



MONTANA GEOLOGICAL SOCIETY

NEWSLETTER

February 2016

MGS Luncheons:

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the Shannon Formation*
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March 2nd : Anna Phelps
presents *Facies,
Architecture, and Sequence
Stratigraphy of the
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Members can RSVP by email or
by calling Doretta Brush
at Ballard Petroleum 406-259-8790
All meetings are held at the
Billings Petroleum Club at
11:45 a.m. unless otherwise noted

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Fellow MGS Membership,

MGS Vol. 60 No. 2

There is nothing like spring to warm the heart of a geologist. Fieldwork can be challenging when outcrops are covered by snow, but not impossible if you've got a broom (burr... oh the haunting memories from grad school). With warmer weather comes the chance to get back out there where geology lives and this spring will be actioned packed for the MGS!

Many activities and events are coming up, starting with the first, S.T.E.M. Energy Days (Science, Technology, Engineering, and Math) for Billings' kid's kindergarten through 6th grade on Saturday, February 20th. Our membership has prepared exhibits and activities to teach young minds about energy, its sources, and what it provides to them as energy consumers. Interest in this activity has been huge! We originally had a goal of signing up 150 students but after four days after registration opened, we added another 50 slots making it 200. We're delighted that there is so much interest and hope that the MGS membership turns out to share their knowledge with all these kids.

The Past President's Dinner, MGS's premier annual event, will be held on February 26th at the Petroleum Club. Come on out for the chance to roast our very own Mark Millard. To tell the truth, we won't have to turn the heat up on him much. Just give him a microphone and he's happy to roast himself, and that's before we let him drink any ginger ales. Get some sugary drinks into him and then the party will really get started.

Quickly following are the Billings Science Fair and Expo (March 18-19th) and the Girls-n-Science, formerly known as Chicks in Science (April 16th). The MGS has had very successful booths at both events for years. The MGS has been such a big part of the Science Expo that we have the biggest booth,



right in the center of the floor. This March Sarah Edwards (MGS Newsletter VP) will be organizing MGS's exhibitor booth for the Science Fair Saturday, March 19th. There will be tons of minerals, fossils, and rocks of all stripes to show the kids, plus the traditional and loved lapidary/jewelry making station, maps and more. Please come out and bring all the kids in your neighborhood with you. The Science Fair is also looking for judges and would like to remind all of you that you are very qualified. It's fun to see the kids' projects and hang out with so many



other folks in our community that care about our children's education. If you are interested in volunteering or being a judge, please contact Sarah Edwards (sedwards@sm-energy.com).

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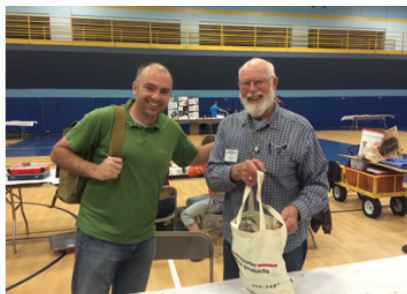
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Jim Halvorson 656-0040

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Doretta Brush 259-8790

Girls-n-Science this year is being organized by Anna Phelps (MGS Educational Outreach Coordinator) with a mission to grab the interest of girls to pursue careers in science and geology. Last year we had hundreds of girls come to the booth with questions and to see our



presentation. About three hours is all the longer my voice could hold out, so help will be very appreciated. Or I could just shout a little more quietly, but what's the fun in that? If you are interested in volunteering for this event, please contact Anna Phelps (aphelps@sm-energy.com).

A wise person once said that the more you put into an organization, the more you get out of it. Please contribute your time and efforts into these worthwhile causes; it is well worth the investment.

Thank you,

Riley Brinkerhoff,

MGS President



Science Expo

March 18th -19th 2016



What is the Science Expo?

- A regional science fair for southeastern Montana sanctioned by the Intel International Science and Engineering Fair (ISEF)

- Held at the Montana State University-Billings (Alterowitz Gymnasium)

- Has Guest Scientist(s) Lectures and

- Interactive Science Exhibits

- A way for the MGS to promote and encourage kids to pursue careers in geology and science!



***If you are interested in judging student projects on March 18th, volunteering at the MGS booth on March 19th 2016 or learning more about this event, please contact Sarah Edwards at sedwards@sm-energy.com or (406) 869-8763.**



STEM Billings Energy and Engineering Day

STEM Billings is hosting an Energy and Engineering event the afternoon of February 20 at Riverside Middle School, open to all kindergarten through sixth grader students from the Billings area. The event will include hands-on subsurface activities (geology, exploration, etc.), surface activities (refining, processing, chemical treatment, etc.) and relevant applications (engineering design work, structural design, etc.). There will also be an oil and gas production facilities replica for students to explore. Registration is \$20 and opens January 15. If you have any questions, or would like to volunteer at the event, please contact Anna Phelps at (406)869-8794 or aphelps@sm-energy.com.

Teacher of the Year Award for 2015

Catherine Frazer of Absarokee Jr/Sr High School was the 2015 recipient of the Montana Geological Society (MGS) K-12 Earth Science Teacher of the Year Award. Ms. Frazer has taught science for 22 years mostly grade 7-9 Life Science, Earth Science and Physical Science. She believes her students learn best with a variety of teaching methods from traditional lectures to hands on labs and fun activities. Each year Ms. Frazer goes beyond her required teaching duties to have her students compete in local and regional science fairs, Science Olympiad, and Science Bowl.

Absarokee Schools have received generous support from Stillwater Mining Company, and many of the students have family members who are employed there. Although only a few from each graduating class may end up working in mining, Ms. Frazer understands the importance of teaching Earth Sciences to all students. Many of her former students have gone into science related fields or to work in industry, but they all remember her field trips and fun activities. Ms. Frazer received the \$1000 MGS award in December and is eligible to apply for additional awards up to \$8000 through the American Association of Petroleum Geologists (AAPG).



MGS PAST PRESIDENT'S DINNER

In honor of Past President Mark Millard, will be held

Friday February 26th, 2016

Cocktails @ 6:00 pm; Dinner and Program at @ 6:45pm

At the Billings Petroleum Club

Please RSVP by Feb 23rd to

montanageologicalsociety@gmail.com

(Please note whether you and your guest want Surf, Turf, or Other)

Surf: Lemoncella scallops with risotto

Turf: New York Steak 12 oz topped with garlic-sautéed mushrooms

Other: Vegetarian (pasta primavera) or Gluten-Free (steak/salad or chicken roulade)



This dinner is OPEN TO ALL MGS MEMBERS and spouses/significant others.

*The dinner will be free for all members, but we ask that you make a small donation to the MGS
Scholarship Fund.*

*Also, if you have any compromising photos of Mark, please forward them to
montanageologicalsociety@gmail.com.*

**We sincerely hope you can join us in one of the most important MGS social functions of the year!
Please feel free to share stories of Mark, or just come to socialize with other members and thank Mark
for his colorful service and dedication.**



How to Find Bypassed Pay in Old Wells Using DST Data

Monday - Wednesday, March 14-16, 2016

Billings Petroleum Club, Crowne Plaza Hotel Billings Montana

Fee: \$600 members, \$650 non-members; Includes: lunch, workbook, and PDH certificate

Instructor: Hugh Reid

Course Focus For Today's Low Priced Oil Environment

This year a major focus of the course will be how to identify tight oil sand from DSTs to use as candidates for horizontal wells with multi-stage frac's. However we will also identify better permeability zones which are damaged and can be simply re-entered or re-perf'd in a cheaper vertical well. *"No need for an expensive horizontal well where a simple vertical well will do the trick".* We will also cover using water DSTs to find zones for water disposal wells pertinent today's industry.

Who should attend? Geologists, engineers & technicians who encounter or utilize DST results and reports in their exploration & production decisions. In fact, any professional who needs to make more sense of the numerous old DSTs which are present in so many wells, often with confusing results. Particularly appropriate for those prospecting for bypassed pay using logs and geology, who may wish to verify their conclusions from the DST, or for regional geologists using show maps of DST results.

Objectives

By the end of the course participants should be able to accomplish the following:

- understand DST pressure charts to identify obvious formation damage & depletion (small reservoir) and mechanical problems (eg. tool plugging).
- recognize high vs. low permeability tests.
- understand why data from cores and logs often conflict with DST data.
- "make more sense" of DST results printed in PI well cards and field reports where no chart is available and even estimate approximate permeability & damage in some cases.
- identify presence of limited natural fractures.
- appreciate where recoveries of "oil cut mud" and gas rates of "TSTM" may be significant from an exploration standpoint.
- determine when a gas test is co-producing water.
- identify gas presence even where no gas was reported in certain tests.
- identify potential oil zones from DSTs which recovered no oil (from the chart shape and air blow description).
- estimate the approximate gas rate in DSTs of "GTS TSTM" by knowing the time gas took to reach the surface and the air volume of the test string.
- make a decision as to whether old DSTs can be recompleted as commercial wells today from limited information.

Content

This course is a non numerical introduction to understanding DSTs & DST pressure charts focusing on pattern recognition and practical "quick look" techniques. Numerous field examples & case histories are utilized and theory is kept to a minimum. Course manual contains numerous DST charts which can be used for trouble shooting problem DSTs later. It is a permanent reference source. To avoid problem of attendees forgetting procedures taught at the course, all techniques are given in cookbook format 'fill in the blanks'. A key emphasis of the course is to show how to *identify missed (damaged) pay in competitor's 'dry' wells & additional pay in your own producing wells*. This is an important skill to complement log skills! In summary, the course is designed to provide participants with information not normally encountered in routine service company training seminars and to impart some interpretive skills gained by the instructor in over 25 years of experience.

Class Descriptions and Register Online: www.pttcrockies.org

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

MGS Luncheon Meeting

Tuesday, February 23rd

11:45 am – Billings Petroleum Club

Please join us for lunch (\$14) and the talk (no charge)

RSVP – montanageologicalsociety@gmail.com, or 406-259-8790

An email reminder will be sent 3 days prior to the talk

E.P. PRESTON KERR IV

Geologist II
SM Energy Company

Unlayering the Shannon Formation

Powder River Basin, WY



The Shannon formation is an emerging resource play in the Powder River Basin, and has been a targeted interval in the basin since the late 1800's. Historical development includes several prolific conventional fields, such as Teapot Dome and Hartzog Draw. In many cases, the term "resource play" is associated with formations that are inherently rich in TOC or are vertically proximal to a known source rock. The contemporary evolution of horizontal drilling and stimulation practices, however, has re-opened historic basins in areas that contain conventional-like carrier beds that were once deemed too tight to be developed with vertical wells. The Shannon formation in the Powder River Basin is not juxtaposed against an obvious source rock, nor is it inherently rich in TOC; but it does exhibit ubiquitous oil saturation and has proven to yield economic returns through unconventional development. Lithologically, the formation is comprised of thin to thick bedded shallow marine sandstones that are often heavily bioturbated, and encased above and below by marine mudstones and siltstones. Further, log correlations and historic Shannon production trends indicate that higher flow regime clastics were predominantly deposited in a series of NW-SE orientated sand bodies, which act as stratigraphic sweet spots. This talk will be structured to cover three methodologies that allow for a better description of the Shannon reservoir and associated petroleum system: 1) Described "core facies," and their implications to depositional environment. 2) The establishment of electric "log facies" and the tie to their respective "core facies." 3) Stratigraphic implications of associated "log facies" mapping.

Biography

Preston Kerr is a geologist at SM Energy Company in Billings, Montana. He received a bachelor's degree in geology from the University of Colorado, and a master's degree in geology from the University of Oklahoma. He is currently pursuing his master's degree in business administration through the University of Montana.

Upon completion of his undergraduate degree, Preston worked as a Geologist and Operations Coordinator for Richardson Operating Company in Denver, Colorado for 1 year before returning to graduate school. After receiving his master's degree, he joined SM Energy's Southern Rockies Asset Team and has been working late Cretaceous siliciclastic reservoirs in the Powder River Basin of Wyoming for the past 2.5 years. Most recently, his focus has been on the reservoir modeling and development planning of the Shannon and Sussex formations.

MGS Luncheon Meeting

Wednesday, March 2nd

11:45 am – Billings Petroleum Club

Please join us for lunch (\$14) and the talk (no charge)

RSVP – montanageologicalsociety@gmail.com, or 406-259-8790

An email reminder will be sent 3 days prior to the talk

ANNA PHELPS

Geologist
SM Energy Company



Facies, Architecture, and Sequence Stratigraphy of the Devonian-Mississippian Sappington Formation, Bridger Range, Montana

The Late Devonian-Early Mississippian Sappington Formation in Montana is a marine unit comprised of lower and upper organic-rich shale members and a middle calcareous siltstone member. The Sappington Formation was deposited during a period of complex paleogeography in Montana, characterized by deposition in sub-basins and onlap onto structural highs, and eustatically- and tectonically-driven transgressive-regressive cycles. Detailed outcrop analysis was conducted on the Sappington Formation across the Bridger Range in southwestern Montana to better understand the Sappington Formation depositional system and changing regional paleogeography. The Sappington Formation is further interpreted in a stratigraphic architectural framework to improve the ability to predict hydrocarbon reservoir heterogeneity within Late Devonian-Early Mississippian strata more regionally.

Fourteen facies within the Sappington Formation are identified: 1) organic-rich mudstone and siltstone; 2) silty mudstone; 3) clay-rich, calcareous siltstone; 4) quartzose siltstone; 5) interlaminated siltstone and mudstone; 6) lenticular siltstone and mudstone; 7) wavy siltstone and mudstone; 8) combined flow siltstone; 9) ripple laminated siltstone; 10) convoluted siltstone; 11) tabular siltstone; 12) low-angle-stratified sandstone; 13) fossiliferous dolomite; and 14) oncolite-bearing floatstone. Genetically related facies are assigned to facies associations that generally represent deposition along a wave-storm-dominated prograding shoreface-shelf system sourced from the Beartooth Shelf to the south. Stratigraphic sequences, surfaces, and systems tracts are interpreted based on facies relationships, depositional processes, and regional stratal stacking patterns. The sequence stratigraphic framework includes two full depositional sequences, the oldest including a TST and HST, the second including a TST, HST and FSST, and a third sequence containing a TST and HST continuing into the overlying Lodgepole Formation. Depositional sequences are interpreted to be controlled by glacioeustatic, third-order sea level fluctuations, whereas basin geometry and configuration is inferred to be tectonic in origin.

Analysis of facies stacking and stratigraphic architecture indicate significant lateral lithologic heterogeneity on the field and reservoir scale. Observed facies heterogeneity and architectural complexity of the Sappington Formation may help explain hydrocarbon production heterogeneity of the contemporaneous Bakken Formation in the Williston Basin and might have strong implications for new development and secondary recovery for the Bakken Formation in the Williston Basin.

Biography

Anna Phelps is a geologist at SM Energy in Billings, Montana. Anna obtained her B.A. degree in Geology at Colorado College (2010) and M.S. Degree in Geology at the University of Montana (2015). This presentation is the work of her M.S. thesis.

At Colorado College, Anna explored Front Range geology and conducted research on the Late Devonian Chaffee Group near Crested Butte, Colorado. Between college and graduate school, Anna spent a winter traveling in Southeast Asia and a couple years working on a ranch on the Upper Southfork of the Shoshone River outside of Cody, Wyoming. In Wyoming, she regularly admired the Absaroka volcanics from horseback (one of the best ways to study geology!).

At the University of Montana, Anna led the UM AAPG Imperial Barrel Award Team to win the Rocky Mountain Regional Competition and compete at the International Competition at AAPG ACE. Also while working on her M.S. degree, Anna interned with Conoco Phillips and Apache Corporation in Houston, Texas, which ignited her excitement about working in the oil and gas industry. Anna is currently working as an exploration geologist for SM Energy, evaluating Rocky Mountain basins from Canada to Mexico.

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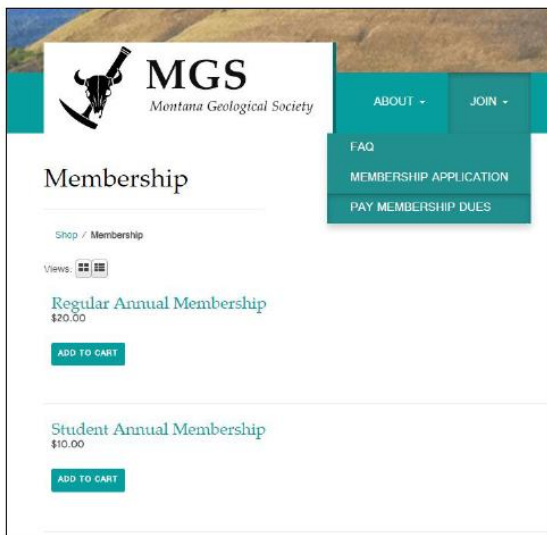


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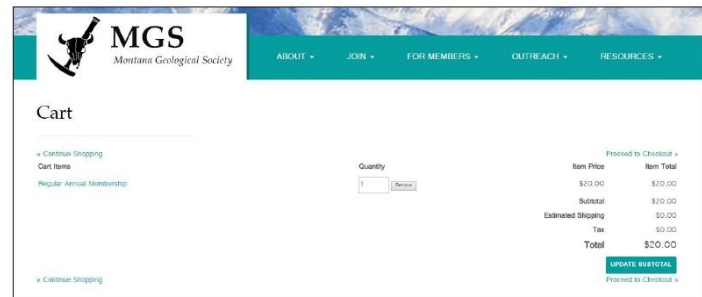
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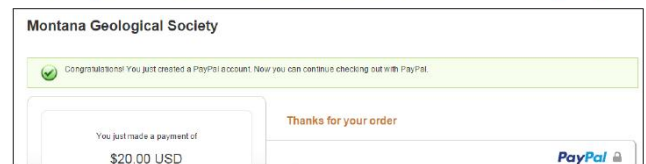
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