

U of M

GEOLOGY NEWS

A Report to Alumni and Friends

Department of Geology, The University of Montana

Fall 1999

MESSAGE FROM THE CHAIR

Steven D. Sheriff

Once again I get to write the lead blurb for our annual newsletter. I said annual and we are getting better at making it annual. We continue to get so many positive comments, postcards, donations, and corrected addresses from previous newsletters that we promise we'll try to keep it annual. Want to help? Send some news.

This fall we have two visiting scholars in the department; both are UM alums. John Mahoney, a geochemist from the University of Hawaii is visiting while on sabbatical. John is working on lithospheric-scale geochemical anomalies in the Indian Ocean and is also well known for his text on flood volcanism (*Large Igneous Provinces: Continental, Oceanic, and Planetary Flood Volcanism*; AGU, 1997). Chris Brick is spending an NSF post-doc from a special program directed at improving K-12 science education by getting Ph.D. scientists to contribute at the K-12 level. Chris has been splitting her post-doc between UM and MSU. The only other change we had was Dave Gaueman, our graphics technician, left to pursue another career direction. We are in the process of finding a replacement for Dave and wish him well in his new endeavor.

The biggest new item on our list is our acquisition of another building at Fort Missoula. You may recall that last year we christened the joint Geology-DBS Field Research Center at the Fort. This year our addition is a core shed which houses a huge collection of drill cores, donated largely by Cominco and Asarco, from the Belt Supergroup. As you can imagine, Don Winston is pretty stoked about a building full of Belt rocks; this has been his project from start to finish and it is a great addition to the archives. We intend this

core-repository to be a long-term research center for those interested in the Belt Supergroup, and we hope it will be of interest to exploration groups as well as academics. Speaking of industry, I know there are many of you out there in a position to interview and potentially hire good students. We are trying to produce good students. So if you are in the position and get the chance, give a UM Geology student a chance to get some professional experience; they'll appreciate it and so will we. We would really like to have a more robust and active summer intern program for graduate and undergraduate students.

Perhaps you've met some of our current students. Using a portion of your donations we have regularly helped to defray student expenses so they can attend GSA, AGU, NWMA, ACS, and AAPG meetings. This year's GSA meeting in Denver was well attended. We also have a contingent of students presenting papers at the fall AGU meeting in San Francisco. And of course we're still organizing the year 2000 GSA-Rocky Mountain Section meeting here in Missoula. This meeting promises to be a good one with symposia on the Coeur d' Alene district mineralization, Cretaceous foreland development, paleoclimatology, the Clark Fork River Superfund Site and more, most with associated field trips. We are hoping that the Missoula meeting also serves as an excuse for you to visit; please do.

I'll finish with the pitch. Your donations support students. We use your donations for supporting student research, field trips, small scholarships, and educational/instructional materials. One way to contribute, besides sending me all your money, is to work in a stop at UM during one of your trips. Visit the department and give us a seminar on your recent career work or research. We do not get nearly enough speakers, especially from the commercial/industry end of geology. We do not have a speakers budget and visiting speakers are one of the best ways our students learn about what really goes on when they go to work

in geology. If you need a temporary lab, field, or office assistant think about hiring one from UM. If you have an appropriate, isolated problem that needs to be solved, maybe it would make a good senior or M.S. thesis. Thanks for listening and remember the Rocky Mountain GSA meeting this spring in Missoula.

What's the Faculty up to?

Dave Alt

Dave continues to investigate the geomorphologic record of Glacial Lake Missoula, mainly through the finalization of his new book entitled "Glacial Lake Missoula and its Humungus Floods." The book should be published this year. While he's not contemplating the history of Glacial Lake Missoula, Dave spends his time teaching classes in Geomorphology and Introductory Geology and keeping an eye on the local bird populations in the Missoula area.

Marc Hendrix

This past year, I continued my work on sedimentary basin evolution in central Asia and Montana. Far and away, my biggest commitment over the past year has been to serve as editor for a GSA Special Volume on Asian tectonics. I've now received the revised versions of all twenty contribution papers, so the book is nearly out of my hands. It'll be a happy day when I mail the entire package off to GSA.

My editorial duties required me to be in Missoula for much of the summer, but I did manage to participate in a short field season in Inner Mongolia (part of China) during early July. We focused our work on a thick pile of synorogenic strata related to the Jurassic emplacement of a set of very large thrust nappes. For years, my students and I have been studying the more distal part of the same sedimentary basin system across the border in Mongolia, so it was exciting and illuminating to examine the proximal parts of this system. In early August, Brigitte and I visited Guatemala and Honduras for a true vacation. What an amazing place. We climbed an active volcano with glowing hot basalt in fissures at the summit, checked out some Mayan ruins in the jungle, and visited Brigitte's sister on the Honduran island of Roatan where I learned how to scuba dive.

Two of my graduate students finished up this year. Mary Beck put the lid on her MS thesis and headed to Penn State to start a Ph.D. Eric Roberts also finished

up this year, despite spending two months as a field geologist for a dinosaur expedition to Mali, Africa. Happily, the departure of these two grads has been followed by the arrival of a great new bunch. Most of my new students are spending their time looking into the history of Mesozoic tectonics and sedimentation here in the northern Rockies.

Aside from geology, I've been busy woodworking, gardening, and fishing.

Nancy Hinman

Over the past year, Nancy Hinman and her students have studied aspects of thermal spring chemistry, hydrology, and geology. Graduate student, Cindy Wilson, has discovered diel cycling in several compounds found in thermal springs and is presently unraveling the complex interrelationships between them. Recent Master's graduate, Jenni DeMonge Esser, completed the first study of the cement lining the streams of the Upper Geyser Basin in Yellowstone. Her work demonstrated that the deposits form in only losing portions of the stream, contrary to expectations. Graduate student, Treavor Kendall, has carefully documented the geochemical and hydrological parameters of siliceous sinters in various stages of diagenesis. His work has bearing on the preservation of microfossils in the geological record. Although still without enough frequent flyer miles to get to Mars, Nancy continues to study the biogeochemical reactions occurring in the thermal springs of Yellowstone and elsewhere.

Don Hyndman

Don Hyndman kept busy during the past year with teaching his usual courses in igneous petrology and optical mineralogy, along with newer courses in geological hazards.

His interest continues in the Blackfoot landslide that temporarily blocked the Blackfoot River near Ovando last year. He continues to help monitor slide movement and degradation while acting as major advisor for Jenni Jo Brown who is studying the slide for her M.S. thesis. That work includes study of old landslides in the area, monitoring the depth to ground water in new test wells, study of the smectite-clay content of the bouldery silts that failed, and calculating the stability limits for the slope.

Carl Schafer completed his M.S. thesis on partial melting in the high-grade metamorphic rocks in the northern Bitterroots. Carl and Don have a paper in press in Tectonophysics, along with David Foster who also

worked with Don on a Masters in the Idaho batholith some years ago. Dave taught in Australia after completing his Ph.D. and is now at the University of Florida.

Don also coauthored a paper on crystallization in one of the big Purcell sills in the Prichard formation, submitted with Michael Poage who completed his M.S. with Don a few years ago. Mike is completing his Ph.D. at Dartmouth. Don is working on another paper with Stephen Porder who completed his M.S. a couple of years ago. That paper, based on Stephen's thesis, is on regional metamorphism associated with the same big basaltic sill but which post-dates intrusion of the sill.

In addition to teaching classes, Don is preoccupied these days with organization for the upcoming GSA Rocky Mountain Section meeting in Missoula in April, 2000. Some days he wonders why he ever agreed to be General Chair for the meeting. Other days, he is grateful for all of the help from colleagues, and looks forward to a great meeting and seeing lots of old friends at the meeting.

Ian Lange

Another year by, another dollar earned so to speak. But the past year has been educational and fun. Work on gold deposits continues. In particular Tombstone or Ft. Knox-type of deposits have my interest. One deposit evidently occurs in the mineral-rich Tobacco Root Mountains. I have presented some preliminary findings at the GSA meeting and intend to present more info about this deposit at the up-coming "Geology and Ore Deposits 2000" meeting to be held in May in Reno. Additional work on gold includes a paper Tom Gignoux and I wrote on the Ninemile placer gold deposits which appeared this year in *Economic Geology*. Also, Lee Woodward and I finally saw our paper on the Argo copper belt in the Big Belt Mountains come out in the long awaited Belt Symposium III volume published by the Montana Bureau of Mines and Geology. A big round of snaps goes to Dick Berg for getting this magnum opus published.

The future will hopefully find me and Jo-Ann in Australia for awhile visiting extinct killer marsupial sites and ore deposits as I partake in a well-deserved spring semester sabbatical break. I also plan to investigate with Lee Woodward some of Montana's placer deposits which do not have known lode sources, so next year looks to be fun and educational too.

Johnnie N. Moore

My research and teaching for the last year continues to concentrate on understanding issues affecting watershed health, specifically the contaminant hydrology of aquatic and floodplain systems, and human impacts on earth systems. Along with graduate students under my direction, I am conducting hydrologic research on scales ranging from the large basin to local river reaches. At the basin-wide scale, we continue work in the Madison-Missouri rivers, the upper Clark Fork River Basin and the Blackfoot River, examining the processes controlling metals and arsenic transport and release, and availability to aquatic biota. At a somewhat smaller scale, we are examining the processes fixing and mobilizing arsenic and metals in sediments and soils. Our most recent work concentrates on ground water-surface water interaction in contaminated streams and has identified important controls on arsenic mobility within the hyporheic zone of streams. Much of this work crosses disciplines as I collaborate with microbiologists, aquatic biologists, fisheries biologists, terrestrial ecologists, wildlife biologists, and hydrogeologists (read Bill Woessner).

In 1995, I procured funding (\$800,000) with a colleague in microbiology, to build a campus wide inorganic analytical facility, the Murdock Environmental Biogeochemistry Lab. That lab now serves faculty and students in a wide array of disciplines. The laboratory is the mainstay of environmental chemical research on campus and keeps me busy trying to keep all the equipment running up to specs.

I am also a member of the University of Montana "University Science Research Planning Committee" which is developing a research plan for federally-sponsored research to the year 2020. This experience is giving me extensive insight into the workings of other departments on campus and the egos involved in the reductionist discipline of molecular biology.

I realized that in my career as a university teacher and researcher I have given more than 2000 lectures. That seems like enough, so I have decided that I need to do more hands-on teaching. I am now in the process of changing my courses to be more "exploratory"—setting up a problem to solve and then carrying out the solution from primary data gathering to report writing. My first attempt at this was in Environmental Geology where the students learned all the techniques to make flood predictions. They learned how to measure stream flow, make estimates of error, survey in river channels and floodplains and use historical data to predict flood frequency. This ended with a publication quality report. It was a fun and, I think, useful exercise in giving

students a chance to actually practice scientific techniques using modern equipment. I will do more of this next term in a newly revised Global Change course.

In my spare time I try to find some solitude on Montana and Canadian rivers, in a cedar strip canoe I built last winter.

Jim Sears

We spent a great semester on sabbatical leave at the University of Wales in Aberystwyth. We stayed in a cottage made of Silurian grit and roofed with Cambrian slate looking over the Irish sea. There was time to visit famous geological localities along the coasts of Wales, England, and Scotland, and we went to a unique geological meeting in St. Andrews, Scotland in which haggis (stuffed sheep stomach) was solemnly paraded in on a silver tray, then stabbed with a dagger after reading the appropo Robbie Burns ode, and toasted with Scotch. This summer, I did a transect of the Appalachians in Maine, to test a new theory about Iapetus (the ancestral Atlantic). This fall I had a very stimulating trip back east to give lectures on the subject and received much vigorous feedback!

Steve Sheriff

This semester students in my *Computation and Computers in Geology* course got the advantage of having the computer teaching lab being completely finished. We installed an LCD video-projector which projects the instructors monitor onto the slide screen. The projector is a big improvement over last year, and we will soon have full multimedia capability in SC 304 as well. My *Solid Earth Geophysics* course has the biggest enrollment (all of 16) that it has ever had. For the courses where I have put my notes, exercises and the like on our web page, it seems to be pretty helpful for students. Of course, there is an insidious aspect to it as well; you post a stack of old exams and most of the students will do them all as warmups for the real thing. However, the thought of putting my Solid Earth notes onto the web is daunting; there's still no easy way to go from scribbled equations to nice presentation on the web.

Research wise I have been spending too much time teaching and running the department. I am still hoping to trick an unsuspecting graduate student into following up on Casey Evan's work. Two years ago, Casey developed some tightly constrained models for the configuration of the Tertiary-Precambrian boundary in the central Missoula Valley, and I'd really like to see what it looks like at the Hellgate margin. Although Ron

Anderson developed a nice new statistical method to help out my search for a robust indicator of lithospheric boundaries, I have yet to really test it as a tool to map sutures between contrasting chunks of lithosphere; I am sure I'll be able to get back to this real soon now. In part I have been waylaid by a couple of interesting magnetic interpretation projects related to metals exploration. Meanwhile I have been trying to get funding to buy a bunch of new geophysical equipment for applications in the shallow subsurface. I should find out next month how my last proposal fared. If I get the equipment, I intend to make the Environmental Geophysics course a two-semester event.

George Stanley

After a sabbatical in New Zealand, 1997-98, I continue teaching paleontology and doing research on Mesozoic rocks, reefs, and fossil corals. I also continue to enjoy my frequent interactions with the public and local schools, bringing grade school children and teachers to the Geology Department for tours of the collections and facilities. I also interact with the public who bring in fossils for identification. I taught a popular course in 1999 called "Paleontological Techniques," and I continue to organize an intern program that allows select students to have hands-on experience working with our voluminous collections of rocks and fossils.

I've recently been appointed to the faculty of the Division of Biological Sciences at UM and I hope to interact there with students and faculty. Also I've just been appointed through the Honors College to their honors faculty, and I am now busy organizing a new course that looks at science and the creationism movement. It is to be entitled "God, Darwin, and Dinosaurs" and is co-taught with UM Philosopher of Science, Burke Townsend.

The departmental collections, which I continue to maintain, have been relocated to a large area in the basement of the Science Complex. In addition to rocks and economic minerals, these include nearly 100,000 specimens of fossils from Montana and various parts of North America and the world. I'm also busy supervising the thin section and rock preparation lab. The collections facility continues to attract local, national, and international visitors who come to conduct research with the collections. These included, Mathius Gladow from Erlangen, Germany; Sarah Gabbott from Leicester University, Great Britain; Constance Soja, Colgate University; Susan Kidwell, University of Chicago; and Ewa Roniewicz, Polish Academy of Sciences.

I remain active in research on Mesozoic fossils and

reefs, and I am working on a new book on the Evolution of Reef Ecosystems," to be published by Plenum Press. I was a consultant on a BBC production "Jurassic Reef Park" and continued research on Mesozoic fossils in the Sonoran desert of Mexico. I co-edited a special volume published in Mexico City, in the *Revista Mexicana de Ciencias Geológicas*, 1997-98 with my Mexican collaborator, Carlos Gonzalez. I completed a National Geographic Society field research project in 1998 which funded five UM students to take part in research in excavating Mesozoic fossils in the Sonoran desert near Caborca, Mexico.

I received a 1999 supplement award from the National Science Foundation to allow me continue international, Mexican collaborative research in Sonora which will continue through 2001.

I was joined in November, 1998, by a post-doctoral scholar from China, Dr. Shunxin Zhang, who took part with me in a project to recover tiny microfossils called conodonts from Triassic limestone in California, Nevada, Oregon, and Vancouver Island. She took part in field work with me and my students in the Blue Mountains region of Oregon and Idaho (Summer, 1999).

I was active in field work during summer, 1999. I hosted and supervised a graduate student from the University of Erlangen, Germany, who visited Missoula and took part in research on Triassic reef fossils. He joined me and two UM paleontology students in studying and collecting fossils in the Blue Mountains, Oregon. Part of Summer, 1999, was spent documenting Mesozoic stratigraphy in west-central Nevada with a graduate and an undergraduate student and a paleontological colleague from the Smithsonian Institution. We visited the Berlin Ichthyosaur State Park, Nevada, and worked at a gold mine at New Pass, Nevada, where a student is excavating a new fossil site. It contains some of the oldest corals in North America.

I supervised two graduate students--David Goodwin, working on a paleontology field project in Sonora, Mexico, and Jeannett Yarnell, working in Alaska and the Yukon. I'm also working with a high school teacher, Thomas Andres, who is under my supervision for a Masters in Teaching degree at UM. I was awarded two years of funding from the Murdock Foundation, Partners in Science Program, to support Tom's participation in field and lab studies in Nevada. Tom was on leave from teaching at a private Indian high school in Ashland, Montana. We will present the results of our project at a special Murdock meeting in Tucson, Arizona, in January, 2000.

I continue to serve as the United States Representative of the International Subcommittee on Triassic Stratigraphy. For awards and activities in 1998,

I received the Haworth Distinguished Alumni Award for research achievements from my Alma Mater, the University of Kansas. I also was acknowledged by UM for my Fulbright activities in Germany, Turkey, and Slovenia. During 1999, I was elected Vice-President and United States Representative for the International Society for Study of Fossil Corals at the meeting of our group in Sendai, Japan (September, 1999). While in Japan I conducted field work with Japanese students and faculty at Kyushu University and at the symposium in Sendai, I gave a plenary lecture to delegates from 35 different countries.

Gray Thompson

Gray Thompson continues to write textbooks with Jon Turk for Saunders/Harcourt Brace. Their latest is a second edition of "Earth Science and the Environment," the most popular physical earth science text currently on the market according to Harcourt Brace market research.

The Texaco Corporation is donating to us a new (to our department) X-ray diffraction unit and considerable clay preparation lab equipment from their New Orleans office, which is closing. These instruments will upgrade our XRD and clay labs considerably. Both Gray and Jim Bigley are working on the acquisition, and we expect to have the equipment installed and running before Christmas.

Don Winston

I continue the great arrangement I have with Dean Flightner, taking leave for field work and writing in the fall and teaching three courses in the spring. It's great to separate Belt research from my teaching responsibilities. Last spring, Marc Hendrix and I took the spring field trip through Capitol Reef to southern Utah. We focused mostly on Mesozoic eolian and fluvial redbed successions through central Utah to the Goosenecks of the San Juan, where we hiked down through Pennsylvanian carbonate cycles along the Honaker Trail. We then worked through Cretaceous transgressive-regressive sequences north of Glen Canyon and returned to Missoula via Zion Park. It was a fun trip with great students and lots of classic geology.

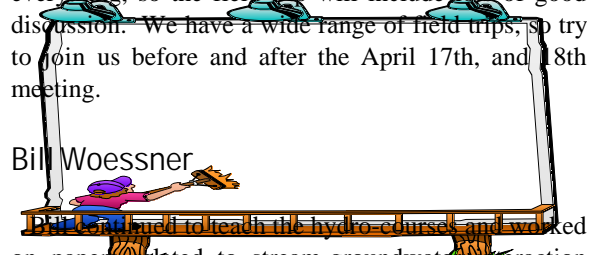
The Belt still lives. Last spring Paul Link, Nate Hathaway, and I published our new Belt-Yellowjacket correlations under the title: *The Yellowjacket is Not the Prichard and Other Heresies*. By correlating the Yellowjacket formation and Lemhi Group with the

Ravalli, Wallace, and Missoula Group, we made the Belt basin even larger and eliminated some big thrusts based on previous stratigraphy. That was fun.

In the spring we signed papers with the Montana National Guard to occupy a gigantic, 300 ft. x 60 ft., vacant commissary building at Fort Missoula for the Belt Basin Core and Research Center. Hundreds of core pallets from Comminco spent the winter outside waiting to be admitted. But when the word got out, the flood gates opened, and we were deluged with core from ASARCO, Kennecott, and Inspiration. The building is now full of core resting on pallets, and we are awaiting federal funding to repair the roof, windows, etc. Then we will seek additional funding to stack the core on racks, and for constructing an inside room to lay out core, file Belt core logs, measured sections, and maps. At this stage we have successfully rescued from landfills irreplaceable Belt core that cost tens of millions of dollars to drill. This represents a great resource for professional and student research, and we have received great encouragement and some financial support from mining companies.

Our hosting the April GSA Rocky Mountain Section meetings in Missoula has turned my attention to editing the guidebook together with Sheila Roberts at Dillon. In addition, Ian Lange, Brian White, and I are leading a field trip to the Coeur d'Alene district, where Brian White has made some new important interpretations. Writing the guidebook article has been prolonged because Brian and I don't exactly agree on everything, so the field trip will include lots of good discussion. We have a wide range of field trips, so try to join us before and after the April 17th, and 18th meeting.

Bill Woessner



Bill Woessner will be teaching the hydro-course and worked on papers related to stream-groundwater interaction and virus transport in groundwater. His continued interest in surface water-ground water interaction resulted in a new graduate seminar in the spring and invitations to present keynote presentations at the joint American Institute of Hydrology and International Association of Hydrogeologists, and at the National Groundwater Association's Pacific Focus conferences. He also spent ten days in Switzerland attending an international modeling conference and presenting an invited talk at the Universite de Neuchatel. In the spring, Bill started research on the hydrology of wetlands in the forested Swan Valley. Work is focusing on small wetlands that sustain a rare and endangered plant, water howellia. Busy with students as always, he

is also serving on the Executive Committee of the Faculty Senate and on the search committee for the Dean of the College of Arts and Sciences.

ALUMNI NEWS

Alexandra Brooks Amonette (B.A. 1998) is working on her M.S. degree in chemistry at WSU (Tri-Cities Campus) and doing part-time work as a science associate for Applied Geology and Geochemistry with Pacific Northwest National Labs. She's doing research on contaminants in the vadose zone at Hanford.

Marvin D. Brittenham (B.A. 1969, M.S. 1973) and his family moved to Bountiful, Utah, where Marvin is Vice President of Exploration for Flying J Oil and Gas, Inc. He and Harriett are very happy to be back in the Rockies after seven years in Houston.

Stan Carrick (B.A. 1976) is working as a hydrologist for the State of Alaska, Department of Natural Resources.

Peter A. Dea (M.S. 1981) is currently Vice Chairman of the Board and Chief Executive Officer for Barrett Resources Corporation, a Denver-based natural gas and oil exploration and production company. In 1999 he attended the Harvard Business School Advanced Management Program. Peter has taken recent trips to Chile for kayaking and to Mount Kilimanjaro for climbing.

Alan English (B.A. 1986) is now working at the Montana Bureau of Mines and Geology in Butte, Montana.

Stanley C. Harrison (B.A. 1956) is retired but works as a consultant looking for hydrocarbons leaking from the sea floor. He has worked the northern Gulf of Mexico, offshore Africa, and the Mexican Gulf of Mexico. We were sorry to learn he lost his wife of almost 38 years in October of 1997.

David King (M.S. 1986) is managing a Rural Water and Sewer District near Bozeman, Montana, after working as a mineral exploration geologist for seven years and a

consulting hydrogeologist for ten years. David is now enjoying a less hectic life with his wife Rebecca and daughter, Galen.

Juliette Lucy (M.S. 1996) has started her fourth year doing groundwater investigations for North American Mine Services and Kennecott Utah Copper in Salt Lake City, Utah.

David Myhre (B.A. 1987) is currently vice president of a Falcon Construction, a small firm that specializes in environmental remediation related construction. He spent the last twelve years working as a geologist in various capacities in both the public and private sectors. David married in 1990 and now has two boys, ages 2 and 4 and a new baby born in May, 1999.

Mark Odegard (B.A. 1997) is a Geotech/Geologist for Whiting Petroleum in Denver, Colorado, doing exploration for oil and gas throughout the Rocky Mountains and the Gulf of Mexico.

Ray B. Olson (B.A. 1952, J.D. 1970) is a retired attorney/geologist (Anaconda/AMAX) since 1981.

Richard H. Roda (B.A. 1960) retired in January, 1999, after thirty-six years in the oil industry.

STUDENT AWARDS

BERTHA MORTON SCHOLARSHIP - Betsy L. Cunningham, Sonia A. Nagorski

ESTWING PICK AWARD - Matthew T. Zunker

GEOLOGY ALUMNI SCHOLARSHIP - Jennifer Jo Brown, Temple E. McKinnon, Karl A. Pracht, Christa-Marie Tyrrell, Sonia A. Nagorski, Joshua K. Borrell, Carla E. Brock, Anna B. Breuninger, Brian M. Priest, Adam N. Perine

FRED HONKALA SCHOLARSHIP - Benjamin M. Webb, Outstanding Senior

PATRICK McDONOUGH MEMORIAL SCHOLARSHIP - Brian M. Priest, Matthew W. O'Brien, Joshua K. Borrell

MICHAEL LEE WILSON MEMORIAL SCHOLARSHIP - Jennifer Jo Brown, Temple E. McKinnon, Heather L. Perry

MONTANA SPACE GRANT CONSORTIUM GRADUATE FELLOWSHIP - Cindy L. Wilson

PHI KAPPA PHI SCHOLASTIC HONOR SOCIETY NOMINATIONS
Lana D. Cohen, Matthew T. Zunker, Weston D. Swirtz, Brian E. Ellis, Jay M. Cummings, William G. Olsen, Anna B. Breuninger, Jennifer Jo Brown, Betsy L. Cunningham, Sonia A. Nagorski

PLANETARY BIOLOGY INTERNSHIP - ROCCO MANICNELLI AT NASA AMES, CALIFORNIA - Cindy L. Wilson

SENIORS GRADUATING WITH HIGH HONORS - Lana D. Coehn, Matthew T. Zunker

UM GRADUATE SCHOOL TRAVEL AWARDS - Jennifer M. DeMonge Esser, Treavor A. Kendall, Eric Roberts, Sonia Nagorski, Warren Phillips, Anna B. Breuninger, George Furniss

UM MORTAR BOARD OUTSTANDING SENIORS - Benjamin M. Webb

WATKINS SCHOLAR - Lana D. Coehn, Brian E. Nixon

ROBERT & ELEANOR WEIDMAN SCHOLARSHIP - Brian E. Nixon

WATER FOR THE NEW MILLENNIUM 1999 ANNUAL CONFERENCE FIRST PLACE STUDENT PAPER AWARD - George Furniss

1999 GEOLOGY SENIOR THESES

Annie Gellatly, Directed by Don Winston, *Were "Molar-Tooth" Gas Expansion Voids in the Helena Formation Initially Filled by Vaterite?*

Chris DuRoss, Directed by Marc Hendrix, *Evaluation of Grant Creek Landslides*

Brian Collins, Directed by Donald Winston, *The Intrastratal Middle Wallace Breccia: Evidence of Post-Wallace Faulting*

Benjamin Webb, Directed by James Sears, *Detailed Mapping of the Garrison and Luke Mountain Quadrangles, Powell County, Montana*

1999 GEOLOGY GRADUATE THESES

Mary L. Beck, M.S., 1999 - *Sedimentologic and Tectonic Characterization of Mesozoic Strata, Noyon Uul Syncline, Southern Mongolia*

Jon Carlson, M.S., 1999 - *Geology and Mineralization of the West Butte Intrusive Complex, Sweet Grass Hills, Northern-Central Montana*

Betsy L. Cunningham, M.S., 1999 - *Petrogenesis of the Adel Mountains Volcanic, Central Montana*

Jennifer M. DeMonge Esser, M.S., 1999 - *Streambed Armoring in Iron Spring Creek, Yellowstone National Park, Wyoming: Ground Water-Surface Water Interactions*

Rene L. Foehl, M.S., 1999 - *Uranium- and Silver-Bearing Veins in the Sunshine Mine, Coeur D'Alene District, Idaho: A Genetic Relationship?*

Matthew L. Gibson, M.S., 1999 - *Hydrothermal Water/Groundwater Interaction: A Comparative Study of Electromagnetic Terrain-Conductivity Mapping and Standard Hydrogeochemical Techniques*

Thomas C. Johannesmeyer, M.S., 1999 - *Magma Mixing and Mingling in the Late Cretaceous Ringing Rocks Pluton and Implications for the Origin of the Boulder Batholith*

Jeffrey K. Johnson, M.S., 1999 - *Contaminant and Hazardous Material Characterization for the Abandoned Paragon Mine Site, Shoshone County, Idaho*

Treavor A. Kendall, M.S., 1999 - *Early Diagenesis of Thermal Springs Deposits*

Ruth A. Lerman, M.S., 1999 - *High Temperature Fluids and Calcite Vein Formation in the Montana Disturbed Belt, West-Central Montana*

Eric M. Roberts, *Sedimentology, Taphonomy, and Alluvial Sequence Stratigraphy of the Two Medicine Formation (Campanian) Near Choteau, Montana*

RECENT VISITING SPEAKERS
AND
FACULTY SEMINARS

February 9, 1999, Don Morton, University of Montana, *Scientific Computing Activities in the Geosciences*

February 26, 1999, Alan R. Carroll, University of Wisconsin-Madison, *Stratigraphic Classification of Ancient Lakes: Balancing Tectonics and Climatic Controls*

March 9, 1999, James Sears, University of Montana, *A New Look at the Siberian Connection (Or, I Was Right After All)*

March 11, 1999, Judith Parrish, University of Arizona, *How We Know the Climate has Changed--Interpreting Climate from the Geologic Record*

March 12, 1999, Judith Parrish, University of Arizona, *Climates of the Supercontinent Pangea*

March 23, 1999, Greg Kennett, Ecosystem Research Group, *Wetland Delineation Methodology and Groundwater Surface Water Interactions in Wetlands*

March 23, 1999, Greg Kennett, Ecosystem Research Group, *Wetlands and Groundwater*

March 25, 1999, Richard Hauer, University of Montana Bio-Station, *Streams and Groundwater*

March 26, 1999, Mary MacLaughlin, Montana Tech, *Numerical Modeling of Stability Problems in Geological Materials: From Landslides to Ground Control*

March 30, 1999, Ron Pierce, Montana Fish, Wildlife, and Parks, *Stream Restoration and Surface Groundwater Interaction*

April 9, 1999, Janet Hering, California Institute of Technology, *Redox Cycling of Arsenic in Hot Creek and Lake Crowley: Implications for Water Quality in the Los Angeles Aqueduct*

April 20, 1999, Dennis Eberl, U.S.G.S., Boulder, Colorado, *Crystal Growth and Emergent Equations*

April 27, 1999, Frankie Jackson, Museum of the Rockies, *Dinosaur Eggs, Embryo and Skin from the Late Cretaceous of Patagonia*

September 7, 1999, David Hyndman, Michigan State

University, *Successful In-Situ Remediation of a Contaminated Aquifer: The Role of Aquifer Characterization and Transport Modeling in Bioremediation Design*

September 14, 1999, James Sears, University of Montana, *Great Rebounding Ramps*

October 19, 1999, Matt O'Brien, University of Montana, *Miocene Sands of Southeastern Louisiana: Synopsis of a Summer Internship at Burlington Resources*

November 3, 1999, Pamela Hallock Muller, University of South Florida, *Global Change: Implications for Coral Reefs*

November 16, 1999, John Mahoney, University of Hawaii, *The Indian Ocean Mantle Mega-Domain*

November 18, 1999, Marc Hendrix, University of Montana, *Assembling Asia: The Sedimentary Record of Extreme Continental Growth*

ROCKY MOUNTAIN SECTION, GSA

52nd ANNUAL MEETING

APRIL 17-18, 2000

MISSOULA, MONTANA

www.cs.umt.edu/GEOLOGY/

The First Rocky Mountain GSA of the Millennium!

The University of Montana Department of Geology will host the 2000 Rocky Mountain Section meeting of the Geological Society of America in Missoula, Montana. The meetings will be held in the new **Missoula Community Theater (MCT)**, 400 block E. Broadway, which is within three blocks of the Holiday Inn headquarters hotel. **Please join us for a great meeting! Preregistration deadline March 12, 2000.**

ABSTRACTS deadline January 15, 2000. Abstracts, limited to about 250 words, must be submitted electronically or camera-ready.

Electronic submission (preferred). See GSA Web site <http://www.geosociety.org/>.

A downloadable PDF version is also available on the GSA Web site.

Paper form: Submission must be on the official 2000 GSA section meeting abstract form, and in accordance with instructions on that form. Abstract forms are available from Abstracts Coordinator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301,

(303)447-2020, ext. 161, or email ncarlson@geosociety.org. Send one original and five copies of the abstract to Marc Hendrix, Technical Program Co-chair, Dept. of Geology, Univ. of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296, (406)243-5278, email marc@selway.umt.edu. Authors of invited (symposium) papers, and those who think their paper might be suitable for inclusion in a symposium, should send an extra copy of the abstract to the first-listed contact person for that particular symposium (see symposia, below).

Only one volunteered paper may be presented by an individual; however a person may be a co-author of other papers. Those invited for symposia may present additional papers. Abstracts will be reviewed for content, originality, and format. There is no fee to authors for submitting abstracts to a section meeting.

For details on Accommodations, Welcoming Party, Special Events, Projection equipment, Poster Sessions, Student Travel Support, Student Assistants Wanted, and Exhibits, please see UM Geology Web site above (links to GSA Web site) or GSA Web site directly at <http://www.geosociety.org/>.

ADDITIONAL INFORMATION: Address general questions to Don Hyndman, (406)243-2241, dhyndman@selway.umt.edu, Dept. of Geology, Univ. of Montana, 32 Campus Dr., Missoula, MT 59812-1296.

TECHNICAL SESSIONS: Symposia

The following symposium topics have been organized; they will include invited papers and selected volunteered papers. Many other sessions on topics dealing with Rocky Mountain geology are planned. Prospective contributors to Symposia should contact individual conveners directly. For general information regarding symposia contact Marc Hendrix, Coordinator for Symposia and Technical Program, Dept. of Geology, University of Montana, Missoula, MT 59812, (406)243-5278, marc@selway.umt.edu.

Current tectonic research in the northern Rocky Mountain region: new ideas and directions. Lee Woodward, (505)277-5309, Dept. of Earth & Planetary Sciences Univ. of New Mexico and Dave Lageson, (406)994-3331, lageson@montana.edu. Dept. of Earth Sciences, Montana State Univ., Bozeman, MT 59717-0348.

Structural Analysis of the Rocky Mountain fold and thrust belt: Jim Sears, (406)243-5251, jwsears@selway.umt.edu. Dept. of Geology, Univ. of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296

Active tectonics, tectonic geomorphology, and paleoseismology of the intermountain Seismic Belt (ISB) and adjacent regions: J. Ramon Arrowsmith (602)965-3541, ramon.arrowsmith@asu.edu, Dept. of Geology, Arizona State University, Tempe, AZ 85287-1404, and Lee Amoroso (602)965-5081, lamoroso@asu.edu. Dept. of Geology, Arizona State Univ.

Geophysics of the Intermountain West: Posters. Dave Brumbaugh (602)523-7191, david.brumbaugh@nau.edu, Dept. of Geology, Northern Arizona Univ., Flagstaff, AZ 86011-4099.

New perspectives on the structural development, stratigraphy, and ore emplacement in the Coeur d'Alene mining district: Don Winston (406)243-5511 or 721-1016, winston@selway.umt.edu, Dept. of Geology, Univ. of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296; Brian White (509)354-8066, bew6@cdc.gov, NIOSH-Spokane Research Lab, E. 315 Montgomery Ave., Spokane, WA 99207; Ian Lange (406)243-4024, gardener@selway.umt.edu, Dept. of Geology, Univ. of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296.

Magmatism and orogenic processes in the Rocky Mountains: David Foster (352)392-7316, dfoster@geology.ufl.edu. Dept. of Geology, University of Florida, Gainesville, FL 32611; Tom Kalakay and Barbara John, Dept. of Geology and Geophysics, University of Wyoming, Laramie, WY 82071-3006; Jim Sears, (406)243-5251, jwsears@selway.umt.edu. Dept. of Geology, Univ. of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296.

Sedimentary basin studies in the Rocky Mountains: Marc Hendrix, Univ. of Montana. (See Coordinator for Symposia, above.)

Effects of fractures and faults on hydrogeology: Shemin Ge, Univ. of Colorado (303)492-8323, ges@spot.colorado.edu and John McCray, Colorado School of Mines, (303)384-2181, jmccray@mines.edu.

Surface – ground water interactions in fluvial systems: William W. Woessner (406)243-5698, gl_www@selway.umt.edu. Dept. of Geology, Univ. of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296.

Acid rock drainage associated with flooded pit lakes and abandoned mines: Chris Gammons, (406)496-4763, cgammons@mtech.edu, Dept. of Geological Engineering, Montana Tech, Butte, MT 59701-8997.

Critical geologic intervals: mass extinctions and recoveries, and biotic changes: George Stanley, (406)243-5693, fossil@selway.umt.edu. Dept. of Geology, Univ. of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296

Tertiary extensional basins in southwestern Montana: Rob Thomas, (406)683-7615, r_thomas@wmc.edu, Dept. of Environmental Sciences, Western Montana College, Dillon, MT 59725-3598.

Late Quaternary paleoecology of the northern Rocky Mountains: Eric Edlund, (406)243-6126, edlund@selway.umt.edu, Dept. of Geography, Univ. of Montana, 32 Campus Drive #5041, Missoula, MT 59812-5041.

Biogeochemistry of Yellowstone, including thermal aspects, soils, and streams: Nancy Hinman (406)243-5277, hinman@selway.umt.edu, Dept. of Geology, Univ. of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296.

WORKSHOPS

Stereo Aerial Photography as an Historical Geo-Data Source: Case Study for Landslide Hazard Identification. *Sponsored by GSA Engineering Geology*

Division and US Army Corps of Engineers (ERDC-TEC) April 15-16.

John Jens, (703)428-6948, jjens@tec.army.mil, U.S. Army Corps of Engineers, Topographic Engineering Center, Digital Products Center, Alexandria, VA 22315-3864.

THEME SESSIONS:

1. Undergraduate research: research-based learning in the classroom; teaching science by example. Chris Brick (406)549-6939, brick@selway.umt.edu.

2. Distance education in the geosciences: experiences and strategies for teaching geoscience via the internet. Chris Brick (406)549-6939, brick@selway.umt.edu.

3. K-12 in the Geosciences. A half-day afternoon session, Monday, Apr. 17, entitled "What's new in Earth Science?"

FIELD TRIPS

Contact trip leaders for details; Direct any general inquiries to Field Trip Co-chairs Don Winston (406-243-5511) at the U of M (winston@selway.umt.edu) or Sheila Roberts (406-683-7017) at Dept. of Environmental Sciences, Western Montana College of the University of Montana, Dillon, MT 59725 (s_roberts@wmc.edu).

Guidebook: A peer-reviewed *Guidebook to the Geology of Western Montana and Adjacent Areas* will be published for the field trips of the meeting.

Pre-meeting trips:

Tectonic Evolution of Bitterroot Metamorphic Core Complex. Trip will examine the structure, petrology, and geochronology of the complex exhumed by extensional shear in Eocene time, including the mylonite, mid-crustal Cretaceous granites, shallow

Eocene plutons, and hanging wall metasedimentary rocks. Two days, Apr. 15-16. David Foster (352)392-7316, dfoster@geology.ufl.edu. Dept. of Geology, University of Florida, Gainesville, FL 32611. Cost \$110. *or* \$140. for special B&B.

Glacial Lake Missoula: shorelines and sediments, giant ripples and other features from catastrophic drainage of the lake: One day, Apr. 16. Dave Alt (406)243-4761 or 543-5070, davealt@selway.umt.edu. Dept of Geology, University of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296. Cost \$45; min. 8.

Quaternary geology, geomorphology, and hydrology of the Upper Flathead Valley, Flathead County, Montana: Two days, Apr. 15-16. Larry Smith (406)496-4379, larry@mbmgsun.mtech.edu. Montana Bureau of Mines and Geology, Butte, MT 59701; Lex Blood (406)752-5222 ext. 290, Geoscience Dept., Flathead C.C., Kalispell, MT; John Lafave, (406)496-4306, jlafave@mbmgsun.mtech.edu, MT Bureau Mines and Geology, Butte, MT 59701. Cost \$80, excluding lodging. Block of rooms (\$58/double incl. bfst, reserved at Hampton Inn in Kalispell). min 10, max 35.

Impacts to the surface and groundwater systems from 100 years of Butte mining and smelting; the Clark Fork Superfund Site: One day, Apr. 16. Christopher Gammons (406)496-4763, Cgammons@mtech.edu, Dept. of Geological Engineering Montana Tech.-Butte, Butte, MT 59703; Joseph Griffin, Environmental Science and Engineering, Butte, MT 59701; and William W. Woessner (406)243-5698, gl_www@selway.umt.edu, Dept. of Geology, Univ. of Montana, Missoula. Cost \$50; min. 10, max 30 partic.

Geology of the western Lewis and Clark Line and Coeur d'Alene Mining District: new structural, stratigraphic, and ore genesis interpretations: Two days, Apr. 15-16. Brian White, Don Winston, and Ian Lange (see symposium 5, above). Cost \$105; min 10 *During meeting* (Monday evening)

Blackfoot Thrust, just east of Missoula. Evening, 5-8 pm, Monday, Apr. 17. Jim Sears and Sue Clements. (see Symposium 2, above). Cost \$5. min. 5 partic. *Postmeeting*

7. Structural and stratigraphic evolution of the Rocky Mountain foreland basin in central-western Montana. Two days, Apr. 19-20. Jim Sears (406)243-5251, jwsears@selway.umt.edu; and Marc Hendrix, (406)243-5278, marc@selway.umt.edu. Dept of Geology University of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296; with Ruth Lerman, Ben Webb, Mike Taylor, Brian Priest, Brian Nixon, Univ. of Montana. Cost \$110. min. 10, max. 25 partic.

8. Shallow-level plutonism in the Sevier fold and

thrust belt east of the Pioneer Mountains, Montana. Trip will examine structural and chronologic relationships between granitic plutons and thrusts in the foreland of the Sevier fold and thrust belt. 2 ½ days, 3 pm Apr. 18-7 pm Apr. 20. Tom Kalakay, Barbara John, and David Foster (see symposium 6, above). Cost \$180, incl. bfst.; min. 12 partic.

9. Platinum Group metal mines in the Stillwater Complex, Montana; surface and underground; mining geology and geotechnical engineering practices: 3 days, Apr. 19-21. Ennis Geraghty (406)328-8407, egeraghty@stillwatermining.com Stillwater Mining Co., Box 365, Nye, MT 5906 and Diane Wolfgram (406)496-4353, dwolfgram@mtech.edu. Montana Tech., Butte, MT 59701. Cost \$250; students \$200, incl Stillwater guidebook material only. min. 10, max 30 partic.

10. The Mississippian Lodgepole Formation, Little Belt Mountains, central Montana: carbonate cycles and Waulsortian "Mounds:" 2 days, Apr. 19-20. George Stanley, Univ. of Montana (see sympos. 11, above) and Randolph Burke, (701)224-3682, North Dakota Geological Survey, Bismark, ND 58505-0840. Cost \$ 105; min. 9, max. 20 partic.

11. Blackfoot landslide and debris slide that blocked the Blackfoot River, Montana on March 28, 1998, and its continuing evolution: One day, Apr. 19. Jennijo Brown and Don Hyndman (406)243-2241, dhyndman@selway.umt.edu. Dept. of Geology, Univ. Montana, 32 Campus Dr. #1296, Missoula, MT 59812-1296. Cost \$50. min. 6.

12. Geology of the Lewis and Clark Trail in Montana and Idaho: Two days, Apr. 18, 4:00 pm-20. Rob Thomas (406)683-7615, r_thomas@wmc.edu and Sheila Roberts (406)683-7017, s_roberts@wmc.edu. Dept. of Environmental Sciences, Western Montana College, Dillon, MT 59725-3598. Cost \$190. min. 10, max. 20.

ALUMNI AND FRIENDS CONTRIBUTE
GENEROUSLY

The department and our students have been helped by generous donations from alumni and friends over the past year. Your gifts have helped to fund field trips for our students, purchase computers for the department, fund scholarships for our best students, and a variety of other things that have helped to keep this a dynamic and fun place to study geology. We thank you kindly for your support. If we've missed anyone, we apologize. If you would like to make a donation, please send it to the Geology Department, The University of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296.

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Deb Waltari and Kenneth Wells
Jared Wells
Nancy Winslow

Exciting News for Montana Residents Considering Giving Gifts to the Geology Department

The Geology Department has an opportunity during the next two years to build its endowment because of Montana House Bill 434. This bill, enacted during the 1997 session, is entitled “An act providing a tax credit for planned gifts by individuals and other gifts by corporations and estates made to qualified charitable endowment funds.” The act will self-destruct on December 31, 2001. The way it works is this. A **Montana tax payer** is allowed a tax credit against his or her state income tax in an amount equal to 50% of the present value of the aggregate amount of the charitable gift made by the tax payer during the year to any qualified endowment (for example, The University of Montana Geology Department Endowment). The maximum that may be claimed by the tax payer for contributions made from all sources in a year is \$10,000. The credit allowance may not exceed the taxpayer’s income liability. Planned gift means an irrevocable contribution to a permanent endowment held by a tax-exempt organization. Below is an example of how an individual contributor would be affected.

Compare the actual cost of a \$5,000 planned gift (to endowment) with a gift of cash

	<u>Paid-up Life Insurance Policy</u>	<u>Gift of Cash</u>
Charitable Amount of Gift	\$5,000	\$5,000
Federal Tax Deduction (@ 28%)	(1,400)	(1,400)
MT Income Tax Deduction (@ 8%)		(400)
MT Endowment Tax Credit	(2,500)	
¹ Montana College Contribution Credit		<u>500</u>
Actual Cost of Gift to Tax Payer	\$1,100	\$2,700

Corporations may also claim an amount equal to 50% of a charitable gift, and up to a total of \$10,000 a year. The deduction also may not exceed the taxpayer’s income tax liability.

Below is an example.

Outright Gifts from Corporations, Small Business, Corporations, Partnerships, or Estates Also Qualify

Compare the actual cost of a \$5,000 endowed gift with an unendowed gift of only \$1,500 (This illustration does not apply to gifts from individuals)

	<u>Designated for Endowment</u>	<u>Not Designated for Endowment</u>
Corporation, Partnership or Estate Gift	\$5,000	\$1,500
² Federal Tax Deduction (@ 39%)	(1,950)	(585)
² MT Income Tax Deduction (6.7%)		(101)
MT Endowment Tax Credit	(2,500)	
¹ Montana College Contribution Credit		<u>150</u>
Actual Cost of Gift	\$ 550	\$ 664

¹College Contribution Credit is available for all gifts (including gifts of cash) made to the general endowment funds of most Montana colleges. The credit is 10% of the charitable amount of the gift, to a maximum of \$500 or your income tax liability, whichever is less. This credit is not available when the endowment tax credit is used and neither credit may be carried back or carried forward.

²Tax rates shown are corporate. Taxes for partnerships and S corporations flow through to the partners or shareholders in proportion to their ownership interests and are taxed at their respective individual rates.

Another interesting contribution instrument enacted by the Montana Legislature in 1997 for Montana taxpayers was the Montana Endowment Tax Credit. This is a 13-month charitable annuity trust that an individual can establish that allows the donor: (1) to use the state tax credit, (2) to take the federal charitable deduction, (3) to receive an annuity payment; and then (4) get the satisfaction of seeing the trust distributed to the charity, whether it is the Geology

Department or any other Montana charity, in the 13th month.

Because of the relatively short period between the establishment of the trust and the distribution to the charity, it is appealing to donors because they actually get to see the benefit of their generosity as it goes to work for the charitable cause, unlike gift annuities, other charitable trusts, or life insurance policies where the distribution of the gift does not go to the purpose the donor set out until after the donor's death.

The minimum requirement for a 13-month charitable annuity trust which is handled through the UM Foundation is \$20,000. The trust offers a state tax credit of up to \$10,000. The credit must be used in the year the gift is made. There no carry forward. Following is an example of how this trust might be beneficial to the giver and the Geology Department.

ASSUMPTIONS:

Projection runs for 1 year.

Fixed term of 1.0877 years (11/30/1999 to 12/31/2000).

Original principal is \$20,000. Cost basis is 50%.

Donor income tax bracket is 36%, 20% for capital gains.

Beneficiary income tax bracket is 36%, 20% for capital gains.

Charitable Annuity Trust	
5%	
Gross Principal	\$20,000
Charitable Deduction	\$18,993
Federal Income Tax Savings	\$ 6,837
Montana Qualified Endowment Tax credit	\$ 9,496
Cost of Gift	\$ 3,667
Income	5%
Capital Appreciation	5%
Total Before-Tax Benefit to Income Recipients	\$ 1,000
Total After-Tax benefit to Income Recipients	\$ 640
Benefit to UM Foundation for Endowment	\$21,000
Total Benefit	\$21,640

Column 1: payment schedule is annual at end. These calculations are estimates of gift benefits. Your actual benefits will depend on the timing of your gift (IRS Discount Rate is 7.4%). These calculations are estimates of gift benefits. Your actual benefits will depend on the timing of your gift. (IRS Discount Rate is 7.4%.)

For more information about any of the above, please call Karen Sitte, The University of Montana Foundation, at 1-800-443-2593, 406-243-6208, or email: sitte@selway.umt.edu

THAT'S THE END OF OUR NEWS

Well, that's our news for now. Don't forget that you're all invited to the Belt Bash this fall! Feel free to visit any other time as well, either in person or in cyberspace--it's always good to hear from our alums. Finally, please let us know what you've been up to so we can include it in the next newsletter!

Visit our web page at <http://www.cs.umt.edu/GEOLOGY/>

IF YOU HAVE NEWS OR IF YOU RECEIVED YOUR NEWSLETTER AT A FORWARDED ADDRESS, PLEASE
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Recent events of interest, career changes, accomplishments, or whatever (3 or 4 lines).

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The University of Montana
Missoula, MT 59812

**Geology Department
The University of Montana
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Missoula, MT 59812-1296**

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