

U of M

GEOLOGY NEWS

A Report to Alumni and Friends

Department of Geology, The University of Montana

Fall 2000

MESSAGE FROM THE CHAIR

Steven D. Sheriff

The 1999-2000 academic year was a good year in the department, this one also promises to be interesting. We've had some turnover in staff positions. Lynn Biegelsen left her position as our laboratory manager. Lynn helped a lot of graduate students navigate through Johnnie Moore's lab and we'll miss her contributions. We had some worries about finding a replacement but those concerns were unnecessary. Temple McKinnon quickly took over as lab manager and the analytical operation is running well. We wish Lynn well and enjoy working with Temple. Our graphics technician, a job long held by John Cuplin, then Dave Gaueman followed by Amy Rollins is currently being partially and temporarily filled by Anna Breuninger (BA 1995, M.S. 2000). Anna is doing GIS work with Johnnie; we hope to advertise and hire a new technician this spring. Fortunately for us, Jim is still our electronics technician, and when you stop in the office you are still be greeted by Loreene or Christine.

Although there has been no change in the faculty, Don Hyndman was on a sabbatical assignment this fall and Nancy Hinman took a year's leave of absence to work as a geologist for Yellowstone National Park (tough duty Nancy!). We do not have any visiting faculty teaching this year but we have had a pretty good stream of speakers for the past few years; you can always check the web site to see who is coming. The rest of us are involved in a mix

By now, you know the pitch is coming; my hand is out-your donations support students. We use your donations for supporting student research, field trips, small scholarships, educational, and instructional materials. You keep helping us and we'll help the students. One way to contribute, besides sending me all your money, is to work in a

of teaching, research and public service; you'll read about what we've been up to on the following pages.

Last spring we hosted the Rocky Mountain Section meeting of the Geological Society of America. There are substantial bureaucratic and logistical hurdles associated with such a task but it was very rewarding for the department. Don Hyndman was the meeting chairman and he pulled it off well. Many alumni attended, and lots of our faculty, graduate students and some undergrads gave talks or presented posters. The hallway chit-chat was a continuous reunion that appeared to extend deep into the evenings on a couple of occasions. One rewarding product of the meeting was the field trip guide, *Geologic Field Trips, Western Montana and Adjacent Areas*, edited by Sheila Roberts and Don Winston. Several faculty and alumni contributed to the guide; if you need some ideas for good road trips in the area, that's the source.

Our Rocky Mountain Section meeting provided our students with an opportunity to present and publish much of their work. Getting students to meetings to present graduate or senior theses is something we believe in and strive for. And, 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. We had a van with six students taking their presentations to the national GSA meeting in Reno this November and a few more presented at the AGU meeting in San Francisco. Someday, when somebody is feeling particularly generous, we hope to have an endowment to support field trips, student trips to meetings, and student field work

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 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. And if you have an appropriate, isolated problem that needs to be solved maybe it would make a good senior or M.S. thesis.

So, read the newsletter, enjoy the newsletter, and send some news for the next one!

What's the Faculty up to?

Dave Alt

~~Dave continues as usual in recent years to teach introductory geology, geomorphology, the regional geology of the Pacific Northwest, and something he calls modern concepts, which deals with such alarming subjects as giant asteroid impacts and their tectonic and environmental consequences.~~

More specifically, Dave continues to read and think about geologic events of middle Miocene time in an attempt to sort out the consequences of an extremely large impact in southeastern Oregon about 17 million years ago. Its effects seem to include, among others, Pacific Northwest flood basalts, basin and range spreading, initiation of the San Andreas fault, major deposition of phosphate rock in many regions, a terrific global greenhouse effect, and a large extinction. The subject grew beyond all hope of control several years ago, and continues to expand.

Dave's new book entitled *Glacial Lake Missoula and Its Humongous Floods* has been in press for entirely too long now, the hapless victim of one delay after another. He now hopes to see it in the bookstores next spring. If not, he will burst into tears.

Marc Hendrix

The big (good) news for me this past year is that the university granted me tenure. My thanks to those of you who wrote letters to the faculty evaluation committee on my behalf! While I awaited the tenure decision, I spent most of my research time focusing on a memoir I've been editing for GSA. The memoir is a collection of 19 papers dealing with the Paleozoic and Mesozoic tectonic and sedimentary basin history of central and eastern Asia. My job as editor was to solicit the manuscripts, find reviewers, review the reviews, make acceptance decisions, follow up on revisions, etc. etc. I was also a co-author on six of the papers in the volume, including papers by Derek Sjostrom and Mary Beck—two recently finished UM Masters students who did thesis work in Mongolia. After a year of editorial

pain (my respect for the work of journal editors has increased tenfold!), the entire package of revised accepted manuscripts was mailed off to GSA in March and accepted for publication a couple of months after that. Thankfully, now we're in the home stretch.

This past year was also a big one for me in terms of students finishing up. Both Carla Brock and Josh Borrell finished their MS theses. Carla focused on modern sand compositions in the Columbia River drainage and Josh looked at the sedimentary record of tectonism in central Montana from Late Cretaceous through Tertiary time. Both studies turned out very well. In addition, Mary Beck and Eric Roberts both defended their theses last year, putting the lid on two additional interesting studies. Mary was the second student of mine to work in Mongolia. She focused on a series of synorogenic strata in southern Mongolia. Eric did a very nice sequence stratigraphic study of the Campanian Two Medicine Formation over by Choteau; he also documented an impressive petrified forest that is entombed in an ash flow tuff within the Two Medicine. The results of that study came out in the October 2000 issue of *Palaios*. In addition to the work by these grads, I was also involved with a couple of senior thesis projects geared towards surveying some evolving landforms here in western Montana. Chris Corwin did a nice total station (laser) survey of a big gravel bar in the Clark Fork River and Brad Wolfinger did a similar study on a gravel bar down the West Fork of the Bitterroot River. My hope is that future generations of students will resurvey these features and be able to quantify the geomorphologic changes from year to year by comparing the results of surveys from different generations of students.

One other exciting piece of news is that I'm starting a new project at Flathead Lake, examining the record of sedimentation in the lake for clues as to past climate, fire history, and pollution influx. This past September, Johnnie, Bill, and I collected eight long piston cores (5-7 m in length) from the bottom of the lake, using a specialized coring vessel from the Limnological Research Center in Minneapolis. The cores are nicely laminated and contain a few volcanic ashes, lots of thin black layers (including some containing charcoal from big fire seasons), and some anomalously coarse-grained 'event' beds that may represent storms, turbidites, or high run-off events. Johnnie and I are hoping to develop this project into a major research effort over the next few years.

Outside of work, Brigitte and I continue to enjoy life here in Montana, fishing, hunting, climbing, etc. Please drop by the next time you're out this way.

Nancy Hinman

Aside from obvious effects like heat-fracturing, you would think that fires might have little immediate effect on geological processes. Nancy Hinman and students, Cindy Wilson and Tom Moore, found out otherwise. Timing their fieldwork perfectly, the team started their photochemical studies in Yellowstone National Park the same week fires began raging through Montana. Photochemical studies involve several days of sampling from before the sun comes up until after it sets in order to detect ephemeral photochemical effects on water chemistry. The smokey haze filtered sunlight with increasing efficiency at shorter wavelengths. So, the more photochemically active UV radiation was all but removed, eliminating any photochemical cycling that they might have seen. All was not lost, however, as the lack of cycling illuminated other processes and interrelationships. Tom Moore's work on the properties of schwertmannite and Chantelle Begay's work comparing surface features on Mars with travertine mounds of Arizona relate to Nancy's continuing work on Martian analogs. Nancy continues her work on pre-biotic chemistry and Martian analogs and is on leave this year as geothermal geologist in Yellowstone National Park.

Don Hyndman

I was preoccupied with heading up the Geological Society of America Rocky Mountain Section meeting which was held in Missoula from April 17-18, 2000. Aside from teaching the undergrad Geology 306 course in Igneous and Metamorphic Petrology and the undergrad Geology 207 course in Geological Hazards and Catastrophes, it seemed that I wasn't getting much else done.

My application for sabbatical leave for Fall Semester was awarded so I spent almost two months in Italy and Greece studying active volcanoes and landslides. Highlights included the Vico landslide in northeastern Italy, 1998, debris flows east of Naples, Campi Flegrei caldera next to Naples, Mt. Vesuvius and its 79 AD target Pompeii, Mt. Etna in Sicily, and Santorini caldera in Greece. The Vico landslide is a dip-slip rock slide that catastrophically filled a deep mountain reservoir, expelling the water over the dam and drowning about 3000 people. Campi Flegrei, a giant active caldera with several hundred thousand people on the west edge of Naples and Vesuvius in its eastern suburbs are both active and considered major threats to the lives of more than two million people living in the Naples area. Debris flows in 1998 east of Naples flushed Vesuvius ash off limestone hills into medieval towns killing several thousand people. Mt. Etna, a highly active

basaltic volcano in Sicily, frequently dumps ash on nearby towns. A large mass of its eastern flank collapsed many years ago before the present towns grew on its lower flanks. The volcano rests on young marine clays so the possibility of a new collapse is a major concern. The Greek island of Santorini is a major drowned caldera that erupts catastrophically every few thousand years, with smaller eruptions in between. The last catastrophic eruption about 1600 BC marked the demise of the highly advanced Minoan civilization. The modern towns on the island drape down the inside of the caldera wall and would be annihilated by any large future eruption. The remainder of my sabbatical leave included a trip to the Front Range of Colorado to examine landslides and debris flows, and to confer with U.S.G.S. and Colorado Geological Survey geologists, and to the Texas Gulf Coast to examine hurricane hazards.

Recent publications this year include one with Mike Poage and Jim Sears on *Petrology, geochemistry, and diabase-granophyre relations of a thick basaltic sill emplaced into wet sediments, western Montana*, Canadian Journal of Earth Sciences, vol. 37, p. 1109-1119. Mike completed his Ph.D. at Dartmouth last year and continues there with a post-doc appointment. Two others were published this year with Jenni Jo Brown, *Slump block and debris slide on the Blackfoot River, Montana, U.S.A.*, published in *Landslide News*, vol. 13, p. 15-18, and *Blackfoot landslide 1998-1999: Slippery slope into the Blackfoot River*, p. 179-196, in *Geologic Field trips in western Montana and adjacent areas*, edited by Sheila Roberts and Don Winston, Geological Society of America, Rocky Mountain Section. Jenni Jo will complete her M.S. thesis work on the Blackfoot slide this spring. Another with Dave Foster and Carl Schafer, *Relationship of crustal partial melting, plutonism, and orogeny: Northern Idaho batholith* is in press in a Tectonophysics special issue on Partial Melting and the Flow of Orogens.

Dave did his M.S. thesis years ago on magma mixing in the Idaho batholith, completed his Ph.D., and is now a professor at the University of Florida. Carl completed his M.S. in 1998 and now teaches at a college in Michigan.

I am currently working with two M.S. students. Steve Moss is studying magma mingling as a possible driving mechanism for explosive eruptions from granitic magma chambers in the Bearpaw Mountains of central Montana. John Corkery is studying petrologic processes leading to platinum-group-element enrichment in the Picket Pin section of the gabbroic zones of the Stillwater layered intrusion in south central Montana. In what spare time is left, I am working on the manuscript for a textbook on natural geologic hazards and on another book with Dave Alt, *Geology Underfoot of Montana*.

Ian Lange

The fall 2000 semester finds me back from a half year sabbatical spent partly in Missoula and mostly elsewhere in the western states. I returned to Missoula in April for the first GSA sectional meeting hosted by the Geology Department since 1977. We thoroughly enjoyed the experience even after the two years of preparatory work. The larger than expected turn out, and our many old friends and former students that attended for the technical sessions and field trips, made all the preliminary work worthwhile. This was especially true for me, as the "Chief Financial Officer" of the meeting, because we finished the event in the black. The money made was turned back to the Rocky Mountain Section and will be used to help students attend future Rocky Mountain Sectional meetings.

In addition to that event which consumed a major part of April, I continued to edit my forthcoming book on Ice Age Megafauna of North America. In addition to the animals, I discuss the various theories for the Pleistocene ice ages and extinctions of the great animals at the end of this epoch about 10,000 years ago. The book should hit the book stores and then the best seller lists sometime this year. Additional, non-animal related work continues on precious metal deposits in Montana. A paper entitled "The Nicholson gold-silver deposit, an intrusion-hosted, tombstone-like system in southwestern Montana" located in the Tobacco Root Mountains was presented in May at the Geology and Ore Deposits 2000 meeting held in Reno, Nevada. My paper will appear in print and on a CD ROM with most of the others this fall for those of you who missed this gala event.

While the exploration climate for gold deposits in Montana has cooled to just above absolute zero since the passage of the 1998 anti-cyanide initiative for processing ore from open pit mines, work still continues by some of us diehards on precious metal systems. Dave Waisman, a 1986 M.S. recipient, and I are readying a paper on the silver-bearing Black Pine mine near Philipsburg for publication in Economic Geology.

Once again, it was great seeing so many old friends and not so old students this year. My best to you all.

Johnnie N. Moore

My research and teaching continues to concentrate on

This year was a lot of fun. We started with a great field trip through Glacier Park with Don Winston and a lively group of undergrads and grads. No bear or ranger incidents! Then we geared up for the Rocky Mountain Section of the Geological Society of America meeting in April in Missoula. There was lots of student involvement, including presentations,

understanding issues affecting watershed health, specifically the contaminant hydrology of aquatic and floodplain systems, and human impacts on earth systems. Graduate students under my direction and I are conducting hydrologic research on scales ranging from the large basin to local river reaches. At the basin-wide scale, we continue work in 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 the effects on microbial community structure and function. Much of this work crosses disciplines as I collaborate with microbiologists, aquatic biologists, fisheries biologists, terrestrial ecologists, wildlife biologists, and hydrogeologists (read Bill Woessner). I continue to direct the Murdock Environmental Biogeochemistry Lab (funded by the Murdock Foundation in 1995). 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. My newest research efforts are with Marc Hendrix. Marc, Bill Woessner, and I have gone back to my past and started work again on the sedimentology and history of Flathead Lake. We dusted off old 3.5 kHz seismic records that Tony Qamar, Jerry Kogan, and I collected more years ago than I want to remember. We used those to plan a coring expedition this summer which resulted in eight cores up to 7.5 meters long. Marc will be working on the sedimentology of these cores, and I will be doing the geochemistry. We hope this will give us a long record of geochemical and hydrologic change in the Flathead River Basin. My teaching continues to evolve around "environmental geoscience." I teach the Junior-level Environmental Geology course, a Senior-level Global Change course, and advanced courses in Environmental Geochemistry. In my spare time I try to find some solitude canoeing Montana and Canadian rivers or less solitude roaring around Montana highways with Gray Thompson on our motorcycles.

Jim Sears

posters, and field trips. We had two structure-related trips that were well attended; one to the Blackfoot thrust, and one to Augusta and Sun River Canyon. Great weather for both. I was happy to have a "New look at the Siberian-Laurentian connection: No SWEAT" published in the May issue of Geology. Ray Price and I wrote the update on our 1978 paper to redirect the debate about the

history of the western Laurentian margin. In August, I co-led two field trips along the Rocky Mountain front with the Montana Geological Society meeting in Great Falls. We peered through thick smoke from forest fires at some of the stops, but it was a great time. In September, I got a chance to go to Scotland for a Penrose Conference about Iapetus. The five-day pre-meeting field trip through the Scottish Highlands was a highlight. We had decent weather and fabulous rocks. Seeing the Moine thrust for the first time was a near-religious experience.

Steve Sheriff

Last year I had a couple of interesting opportunities come up to supplement my teaching and running the department. First, the Rocky Mountain GSA meeting in Missoula gave me a chance to present a couple papers resulting from the work of recent graduate students, Casey King and Kelly Brunt. Brian Priest, who is working with Jim Sears and me, also gave a paper. Kelly's and Brian's talks centered on rotations of thrust sheets in Montana's fold and thrust belt. I'm getting close to compiling this work after another step or two. The next step in working out the emplacement kinematics of the thrust sheets might be to measure the deformation of some of the widespread diabase sills that are scattered throughout the Belt. This will be tricky in that I will have to do it without letting on to Don Winston that I am interested in working on Belt-related rocks. If Don found out I'm afraid he'd bury me in Belt detail, something I've carefully avoided for twenty years. There is also a new graduate student who I think I can trick into working with me to extend Casey's determination of the configuration of the Tertiary-Precambrian boundary in the central Missoula Valley; if this works I'll reveal the victim's name in a subsequent newsletter. Finally, being chair paid off with an interesting side trip. Last March, I got invited to be an outside reviewer for the Department of Geology at the University of the United Arab Emirates. That led to a week on the Arabian Peninsula and, I hope, to developing some contacts in that part of the world.

George Stanley

It's great when you can devote your life to the study of I'm continuing collaboration with Mexican geologists on Mesozoic rocks and fossils south of the border--down in the desert country of northwestern Sonora. I co-edited a special issue on the subject, summarizing

long extinct dead things. Paleontology is death and that's the good news! Without this creative process, we paleontologists would be out of work. The past year I've had plenty of work, teaching and researching paleontology in the Geology Department. I've been appointed an adjunct in the Division of Biological Sciences and so have the opportunity to interact with students where the "living meet the dead" so to speak. In addition to teaching introductory paleontology and the history of life courses, I joined the Davidson Honors College (DHC) teaching faculty to develop and teach a new honors course with Philosophy Professor, Burke Townsend. Entitled "God, Darwin, and Dinosaurs," the course examined the nature of the creationist movement in America, and we reviewed the deep philosophical rift separating science and religion. I also worked with DHC undergraduate biology student, Camas Sturm, acting as mentor under a DHC student-mentor program. Camas' results on fossil corals from Nevada were presented at last year's meeting of the National Council for Undergraduate Research, held on the UM campus.

My graduate student, Jeanie Yarnell, finished her thesis on fossil corals from near Denali Park, Alaska, and she also tackled another site in the Yukon. Her thesis was a biogeographic approach, using early Mesozoic reef fossils to test outrageous tectonic hypotheses about the accretion and movement of displaced terranes along the seaboard of western North America. This is part of a larger continuing project funded by the National Science Foundation "Recoveries from Mass Extinctions," and it focuses on fossils from Mesozoic reefs. Reefs are Earth's most fragile marine ecosystem--the first ecosystem to fall in a mass extinction and the last to recover in the aftermath. I've also been a mentor, supervising high school teacher, Tom Andres from Ashland, Montana. Tom is earning a Masters in Teaching Degree at UM while working with me on Triassic fossils from Nevada. He is supported by a Murdock Foundation grant in a program designed to matching university scientists with high school teachers. Tom presented the results in Tucson at a Murdock-Research Foundation meeting last January 2000.

A REU--Research Experience for Undergraduates grant (1999-2000), from the National Science Foundation, is being used to support two undergraduate students, Marty Larsen and Jennifer Krenz, allowing them to participate in my paleontology projects and also helping them learn how paleontological research is done. We spent time together in the field last summer along the Snake River Canyon, Idaho, and the Wallowa Mountains of Oregon, camping out, collecting fossils and studying an ancient fossil coral reef.

research work on stratigraphy, tectonics, and paleontology. Tom Andres took part in the most recent field work in Sonora. Another graduate student, David Goodwin, recently finished his UM Masters thesis which

was based on field work in Sonora (funded by the National Science Foundation and a grant from the Mexican government). It's fun to sweat in January, doing geology under the heat of the desert sun while Montana lies under ice and snow!

I've recently begun collaborating with the Natural History Center at historic Fort Missoula. Last academic year and last summer I acted as advisor to NHM intern, Becki Braun, UM Geology student, who developed an outstanding exhibit depicting the ice age in Montana.

I remain an unrepentant coral reefer. Having made a reconnaissance trip last Spring, 2000 to the Caribbean country of Belize, in Central America, I plan to offer a new UM field course focusing on the reefs of Belize. I've also put the finishing touches on a new book on reef ecosystems in geologic time, to be published early 2001 by Plenum Press.

Gray Thompson

In the Spring of 2000, Texaco Oil donated to us a late-model automated computer-driven Philips/Norelco X-ray diffractometer and a great deal of clay preparation laboratory equipment. We are using the lab instruments already and are working on setting up the XRD unit. When it is up and running, which we anticipate will happen early this spring, our X-ray diffraction analytical capabilities will be considerably increased to make use of new digital analysis procedures. In order to take advantage of this new equipment, we have added a new course titled "X-ray Diffraction Techniques in Rock and Mineral Analysis" to our graduate curriculum.

In addition to these graduate courses, I continue to teach undergraduate mineralogy, field geology, an introductory-level environmental geoscience course, and other undergraduate and graduate courses.

Don Winston

Another busy year--and that's good. The big event for most all of us, of course, was the Rocky Mountain Section Meeting of the GSA in April. Sheila Roberts, who is teaching at Dillon, and I served as guidebook editors and were in charge of running the field trips. In addition Brian White, Ian Lange, and I ran a field trip to the Coeur d'Alene district, where most workers now agree that the minerals were originally emplaced in Belt rocks and remobilized into Cretaceous veins. Brian White has proposed that a north-trending structure he

Since returning here, Nate Hathaway and I measured part of the new Belt formation along the North Fork of the St. Joe River, Idaho. Interestingly enough, the section crosses Big Dick Creek, and we need to come

terms the Noxon line, together with the Lewis and Clark line, localized mineralization in the Belt. I think the major players were the Noxon line and the northwest-trending Jocko line, but not the Lewis and Clark. This difference of opinion resulted in many manuscript drafts before we each decided to state our own views in separate papers and write the road log together. The trip came off well, and Brian and I are still good friends.

There was life after GSA, and, as a reward, Bente and I treated ourselves to a week snorkeling and diving with friends on Tortola, British West Indies. Lots of good ripples, including some undescribed 3d flow oscillation ripples. I returned here to help Annie Gellatly sample Newland core from the new core center for her Masters Thesis under Tim Lyons at Missouri. She will be comparing sulfur isotopes in sulfide and sulfate minerals to infer the oxygen concentration in the Middle Proterozoic. I then headed up a field trip from Glacier National Park to Wallace, Idaho, to try to demonstrate continuity of the Wallace and Shepard formations across the basin and simplify the formal stratigraphic nomenclature. We succeeded in clearing most of the underbrush, but I was given the job of describing a new formation to be the western facies of the Snowslip. After the field trip I jumped a plane for Peru, and Bente and I joined Marc and Brigitte for a wonderful ten days in Cuzco and Machu Picchu. I left them for an International Geologic Congress Proterozoic field trip in Brazil, but joined them in Rio where we shared an apartment. The IGC meetings were better than I had anticipated. The Proterozoic is turning out to be a frontier of interest, and several sessions were devoted to the assembly and breakup of the proposed Proterozoic supercontinent of Rodinia. I am becoming more and more skeptical of the whole idea of Rodinia. There were also some good papers on the microbial precipitation of calcitic and dolomitic sediments. I presented a poster on the Belt.

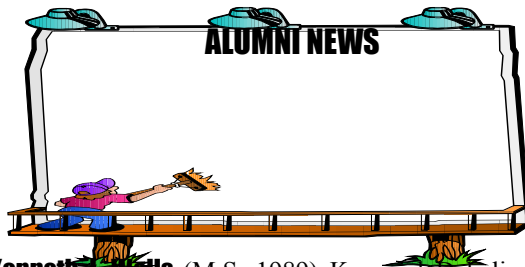
I returned to Montana to find the country smoke-bound and scary. Chopped and piled a lot of trees in the Jocko before leaving for Australia, where I joined Annie Gellatly, Tim Lyons, and Tracy Frank in Brisbane for three weeks. We collected carbonate sediments for Heron Island and Low isles along the Great Barrier Reef to see if the sulfide and sulfate isotopes in carbonate sediments really do reflect the modern atmospheric oxygen concentration. Then we traveled to Mount Isa to collect Proterozoic carbonates. I saw enough of the rocks around Mount Isa to be confident that this part of Australia had nothing to do with the Belt, as the Rodinia model proposes.

up with a new formation name. The fires and my being in Australia postponed the Belt Bash, which we staged on October 13. In true form it rained, but that didn't seem to dampen the spirits or the thirst. So, as you can see, it's

been a great year.

Bill Woessner

Bill has been busy with research and grad students over the last year. He says “about twelve” when asked how many! Student research includes continued work on the impact of septic systems on shallow groundwater, metal migration in floodplain sediments, looking at CFC and tritium in the Missoula Aquifer, evaluating the impact of placer mining on groundwater-surface water exchange, and analysis of local flow systems associated with wetlands. Bill published a paper in *Ground Water*, “Stream and Fluvial Plain Groundwater Interactions: Rescaling Hydrogeologic Thought” in June that attempts to refocus river-groundwater evaluations. He also taught a cross disciplinary seminar in groundwater-surface water interaction this spring. Bill continues to serve as an undergraduate advisor and on the Executive Committee of the Faculty Senate. He was recently nominated and elected to the Board of Directors of the Association of Ground Water Scientists and Engineers of the National Water Well Association. Work continues on a revision of his groundwater modeling text with his co-author Mary Anderson.



Kenneth J. Wells (M.S. 1989) Ken and Deb live in Aberdeen, Scotland, where he is a geologist with Shell. Most of his work involves building 3-D geological models and evaluating new modeling technology. Turbidites and associated soft-sediment deformation are a big interest.

Nick Protos (B.A. 1989) Nick recently moved back to Montana. He was working for Safety-Kleen Consulting until December, 1999, then moved to Billings to work for ThermRetec Consulting. Currently, Nick is managing remedial studies and action for Exxon Refinery.

Rob Angelo (B.A. 1996) - Rob has been working for the

Gary Sorensen (M.S. 1986) For the last five years, Gary has worked as a Geologist/Hydrogeologist for Skagit County, Washington. He previously worked as a mineral exploration geologist for about five years and a consulting hydrogeologist for seven years.

John G. Cleary (M.S. 1976) John is still working as a consulting geologist on the Wood Gulch gold project in Nevada.

Greg Byer (M.S. 1987) Greg recently joined Mundell and Associates, Inc., which is a small company in Fishers, Indiana, that provides hydrogeologic and geophysical consulting services. Greg spearheads the geophysics effort, a career dream. His team is enjoying itself doing state-of-the-art geophysical projects on environmental and engineering issues.

Ross Miller (M.S. 1991) Ross co-founded Land and Water Consulting, Inc. in 1991. Land and Water is a natural resource and water resource consulting firm which is based in Missoula with additional offices in Kalispell and Helena. Ross is married to Sally Johnson and they enjoy tromping around Montana with their seven year old daughter.

Bill Morgan (B.A. 1986) After leaving the University of Montana in 1986 with a B.A., Bill received a B.S. in Civil Engineering from Montana State University in 1989. It seems he has the ability/problem of trying to root for either the Griz or the Cats every fall. Take a guess on who he has been rooting for since 1986! He is currently a staff engineer for the City of Billings Public Works Engineering Division, and tries to keep a couple of rock and mineral specimens around his office in the hopes that a Civil Engineer will ask “What’s that?” He has two daughters who enjoy collecting their own rocks, and he is a violinist in the Billings Symphony Orchestra.

Pamela Sikkink (M.S. 1984) Pamela is currently a Ph.D. student in the School of Forestry at The University of Montana with a focus on landscape ecology.

Alan English (B.A. 1986) Alan recently resigned from the Montana Bureau of Mines and Geology and took a job as a the Manager of the Gallatin Valley Water Quality District. He has finished his Masters degree in hydrogeology at Montana Tech.

Meridian Gold Company for the last four years. His main

focus is epithermal precious metal vein systems of Mexico. Peru and Central American countries are in the works for the summer.

Gordon T. Vaskey (B.A. 1980) Gordon is a senior geologist with PYR Energy Company. PYR Energy is an oil and gas exploration company active in California and the Rockies. He recently moved back to Colorado Springs after nine years in Houston, Texas.

Dick Benoit (M.S. 1972) After twenty-six years of work in the geothermal industry, Dick has decided to cash a severance check and go climbing. It was fun, but electricity prices cannot now support new domestic geothermal projects.

Dave Leppert (M.S. 1985) Dave is living in Boise, Idaho, and is very involved with the Idaho Museum of Mineral Geology.

Brian Iverson (B.A. 1987) Brian is the Manager of Land Affairs with Placer Dome America H.C. in Reno, Nevada.

G.E. McKelvy (B.A. 1966) Greg is a vice president with Phelps Dodge Exploration Corporation.

STUDENT AWARDS

BERTHA MORTON SCHOLARSHIP - Temple McKinnon, Cindy Wilson

BELT ASSOCIATION GRANT - Michael Sperazza

ESTWING PICK AWARD - Nicholas Laatsch

GEOLOGY ALUMNI SCHOLARSHIP - Neal Alexandrowicz, Peggy Clements, John Corkery, Geoff Gilbert, Jesse Mitchell, Heather Perry, Natalie Morrow, Stephen Moss, Warren Phillips, Karl Pracht, Eric Roberts, Noah Hughes.

GEOLOGICAL SOCIETY OF AMERICA RESEARCH GRANT
Stephen Moss

GEOLOGICAL SOCIETY OF AMERICA ROCKY MOUNTAIN SECTION INDIVIDUAL STUDENT TRAVEL GRANT - Sue Clements, Noah Hughes

FRED HONKALA SCHOLARSHIP - Brian Nixon, Outstanding Senior

Bruce C. Lauerman, M.S., 1999 - *VIRUS*

PATRICK McDONOUGH MEMORIAL SCHOLARSHIP - Neal Alexandrowicz, Jeffrey Brooks, Jesse Mitchell

MICHAEL LEE WILSON MEMORIAL SCHOLARSHIP - Geoff Gilbert, Noah Hughes, Jesse Mitchell

PHI KAPPA PHI SCHOLASTIC HONOR SOCIETY NOMINATIONS
Jennifer Jo Brown, Peggy Clements, Temple McKinnon, Warren Phillips, Lana Cohen, Thomas Gruber

ROBERT L. BATES SCHOLARSHIP - Geoff Gilbert

SENIORS GRADUATING WITH HIGH HONORS - Brian Nixon

UM GRADUATE SCHOOL TRAVEL AWARDS - Anna Breuninger, Sonia Nagorski, Warren Phillips, Eric Roberts

UM TRAVEL AWARD - Sue Clements, Noah Hughes, Karl Pracht, Matt Reeves

UM MORTAR BOARD OUTSTANDING SENIORS - Brian Nixon, David Beal

ROBERT & ELEANOR WEIDMAN SCHOLARSHIP - Jessica Meyer

2000 GEOLOGY SENIOR THESES

Lana Cohen, *Determining the Density of the Precambrian Belt Supergroup Near Missoula* - Watkins Scholarship
Project directed by Steven Sheriff

Bradley Wolfinger, *Total Station Survey and Sedimentologic Analysis of a Gravel Bar at Conner Crossing, West Fork Bitterroot River, Montana* - directed by Marc Hendrix

Christopher Corwin, *Total Station Survey and Sedimentologic Analysis of the Turah Bar, Clark Fork River, Montana* - directed by Marc Hendrix

1999/2000 GEOLOGY GRADUATE THESES

David J. Johnson, Ph.D., 1999 - *SEDIMENTARY STRUCTURES AND FACIES IN THE HELENA AND WALLACE FORMATIONS, MIDDLE PROTEROZOIC BELT SUPERGROUP, MONTANA*

OCCURRENCE AND TRANSPORT IN A COLD-WATER,

SAND AND GRAVEL AQUIFER, FRENCHTOWN, MONTANA

Joshua K. Borrell, M.S., 2000 - *SEDIMENTARY RECORD OF UPPER CRETACEOUS THROUGH TERTIARY TECTONISM, NORTHEASTERN CRAZY MOUNTAINS BASIN, CENTRAL MONTANA*

Anna B. Breuninger, M.S., 2000 - *EFFECTS OF FLOODPLAIN REMEDIATION ON BED SEDIMENT CONTAMINATION IN THE UPPER CLARK FORK RIVER BASIN, MONTANA*

Carla E. Brock, M.S., 2000 - *COMPOSITIONAL DIVERSITY OF SAND DERIVED FROM A MIXED-PROVENANCE REGION: HOLOCENE SAND COMPOSITIONS FROM THE COLUMBIA RIVER BASIN*

Jennifer Jo Brown, M.S., 2000 - *A SLOPE STABILITY ASSESSMENT OF THE BLACKFOOT RIVER CORRIDOR BASED ON THE LANDSLIDE OF MARCH 28, 1998*

Jeffrey A. Fink, M.S., 2000 - *CHARACTERIZATION OF THE ONE-DIMENSIONAL TRANSPORT OF THE BACTERIOPHAGE MS2 IN A COARSE-GRAINED VADOSE ZONE BENEATH A SEPTIC DRAINFIELD*

Warren P. Phillips, M.S., 2000 - *SULFIDE CHEMISTRY AND POTENTIAL TOXICITY OF SEDIMENTS AT A COAL-MINE-PIT-LAKE IN SOUTHEASTERN MONTANA*

Christa-Marie Tyrrell, M.S., 2000 - *GROUNDWATER-STREAM INTERACTION IN A PLACER-MINED WATERSHED: AN INVESTIGATION OF ELK CREEK, MONTANA*

Jeannette M. Yarnell, M.S., 2000 - *PALEONTOLOGY OF TWO NORTH AMERICAN TRIASSIC REEF FAUNAS: IMPLICATIONS FOR TERRANE PALEOGEOGRAPHY*

Thomas L. Troy, M.S., 2000 - *EFFECTS OF GROUND WATER FLOW VELOCITY ON MS2 TRANSPORT THROUGH A SAND MATRIX*

Brian M. Priest, M.S., 2000 - *STRUCTURAL AND PALEOMAGNETIC STUDY OF THRUST ROTATION OF A LATE CRETACEOUS SILL, GIBSON RESERVOIR, BOB MARSHALL WILDERNESS, MONTANA.*

Matthew W. O'Brien, M.S., 2000 - *STRATIGRAPHIC ANALYSIS OF THE ALBIAN THROUGH CAMPANIAN COLORADO GROUP WITHIN THE CLARK FORK SAG NEAR GARRISON, MONTANA.*

DIANE S. FRIEND, M.S., 2000 - *FLEXURAL RIGIDITY OF THE NORTHERN ROCKY MOUNTAINS: RELATIONSHIP TO CRUSTAL DOMAINS AND DEFORMATIONAL STYLE.*

RECENT VISITING SPEAKERS AND FACULTY SEMINARS

February 3, 2000, **Jeff Gee**, Scripps Institution of Oceanography, *Magnetization of the Oceanic Crust: Applications to Crustal Formation and Earth's Magnetic Field.*

February 17, 2000, **Daphne Fautin**, Division of Biological Sciences, University of Kansas, *Ephemeral Calcification: What Do You Call a Naked Coral?*

February 29, 2000, **Richard Gibson**, Gibson Consulting, Gravity-Magnetic-Geologic Interpretations, *Basement Tectonics of Williston Basin.*

March 1, 2000, **Richard Gibson**, Gibson Consulting, Gravity-Magnetic-Geologic Interpretations, *Magnetic Exploration and Hydrocarbons in the Former Soviet Union.*

March 2, 2000, **Bradley Ritts**, Department of Geology, Utah State University, *Tectonic History of the Altyn Tagh Fault, NW China: Evidence from Sedimentary Basin Analysis.*

March 3, 2000, **Bradley Ritts**, Department of Geology, Utah State University, *Mesozoic Petroleum Systems of Central Asia: Geology and Molecular Organic Geochemistry of Source Rocks and Oils in the Qaidam and Southern Tarim Basins, NW China.*

March 7, 2000, **Robert Blodgett**, Oregon State University, *Paleontologic Evidence for the Siberian Origin of Many of Alaska's Accreted Terranes.*

March 7, 2000, **James Madison**, Montana Bureau of Mines and Geology, *The Berkeley Pit-Lake System and the Biosulphide Process: Metal Recovery and Water Treatment.*

March 14, 2000, **Ed Flood**, Precious Metals Investment Analyst for Haywood Securities Inc., *The Relationship of the "Market" and the Mining Industry: The Wheel of Fortune*.

March 28, 2000, **James Sears**, University of Montana, *The Law of the Sea: Eustasy and Cambrian Tectonics*.

April 11, 2000, **William Cooper**, UNC Wilmington, *Aquatic Photochemistry: Chemical and Biological Implications in Surface Waters*.

April 12, 2000, **William Cooper**, UNC Wilmington, *Kinetic Modeling of Radiation Chemistry: The Link Between Basic Research and Applications*.

April 25, 2000, **Len Schombel**, *Arsenic Plume at Milltown: Some Observations*.

September 21, 2000, **Eugenie C. Scott**, National Center for Science Education, *How NOT to Teach Evolution*.

September 21, 2000, **Eugenie C. Scott**, National Center for Science Education, *Science, Religion, and Evolution: The Controversy Continues*.

October 3, 2000, **James Sears**, University of Montana, *Soccer Ball Earth: New Tectonic Framework for the Belt Basin*.

October 26, 2000, **David Dolberg**, Mobil-Exxon, *Porosity Prediction from Seismic Inversion, Lavrans Field, Halten Terrace, Norway*.

November 3, 2000, **Jack Schmidt**, Utah State University, *Geomorphology and Adaptive Management of the Colorado River in the Grand Canyon*.

November 9, 2000, **Noah Hughes**, UM Graduate Student, *The Upper Proterozoic-Lower Cambrian Succession of the Pericratonic Eagle Bay Assemblage of South-Central British Columbia: A Constraint for the Timing of the Rifting of Western Laurentia*.

November 17, 2000, **Anthony Hallam**, University of Birmingham, Great Britain, *Mass Extinctions and Sea Level Changes*.

November 28, 2000, **Lynne Dickman**, Bitterroot National Forest, *The Relationship of Fire to Geology*.

December 5, 2000, **F. Jerry Lucia**, Bureau of Economic Geology, The University of Texas at Austin, AAPG Distinguished Lecturer, *Origin and Petrophysics of Carbonate Rock Fabrics*.

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Generous donations from alumni and friends have

greatly helped the Geology Department and our students attend professional meetings and field trips, purchase computers, and conduct their research through scholarship support over the past year. Your gifts have really helped to continue to make this a dynamic and fun place to study geology, and 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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THAT'S THE END OF OUR NEWS

Well, that's our news for this year. Please feel free to drop by any time, either in person or in cyberspace--it's always good to hear from our alums. Also, please let us know what you've been up to so we can include it in the next newsletter, and remember, you're all invited to the Fall 2001 Belt Bash!

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 RETURN THIS FORM.

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