



*Annual Newsletter of the Yellowstone-Bighorn Research Association*

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*Top left to bottom right:: Jinny Sisson presenting Marv Kaufman and Ted Campen with Russ Dutcher awards. 2008 Council meeting. Jinny and students. New bridge. Jerry Bartholomew showing the TRGS participants the disrupted bedding in the Fort Union Formation which he interprets as related to paleoseismicity. Ennis McGarrity leading a TRGS field trip near Dean, MT. Mycologists' banquet on deck of Fanshawe Lodge.*



#### YBRA President's letter 2009

The summer started with our students enjoying a 6" snowfall on their first day off. For many students from the University of Houston, this was their first significant snowfall. Field camp is often filled with many firsts. This is one of many reasons why it is such a memorable experience for all. If you are interested in a short history of the YBRA field camp and its future, we have written a short article to be included in a Geological Society of America Special Paper that will be published this coming fall. GSA hopes to have this released in time for their Annual Meeting in Portland OR.

Last summer we had our usual cadre of field groups as well as two conferences (see related articles). This summer, the camp will be used by many groups including three sessions from University of Houston (two geology and a new applied geophysics camp – see related article), Southern Illinois University, Pennsylvania State University, Cincinnati Museum of Science, New Jersey State Museum, Red Lodge Women's conference, and one new group, a field camp from Baylor University.

One of the projects envisioned for the geophysics field camp is a well logging exercise. In order to undertake this exercise, we will drill a shallow well beyond the fire pit. This will be primarily for educational use, and will also further constrain the local geology and possible future location for a water well. With our present financial situation, it will be several years before we will have a cash reserve available to do this project.

This summer, camp is running smoothly with Jeanette Reinhart as cook (she has been employed by YBRA for at least 25 years) and Ray Raymond acting as both handyman and camp manager this summer. Another small improvement is that we got a new freezer for the kitchen, which will allow Jeanette to better store foods and keep things running. The new bridge across Rock Creek makes it easy to get to and from camp. We really appreciate all the generous donations that helped us get this project done.

#### Significant YBRA People

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Betsy Campen (Betsycampen@bresnan.net)

##### Webmasters

However, we now find we have drawn down our reserve and do not have any spare cash for new projects. For those of you that can give, please do, as we need funds especially in these financially hard times to preserve our camp for future students.

This past winter, an early snowfall allowed us to finally burn the brush pile that accumulated from all the brush clearing projects over the last couple of years. We were reminded of the importance of removing dead wood after the Cascade fire that threatened evacuation of Red Lodge last August (for images of this fire, go to [http://www.cityofredlodge.com/cascadefire\\_slideshow.asp](http://www.cityofredlodge.com/cascadefire_slideshow.asp)). Don't forget, for all who can, there we be another volunteer camp clearing and fixing in late August to make some new brush piles and other necessary repairs.



Significant YBRA People	YBRA summer schedule for 2009
<p><b>Officers</b>  President: Virginia Sisson, University of Houston  Vice President: Rich Fifarek, SIUC  Past President: Peter Crowley, Amherst  Secretary: Josh Smith  Treasurer: Betsy Campen, Billings, MT</p> <p><b>Councilors</b>  Tom Anderson, University of Pittsburgh  Jerry Bartholomew, Memphis University  Bob Giegengack, U Penn  Laurel Goodell, Princeton  Marv Kauffman, Sunset Beach, TX  Jennifer Lindline, New Mexico Highlands University  John Marzolf, SIUC  Peter Muller, SUNY Oneonta  Phil Robertson, SIUC retired  Jennifer Smith, Washington University, St. Louis  Rob Thomas, University Western Montana  Mari Vice, Univ Wisconsin, Platteville</p> <p><b>Special Councilors (Emeritus)</b>  Bill Bonini, Princeton  Gerry Brophy, Amherst  David "Duff" Gold, Penn State  Russ Dutcher, SIUC  John Utgaard, SIUC</p> <p><b>Archivist:</b> Linda Dutcher, Carbondale, IL  <b>Accountant and Member</b>  Denny McGinnis, Billings, MT  <b>Newsletter Editor</b>  Betsy Campen: <a href="mailto:Betsycampen@bresnan.net">Betsycampen@bresnan.net</a>)  <b>Webmaster:</b> Jason Dennison, Cincinnati</p>	<p>UH/YBRA geology field camp Session I June 2- July 6 (36 students, 2 faculty, 3 TA's) out of camp June 25-July 4</p> <p>Penn State geology field camp June 9 to June 18 (25 students, 2 faculty, 2 TA)</p> <p>SIU geology field camp June 21 to August 4 (out of camp July 15 to August 4, 22 students, 2 faculty, 1 TA)</p> <p>Baylor geology field camp June 26 to July 4 (16 students, 1 faculty)</p> <p>UH/YBRA geology field camp Session II July 6 to August 9 (39 students, 2 faculty, 2 TA's) out of camp July 28 to August 7</p> <p>Cincinnati Museum of Science group July 5 to July 26 (varies each week)</p> <p>New Jersey State Museum July 19-31 (10 participants)</p> <p>UH Geophysical field camp August 9 to 20 (14 students, 4 faculty, 1 TA)</p> <p>YBRA Annual work week August 17 to 21</p> <p>Red Lodge Women's conference August 22 (50-80 participants)</p> <p>YBRA Annual Open House August 23</p>

### PALEOSEISMITES ASSOCIATED WITH THE UPLIFT OF THE BEARTOOTH MOUNTAINS

Mervin J. Bartholomew

When we think of the uplift of the Beartooth Mountains of Wyoming and Montana along Laramide faults, we tend to think of those palisades of steeply dipping Paleozoic carbonates and the vast expanse of crystalline rocks behind them that form the core of the Beartooth Plateau as described and illustrated in the classic paper by Foose et al. (1961). Of course, for those who have attended or taught at the YBRA camp, they have typically become familiar with the structural complexities of the Red lodge corner (e.g., Wise, 2000). Perhaps, as they examined the Paleozoic stratigraphic section while gazing at the spectacular beauty of the canyon where the Clarks Fork of the Yellowstone River emerges from the Beartooth uplift, they contemplated how the uplift occurred. *Continued on page 7*

### **Looking a little deeper by Dr. Rob Stewart (University of Houston)**

We are enthusiastically looking forward to the first Geophysics Field School at the YBRA site this summer. As of this writing, we have 17 applicants and are still looking for a few more. A number of University of Houston faculty (including Drs. C. Chan, S. Hall, S. Khan, C. Liner, and R. Stewart) will be leading the educational and research efforts using a variety of geophysical techniques. No experience with geophysical equipment is assumed for the School; however, a previous introductory geophysics course in the classroom is required. We will begin the field camp with a guided tour and geological overview of the spectacular Red Lodge area – visiting the locations of interest for the subsequent geophysical surveys. In particular, we hope to explore the many interesting geologic targets in the area including oilfields, groundwater flows, glacial deposits, precious metals, and complex faulting. The tour will be followed by nine days of geophysical measurement over some of these interesting locations. We will review the acquired data in the field as well as at the camp's computer lab. Geophysical acquisition will include: positional line surveying using GPS technologies, multicomponent seismic refraction, high-resolution seismic reflection, ground-penetrating radar (GPR), and gravity surveys. We will conduct well log measurements (using gamma ray, sonic, resistivity, temperature tools) in a shallow nearby well. We hope this well will help YBRA explore possibilities for a future water well as well as pin point the location of the Mt. Maurice tear fault at depth. All participants will make each type of measurement. Students can take all of the resultant data back to their home institution for their own further analysis or research. Through daily meetings and procedures, there will be an emphasis on safety and learning.

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### **INTERNATIONAL SYMPOSIUM ON ARCTIC-ALPINE MYCOLOGY (ISAM 8)**

Dr. Cathy Cripps, Montana State University  
Current President of ISAM

In August 2009, 20 arctic-alpine mycologists from 15 countries met at the YBRA Geology Field Camp for a series of field trips designed to discover the alpine mushrooms of the Beartooth Plateau. This was the 8th meeting of the International Symposium of Arctic-Alpine Mycology (ISAM) that is held every four years at a field station situated near an arctic or alpine field site. Previous venues in North America were Alaska and Greenland. The scientific workshop is devoted to the study of fungi in cold-dominated environments and combines field work with scholarly presentations. We were really concerned that forest fires would obscure the view from the Beartooth Plateau, however, skies cleared the day before everyone arrived!

On arrival at the camp, our hostess Jeannette directed us to a giant puffball about the size of a football near the upper cabins. These do not grow in Europe and it was a great surprise to our colleagues! The red and yellow Indian Paintbrush plants were also a novelty! We made daily field trips to the Beartooth Plateau to collect fungi above tree line and work continued in the labs until late into the night. The 'mushrooming' was pretty good on the East side of the plateau, especially where giant snowbanks remained since these fungi depend on meltwater for fruiting. However, collecting on the West side was dismal, mostly because of persistent snow cover due to the highest recorded snows in 30 years; we encountered lots of mosquitoes instead of mushrooms!



*Continued from page 4.* We recorded over a hundred species of alpine mushrooms that will be added to our database, many of which were not previously recorded for the Beartooth Plateau. A few are possibly new to science, but they still need to be studied in depth. It was interesting to see experts from arctic and alpine areas of the world immediately recognize “our alpine mushrooms” as many of the same species found in their high latitude countries. The proceedings will be published online.

Meals provided by Jeanette were a highlight and many were curious to see “what Americans eat?” and the answer was “everything!” The symposium culminated on Saturday with scientific presentations complete with an afternoon thundershower, lightening and a rainbow. The banquet served on the deck outside allowed those from countries where mad cow disease is a problem to eat safe American beef accompanied by a wonderful pine nut salad and pumpkin (very American) ice cream. We would like to thank Jinny, Jeanette, Bill, Linda, Russ and everyone involved with the YBRA facility for all their help in making this a symposium to remember!

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### **Tobacco Root Geological Society Holds Annual Meeting at YBRA**

The Tobacco Root Geological Society (TRGS), a group of geologists dedicated to the study of the geology of the Northern Rocky Mountain Province, held its annual meeting at the YBRA camp in late July-early August of 2008. TRGS has existed since its unofficial founding in 1973, when a small group of Indiana University field camp students decided to hold a reunion. The Society held its first field conference in 1976 and was incorporated in 1977. Approximately 50 participants attended the meeting, and most stayed at the YBRA camp during the meeting.



The meeting offered a total of four field trips: (1) Paleoseismites in the Fort Union Formation led by Jerry Bartholomew, (2) an underground tour of the Stillwater Mine led by Mike Koski, (3) a field trip to the Benbow Area led by Ennis Geraghty, and (4) a trip to Beartooth Butte to examine Cambrian mass extinctions led by Rob Thomas. In addition, there was a keynote presentation given by Katelyn Gibbs, a high school student, who has been working with Dave Baker on nanodiamonds from the Indian Creek archaeological site near Townsend, Montana. There were also several posters and talks presented in the classroom in the evenings.

The proceedings volume for the meeting included a total of fourteen papers, and most were on the geology of the Red Lodge area. The reference information for the volume is: The Red Lodge area, 2008, Thomas, R.C., and Gibson, R.I., eds.; Northwest Geology, v. 37, 172 p. It can be purchased through the Montana Bureau of Mines and Geology in Butte, Montana. To see a copy of the table of contents, go to the following web address: <http://trgs.org/>.

Despite the fire near the ski area, the meeting was very successful. People commented on the high quality of the meals and rooms, and they seemed to really enjoy the historic setting and the great views from the porch. There is no doubt that the Tobacco Root Geological Society will be back!

----Rob Thomas

MY MEMORIES OF DR. J.C.F. "DOC" SIEGFRIEDT: Part 1  
WILLIAM A. ROMEK

My first recollections of Dr. Siegfriedt date from early in 1919, when as a lad I was sent to Bearcreek to act as Railroad Agent for the Montana, Wyoming & Southern Railroad. That Railroad was initially the Yellowstone Park Railroad, which in 1905 constructed its 20-plus miles to Bearcreek and opened that field to coal production. Apparently Dr. Siegfriedt came to Bearcreek in 1906 when the town consisted of tents and shabbily constructed shacks. He saw it grow to a prosperous, roaring community.

Dr. Siegfriedt was well over 6 feet in height, with a large frame carrying no excess weight, with blue eyes and somewhat bald. He walked briskly and was full of vitality. He was friendly, gregarious, active in community affairs, fluent in conversation as he was very well informed on so many subjects. He was not a patron of Bearcreek's numerous bars and/or speakeasies. No church was ever built in Bearcreek, but services were held in various homes. Doc did not attend in those or in churches in Red Lodge, but I never heard him expound for or against liquor or for or against any religion.

In November 1920, I entered the employ of the Montana Coal & Iron Company, which owned and operated the Smith and Foster Mines and was the largest coal producer in the Bearcreek Coal Field. Dr. Siegfriedt of Bearcreek and Dr. C. E. Beltzer of Washoe at that time had contracts with the employees of all the mines whereby they provided medical care to miners and their families. The fee was \$2.00 per month per employee, which the Companies deducted from wages and remitted monthly to the Doctors involved. All employees were also covered by the State Workmens' Compensation Act and under its terms Doctors received additional income for the treatment of men suffering compensable injuries.

Coal mining was a very hazardous occupation, and mining towns provided their doctors with both practice and income. Dr. Siegfriedt chose to remain in Bearcreek and the town grew in population and size, so he had a large two-story structure built, which served as a hospital and living quarters for him and his wife. All that now remains of his hospital are two cement walls, about 2 feet high, which marked the front of his lots and the long, cement walk that led to the hospital entrance.

Other than that, Dr. Siegfriedt was born in Davenport, Iowa in 1879. Neither Phil Gardner nor I ever heard him mention his parents or family. No relatives to our knowledge came to Bearcreek to visit him. Other than his wife, no relatives attended his funeral services. Mrs. Siegfriedt, whose maiden name none of us recall, had a sister, Mrs. H. S. Hopka of Roundup, Montana. Her husband was Manager of the Roundup Coal Mining Company, a large coal producer. Another sister was a Mrs. Weeks of Chicago. Mr. and Mrs. Hopka visited Bearcreek frequently and Mrs. Weeks visited occasionally.

I heard Dr. Siegfriedt, on a rare occasion, whistle a tune in the Gardner Drug Store, and it was whistling comparable to a professional. He did not appear at Community events as a performer, although he also played the zither most creditably. Hence, he was musical though seldom publicly.

I was told that there was a typhoid epidemic of minor proportions in the very early years of Bearcreek, which Dr. Siegfriedt brought under control. There were no other epidemics to our knowledge, other than childhood diseases. Winters were severe, but milder than at Red Lodge, which had an elevation 2000 feet higher. Yet there were a number of pneumonia cases each year, and the Spanish influenza struck heavily in 1918. The death toll then was devastating.

To be continued in next issue of the Uplift

Obviously, with such contemplation, would have come the realization that earthquakes (perhaps even big ones!) accompanied displacement on the Beartooth fault and other faults as the Beartooth Plateau was uplifted and emplaced over the synorogenic Paleocene Fort Union Formation. But, other than quick glances at the clastic sedimentary strata near Red Lodge and between Belfry and Clarks Canyon, few YBRA transients give more than a passing thought to the Fort Union Formation and its importance in understanding the uplift of the Beartooth Plateau. Few even realize that the rock beneath many of the buildings at the YBRA camp is the Linley Conglomerate Member of the Fort Union Formation and that the red color along the upper part of Howell Gulch road is indicative of that conglomerate where it crops out in the drainage ditches.

DeCelles et al. (1991a, b) get credit for recognizing that the Linley Conglomerate contains an extensive record of the exhumation and erosion of the Beartooth Plateau. They showed that the Linley Conglomerate, between Red Lodge and Clarks Canyon, represents large alluvial/debris fans developed along the structural front of the emerging uplift. They documented that as the Beartooth Plateau was uplifted and exhumed, progressively older rocks were exposed and the composition of the fans changed from conglomerates with predominately carbonate clasts to those with predominantly basement clasts. DeCelles et al. (1991a, b) also noted that these upper Paleocene fans also contain paleoseismites (e.g., clastic dikes). Of course, large clastic dikes might be familiar to YBRA folks from their experience in mapping in the Elk Basin anticline where paleoseismites also occur (e.g., Engelder et al., 1997) in the Virgile sandstone of the Cretaceous (Campanian) Eagle Formation. The starting point for our ongoing study (e.g., Stewart et al., 2008; Bartholomew et al., 2008) of paleoseismites came with curiosity. While repeatedly driving between Belfry and Clarks Fork Canyon, I noticed that many sandstone beds in the Fort Union Formation have vugs; but it seemed to me that some of these beds had small rectangular vugs oriented at different angles thus giving an appearance of “cuneiform writing” on these beds. I finally had to stop at the exposure on the big hill near the river a few miles south of Belfry. What I saw, were a lot of beds with soft-sediment deformation and it was the weathering of these internally deformed beds which gave the “cuneiform writing” aspect to some beds.

When sedimentologists see soft-sediment deformation (e.g., convolute bedding, ball and pillow structures or load-casts), many first think of loading and slumping associated with fluvial or mass-wasting processes; when structural geologists see soft-sediment deformation, many first think of earthquake-triggered deformation which results in seismites (e.g., clastic dikes, diapirs, sandblow vents, or convolute bedding). Thus the big question arose: could these abundant soft-sediment deformational features in the Tongue River Member of the Fort Union Formation actually be paleoseismites?

If they are paleoseismites, could we determine the “felt area” (and thus an estimate of magnitude) of individual paleo-earthquakes based on their geographic distribution and stratigraphic correlation? Could we determine the frequency or recurrence intervals for paleo-earthquakes along fault segments based on their stratigraphic distribution? Could we determine the paleo-stress field from movement-indicators such as clastic dikes and flow directions? Are there relationships between sedimentary facies (e.g., upper debris fan vs lower alluvial fan) and the types of seismites which occur in them versus distance from the epicentral area of paleo-earthquakes which triggered them? Obviously, we are still working on the answers to most of these questions, but some things we now feel more certain about.

Our two guidebook articles (Stewart et al., 2008; Bartholomew et al., 2008) document evidence which suggests that the soft-sediment deformational features in the Tongue River Member are more distal expressions of paleo-earthquakes along the Beartooth fault which triggered numerous (both geographically and stratigraphically) clastic dikes in the Linley Conglomerate. We have also suggested that seismically induced debris-flows are a good mechanism for emplacing large (car to house-size) slabs of Paleozoic carbonates in bedding-parallel orientations within the upper parts of debris fans of the Linley Conglomerate.

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