelievable proportions.

Did you know that in the 1970's the Park Service deliberately destroyed hundreds of grizzly bears, perhaps as many as 1/2 of the current existing population in the park today? And the official reintroduction of wolves in Yellowstone took place in 1995, but the Park Service, illegally and under the radar, released wolves years prior to that date. Chase cites numerous cases where misguided resource policies were based on politics rather than science. No surprise. Not once has a park official stepped forward to admit fault or accept responsibility though several were willing to comment "off the record". No surprise either.

Chapter 16, "The New Pantheists" discusses the development and impact of the environmental movement and the religious fervor with which extremists approach environmental protectionism because, for them, it is, well, a religion. I highly recommend the book to anyone in a resource based industry—it is educational, informative and infuriating. Oh, and by the way, the book was published in 1986!

How much has really changed in the past 22 years? I know I am largely preaching to the choir. In these tough economic times it's easy to become cynical. Be encouraged that business cycles and government regulations are nothing new. In the industry we tighten our belts, move ahead and plan for the future. And it's okay to be a geologist, fish and hunt, and still drill for oil.

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“Beer Thirty Continues!”

**Joern Hauer Returns!
Ph.D Candidate
University of Montana**

**“Sedimentologic and Stratigraphic
Analysis of the Eagle Sandstone near
Billings, Montana.”**

**February 13th
4:30 at the Petroleum Club**

**Sponsored by
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**Paul Link, Ph.D
Idaho State University**

**“More Than You Want To Know About
The Belt Supergroup.”**

**March 2nd 2009
4:30 at the Petroleum Club**

**Sponsored by
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MGS
Montana Geological Society



By-Passed Pays and Plays: **Lessons Learned from Missed Opportunities**

Tuesday April 7, 2009, Crowne Plaza Hotel, Billings Montana 8:30 am – 4:30 pm

Fee: \$185 MGS members, \$205 non-members

Includes: refreshments, lunch, class notes, and PDH certificate

Instructor: William (“Bill”) DeMis, Roxanna Oil Company, Houston, TX

This course is designed to show geoscientists and managers of teams that finding and exploiting by-passed pay requires skills in addition to well-log analysis. Many conventional oil and gas fields have at least one “dry” hole drilled within them before they are finally “discovered.” Unconventional plays can have dozens or even hundreds of penetrations before the play is recognized and exploited. Pays and plays can be missed for a spectrum of reasons. Some pays and plays are by-passed because of incorrect log analysis, but others are missed because of misinterpreted DSTs, an incorrect stratigraphic model, misinterpreted seismic attributes, incorrect completion methods, or institutional bias – to name only a few reasons. This class will present case studies and exercises of by-passed pays and plays to illustrate lessons learned from missed opportunities. Please bring a ruler, a calculator, and a couple of colored pencils. Rudimentary knowledge of wire-line logs and the ability to calculate water saturations are required.

William D. DeMis - Vita

William DeMis is Exploration Vice President for Roxanna Oil Company. He has over 25 years of industry experience that includes both domestic and international assignments. Prior to Roxanna, Bill has worked for Pennzoil and Marathon Oil Company on various exploration and development projects and held a variety of technical and managerial positions. Mr. DeMis has a BS Degree in Geology from the University of Wisconsin-Madison and a MA Degree from The University of Texas at Austin. He has written two dozen papers on various topics in geology and oil-price economics, and received “Best Paper” awards from GCAGS, AAPG-Division of Professional Affairs, and AAPG-Energy Minerals Division, and the “Best Presentation” award from RMAG-PTTC. He has twice served as Associate Editor of the AAPG Bulletin and as Chair of the AAPG Publication Committee. Bill is a Trustee Associate of the AAPG Foundation and a member of the HGS, RMAG, AAPG, and SPE.

Register online: www.pttcrockies.org

For more information, contact Mary Carr, 303.273.3107, mcarr@mines.edu



MGS Luncheon Wednesday, February 18th

11:30 AM Petroleum Club

2008-09 AAPG Distinguished Lecture

Abstract

GERALD DICKENS

Rice University; Houston, Texas

Funded by the AAPG Foundation

Early Cenozoic Climate and Carbon Cycling: The Sedimentary Record of Global Warming and Massive Carbon Input

The “Greenhouse Earth” of the late Paleocene and early Eocene was generally characterized by warm temperatures and elevated pCO₂. Climate and carbon cycling were, however, far from equable during this interval, as once believed. Surface temperatures slowly warmed by about 5 °C from 59 Ma to the Early Eocene Climatic Optimum centered about 50 Ma. This long-term warming generally coincided with greater inputs of carbon, presumably caused by volcanism. Superimposed on this background change were a series of “hyperthermals”, the most pronounced corresponding to the Paleocene/Eocene Boundary ca. 55 Ma. These were geologically brief (<200 kyr) events that began with rapid warming across the globe and massive input of 13C-depleted carbon. They were also times of extreme variations in ecosystems and the hydrological cycle.

Our current understanding of the late Paleocene and early Eocene allows us to link disparate and unusual observations in strata from across

the globe with a holistic perspective. In particular, the start of the PETM (Paleocene Eocene Thermal Maximum?) is clearly identified in scores of sedimentary records by a prominent negative carbon isotope excursion in carbonate, organic carbon, or both. This excursion precisely coincides with profound mammal and plant migrations in the northern hemisphere, a mass extinction of benthic foraminifera, elevated terrigenous discharge to many continental margins, laminated sediment facies on continental slopes, and a carbonate dissolution horizon in the deep-ocean. Similar changes, though of lesser magnitude, appear to mark the other hyperthermals. Although cause and effect relationships during hyperthermals, as well as links between them, remain uncertain, the hyperthermals and their sedimentary expressions are, without doubt, somehow related to extreme global warming and tremendous additions of carbon to the ocean and atmosphere. Speculative links will be discussed.

Biography

Education:

1989 Bachelors, The University of California at Davis
1993 Masters, The University of Michigan at Ann Arbor
1996 Ph.D., The University of Michigan at Ann Arbor

Experience:

2008-Present: Professor, Department of Earth Sciences, Rice University
2001-08 Associate Professor, Department of Earth Sciences, Rice University
1997-2001 Lecturer and Senior Lecturer, Department of Earth Sciences, James Cook University (Australia)

Publications and Awards:

Authored or co-authored over 90 scientific papers

Sluijs, A., Brinkhuis, H., Schouten, S., Bohaty, S.M., John, C.M. Zachos, J.C., Reichert, G.-J., Sinninghe-Damste, J.S., Crouch, E.M. and DICKENS, G.R. (2007). Environmental precursors to rapid light carbon injection at the Palaeocene/Eocene boundary. *Nature*, v. 450, p. 1218-1221
Nicolo, M.J., DICKENS, G.R., Hollis, C.J. and Zachos, J.C. (2007). Multiple early Eocene hyperthermals: Their sedimentary expression on the New Zealand continental margin and in the deep-sea. *Geology*, v. 35, p. 699-702

Snyder, G.T., Hiruta, A., Matsumoto, R., DICKENS, G.R., Tomaru, H., Takeuchi, R., Komatsubara, J., Ishida, Y. and Yu, H. (2007). Pore water profiles and authigenic mineralization in shallow marine sediments above the methane-charged system on Umitaka Spur, Japan Sea. *Deep-Sea Research (II)*, v. 54, p. 1216-1239
Hancock, H.J.L., DICKENS, G.R., Thomas E., and K.L. Blake, K.L., (2007). Reappraisal of early Paleogene CCD curves: foraminiferal assemblages and stable carbon isotopes across the carbonate facies of Perth Abyssal Plain. *International Journal of Earth Sciences*, DOI 10.1007/s00531-006-0144-0.
Bhatnager, G., Chapman, W.G., DICKENS, G.R., Dugan, B. and Hirasaki, G.J. (2007). Generalization of gas hydrate distribution and saturation in marine sediments by scaling of thermodynamic and transport processes. *American Journal of Science*, v. 307, p. 861-900
2006-present Chief editor *Paleoceanography*
2002-03 JOI/USSAC Distinguished Lecturer

Professional Interests:

Cretaceous and Cenozoic Paleoceanography
The submarine methane cycle
Sedimentary responses to climate and sea-level change.

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MGS Luncheon March 2nd 2009

11:45 AM at the Petroleum Club

“The Permian Phosphoria Formation, SE Idaho – An Extraordinary petroleum source rock and phosphate Resource”

Presented by Paul K. Link, Ph.D Department of Geoscience, Idaho State University

ABSTRACT: The Phosphoria Formation contains pelletal phosphorite, organic-rich mudstone, limestone, dolomite and chert. Two transgressive-regressive tongues, the Meade Peak (thickest SE of Soda Springs ID) and Retort (thickest near Dillon MT) Members, contain pelletal phosphorite and black-shale hosted sapropelic kerogen with up to 30% TOC. In the SE Idaho thrust belt these hydrocarbon source rocks progressively charged reservoirs of Permian Park City and Goose Egg Fm carbonate, and Pennsylvanian Tensleep and Jurassic Nugget sandstone. Multistage migration started with Sevier thrusting in Jurassic time in SE Idaho and continuing with Paleocene Laramide loading in SW Wyoming. Migration was controlled by thrust-generated pathways and lateral updip migration in eastward-thinning overlying Mesozoic strata.

The Phosphoria Formation was deposited in an epicratonic successor basin on the western margin of North America in Leonardian to Guadalupian time, over a span of <6.5 m.y. starting about 260 Ma. Foreland-basin loading inboard of the reactivated Humboldt highland (remnant of the Antler orogenic belt) and evaporative pumping of sea water by sabkhas to the east in the Goose Egg sea facilitated reducing and denitrifying conditions in phosphate-rich bottom water and diagenetic fluids. Although denitrifying bacteria removed nitrogen, perhaps 25% of the phosphate was preserved and deposited as carbonate fluorapatite.

Fortuitous paleogeography established a system of seawater circulation that allowed rapid phosphate accumulation. Evaporation in the Goose Egg Basin to the east and a carbonate sill between the Phosphoria Goose Egg Basins allowed import of surface seawater from the Phosphoria Sea and accumulation of salt in eastern sabkhas. The basin was starved of terrigenous sediment and received only aeolian input. Calculations of seawater circulation during deposition of the 12-m thick lower phosphate ore zone of the Meade Peak Member by D.Z. Piper (Piper and Link, 2002, AAPG Bull) reveal deposition in about 1.8 m.y. and a conservative seawater residence time in the Phosphoria basin of 4.2 years. The mean rate of primary productivity in the uppermost few 10's of meters in the photic zone is modeled at $0.87 \text{ g m}^{-2} \text{ yr}^{-1}$, comparable to conditions on the Peru shelf today. Denitrifying redox conditions developed in the bottom water (below approximately 150-m depth) and afforded deposition rates of organic matter of $0.21 \text{ g m}^{-2} \text{ d}^{-1}$ (of which 90% was lost by bacterial respiration) and high accumulation rate of organic-matter-hosted phosphate of $6.3\text{-}\mu\text{mol cm}^{-2} \text{ yr}^{-1}$ (25% of primary productivity).

The fortuitous paleogeographic setting of the Phosphoria Sea established seawater circulation patterns, and resulting high phosphate accumulation and preservation rates. A world-class phosphate deposit and petroleum source rock resulted. In addition to supplying about 5% of the world's phosphate ore from the Meade Peak and Retort phosphatic shale beds, the center waste shale of the Meade Peak Member is enriched in vanadium, uranium, chromium and other heavy metals.

Phosphate mining in SE Idaho will continue for decades, and is an established industry with significant local and political support. Selenium concentrations in some reclaimed phosphate mines have been an unexpected and annoying issue. New remediation plans isolate Se-rich waste from ground and surface water.

MGS Calendar and Reminders

February 13 Beer-Thirty Presentation, Joern Hauer, 4:30PM; Petroleum Club, Billings
February 18 AAPG Distinguished Lecture, Gerald Dickens, 11:45 AM; Petroleum Club, Billings
March 2 Paul Link, Professor, Idaho State University, 2 presentations: 11:45 AM - Luncheon
 4:30 PM – Beer Thirty
April 7 PTTC and MGS Present: By-passed Pays and Plays: 8:30am-4:30pm Crowne Plaza
 Hotel.

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