

U of M

GEOLOGY NEWS

A Report to Alumni and Friends

Department of Geology, The University of Montana

Fall 1998

MESSAGE FROM THE CHAIR

Steven D. Sheriff

Fall 1997, fall 1998; two newsletters in two years. If we keep this up we'll have to start calling it an annual newsletter. We got so many positive comments, postcards, donations, and corrected addresses from last year's newsletter that we thought we'd send another one. I won't guarantee an annual newsletter but I promise we'll try.

We had a couple noteworthy events in and around the department this past year. Judy left our administrative assistant position to start a new career combining her skills in health care and administration. Everybody was sad to see Judy go but quite happy to see her get a more lucrative and challenging position. Christine Foster is now our administrative assistant; we were very lucky to steal her away from a similar position in UM's Shafizadeh Rocky Mountain Center for Wood and Carbohydrate Chemistry. Christine is getting used to her new job and I'm trying to keep everybody on good behavior so that she will stay. The department is proud to announce that Ian Lange received the 1998 Distinguished Research Award for his many productive years of work in economic geology. This annual award goes to UM's top researcher; we're all very pleased that Ian was this year's recipient. We're also pleased to announce that Lee Woodward (BA, Geology, 1958 and MS, Geology, 1959) was one of six alumni honored by UM with a Distinguished Alumni Award during this year's Homecoming Weekend. Lee has distinguished himself both in this thirty years of teaching and research at the University of New Mexico.

We currently have three visiting scholars in the department. Jim Castro, a recent Ph.D. from our department, is teaching Environmental Geology and

Environmental Geochemistry for us this year. Those are usually Johnnie Moore's courses but Johnnie has 50% release time from his grant from the Murdock Foundation. David McConchie is a Visiting Professor from the Centre for Coastal Management, Southern Cross University East Lismore, N.S.W. Australia. David, a colleague of Nancy Hinman's, has visited before and does research on Heavy Metals in Environmental and Exploration Geochemistry. David will be presenting a short course on *Heavy Metals in Environmental and Exploration Geochemistry* during the 1998/1999 intercession. Dr. Shunxin Zhang, an Associate Professor from the China University of Geosciences in Beijing, is a specialist in Paleozoic and Mesozoic conodonts. Shunxin has recently been a research scholar at the University of Victoria, B.C. Shunxin is in our department working with George Stanley.

The biggest new item on our list, and likely the biggest for a while, is the construction of the joint Geology/Biology Field Research Center at Fort Missoula. This project, funded by about \$900,000 of bond money, is also providing some much needed remodeling of the Science Complex. Starting this past summer (and continuing longer than we'd like) the Science Complex remodel includes enlarging Johnnie's Murdock Analytical Facility, housing all our collections (bugs, fossils, rocks, minerals, and maps) in the old Flume Room in the basement, enlarging the Geology 100 Computer Lab, providing space for Marc's sedimentology lab on the third floor and several smaller changes. Biology's part of the field research center will mostly house an aviary and research space for their ornithologists. We will use our portion for a core lab, mobile geochemistry and groundwater equipment. We intend to develop long-term class exercises related to the wetlands, water table and Bitterroot River and I've been considering building a test-site for my Environmental Geophysics class. We are currently negotiating for another building at the Fort Missoula site in which

to house a collection of drill cores, to be donated by Cominco and Asarco, from the Belt Supergroup. As you can imagine, Don Winston is pretty stoked about a building full of Belt rocks.

We are well on the way towards getting approval from the Board of Regents for a new option in our Ph.D. program. We have attracted a lot of unsolicited interest over the past several years from ex-students and others in the state who wish to earn a Ph.D. and maintain a viable professional career in environmental, minerals, or petroleum geology whether in private industry or governmental agencies. Thus we designed a program that minimizes on-campus residence, allows for joint industry-sponsored research with students and faculty, and leads to a Ph.D. with minimal career disruption. The program has enough in common with our traditional program that we can offer it now under the traditional program; we currently have two students as "pilot specimens" in the program. Given approval by the regents we will be able to advertise the new program as a Ph.D. in Applied Geoscience. We hope the program will further our contacts with industry and agencies and lead to funded senior and M.S. thesis projects.

Speaking of industry contacts, David Hlebichuk (B.A. 1981) and George Stovall (B.A. 1981) from Burlington Resources recently interviewed students for summer internships and career positions with Burlington. I know there are more 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.

Perhaps you have 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 Toronto was a little distant and expensive for most of us but we expect to have a strong contingent at the Rocky Mountain Section meeting in Pocatello this spring. We're currently in the midst of organizing the year 2000 GSA-Rocky Mountain Section meeting here in Missoula - how could we better experience the foreboding Y2K problems? This meeting promises to be a good one with symposia on the Coeur d' Alene district mineralization, Cretaceous foreland development, and Clark Fork River Superfund Site, all with associated field trips.

Ok, here's the pitch. Your donations support students. We use your donations for supporting

student research, field trips, small scholarships, and educational/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 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 is 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.

What's the Faculty up to?

Dave Alt

Dave Alt plunged into Glacial Lake Missoula sometime in 1996, full of energy and enthusiasm. Now he is beginning to look a bit weary. But he claims that he is approaching the ice age shoreline on the crest of a great flood, and expects to surface no later than December 15, 1998. With any luck, the book should appear about six months later.

After that, he plans to return to his long study of the many events of middle Miocene time. That was a period of great impacts, which caused environmental effects that lasted two million years and tectonic effects that still continue. He has been trying to pull it all together for years, but the subject grows faster than he can pull.

Meanwhile, the old boy continues to teach, still wondering whether anyone except himself is learning anything.

Marc Hendrix

This past year, I continued my work on sedimentary basin evolution in central Asia and Montana. In May, I participated in a very interesting meeting in Inner Mongolia (China) that included a field trip to a series of very large thrust nappes of Jurassic age. It was great to have the opportunity to see these structures, because for years now my students and I have been studying the sedimentary effects of Jurassic shortening across the border in southern Mongolia, but we'd never had the

opportunity to see the actual thrust structures themselves. In August, I returned to Mongolia for the final season of field work on my current NSF grant. Most of my time there was spent examining a superbly exposed metamorphic core complex that immediately post-dated the Jurassic thrust events. As always, I had a great time with my Mongolian friends, this time opening up a new beer garden in Ulan Bator, chasing antelopes across the Gobi in our Russian jeep (we never would get very close, but it was still exciting), and stopping by the occasional local eatery for our fill of mutton parts and fermented mare's milk.

Closer to home, this past year was one of major turnover for my students. Derek Sjoström started a Ph.D. at Dartmouth, as did Amy Waddell at Stanford and Tip Meckel at UT-Austin. Lorin Amidon set up shop in a metals mine in the Alaska Panhandle, and Toby King started a graduate program in music at Columbia. Happily, this original crew of grads has followed by a great new bunch. Most of my new students are spending their time unraveling the history of Mesozoic tectonics and sedimentation here in the northern Rockies.

Aside from geology, I continue to be busy gardening, snowboarding (a pastime that earned me a broken collar bone this March), and fishing.

Nancy Hinman

Nancy Hinman continues her work at the conceptual interface between mineral deposition and microbial processes. Her interests focus on the persistence and interpretation of chemical signals indicative of biological processes. As such, she has conducted work on thermal springs precipitating silica and iron oxides, as well as conducting laboratory experiments using iron-reducing bacteria. Recent work by student, Cindy Wilson, has demonstrated the balance between abiotic and biotic processes in thermal springs. Microbes in thermal springs occupy low branches near the common ancestor of the phylogenetic tree. As such, the identification of a chemical system which involves abiotic and biotic processes driven by solar and chemical energy sources has implications for microbial ecology and the first appearance of life on Earth. Nancy's work on the interface between surface water and ground water continues through the efforts of graduate students, Jenni DeMonge and Treavor Kendall. Both are looking at the geochemical processes which affect mineral deposition in

saturated zones and unsaturated zones in thermal drainages of Yellowstone National Park.

Don Hyndman

Last year I got more seriously into some subject matter that I have been interested in for a long time, Geological Hazards. I began teaching a 200-level course called Catastrophic Events in Geology last spring and a senior/graduate student course in Geological Hazards this fall. Although it wasn't the reason for presenting such courses (it happened in the middle of the Catastrophic Events course) a major landslide on the Blackfoot River provided further interest. On March 28, 1998, a few miles south of Ovando, a 1000-foot long section of glacial lake silts and till making up a 300-foot high terrace, slumped about 100 feet, then partly collapsed, sending almost 100,000 cubic yards of silt down across the Blackfoot River. USGS streamflow data at Bonner, about 40 miles downstream showed a sudden drop, then a quick recovery, as water rose behind the dam and flowed around the toe of the slide. I and a new graduate student, Jennijo Brown, have been monitoring the slide for the last six months and attempting to decipher the details of its movement and probable causes. We presented the preliminary results of our study at the national Geological Society of America meeting in Toronto in late October.

One of my graduate students, Carl Schafer, who finished his M.S. on anatectic migmatites in the northern Bitterroots last May, and I presented that work at the Toronto GSA. We have been invited by conveners of a symposium to write up that work for a symposium issue of *Tectonophysics*, focussing on melting in the continental crust. One of my former M.S. students, Dr. Dave Foster, now of the University of Florida, one of his former colleagues in Australia, and the two of us are now completing that paper on melting and timing of intrusion in the northern Bitterroots.

Two of my recent grad students, Mike Poage (finishing his Ph.D. at Dartmouth) and Stephen Porder are finishing manuscripts of papers based on their M.S. theses, for submission to professional journals. Poage worked on chemical and petrographic aspects of differentiation of the Plains sill (northwest of Missoula) and Porder worked on burial metamorphism in Belt rocks spatially associated with the Plains sill.

My other two grad students, Betsy Cunningham and Tom Johannesmeyer, are working on alkalic

igneous rocks (magma mingling/mixing/differentiation?) in the Adel Mountain volcanic rocks north of Helena (Cunningham) and in small mafic-rich plutons just east of the Boulder batholith (Johannesmeyer). Both are field/petrographic/chemical studies that serve to help to understand the interaction between mafic alkalic and felsic subalkalic rocks in the Central Montana Alkalic Province.

In my "spare" time, Dave Alt and I have finished a new edition of *Roadside Geology of Northern and Central California*. This is a totally

Ian Lange

It is hard for me to believe that I have been in residence at the UM for over 26 years, or since the fall of 1972. But life gets better and better as the years go by. And this past year was especially rewarding because I was selected for the 1998 University of Montana Distinguished Scholar Award. Other news includes the completion of a "geological hobby project" that I started in 1990. This project, a book about the late, great Megafauna of the Pleistocene, has been on the back burner until 1998 when I decided I had better finish it and see it published.

In addition to describing the animals, I also summarize some of the present thinking as to why these huge and magnificent animals became extinct, what the Pleistocene was like, and theories for the formation and demise of the great Pleistocene ice sheets. The whole project has been fun especially for one (me) who never took a paleo course. The book should be on the market in the fall of 1999 complete with numerous illustrations by an outstanding artist who works in acrylics and pen and ink.

I have also been working on some gold-related projects, in addition to finishing my first book. A paper about the placer gold deposits and their sources in Ninemile Valley located west of Missoula will appear early next year in *Economic Geology*. And research has begun on a Ft. Knox-like gold deposit located in the Tobacco Root Mountains.

Johnnie N. Moore

Johnnie Moore continues to study metal and metalloid contamination in aquatic systems resulting from agricultural, industrial, mining and smelting operations: Partitioning and transfer of contaminants within water-sediment-biota in streams affected by acid mine drainage and mining wastes; kinetics of

new book that covers the area of the original 1974 N. California book but extends coverage south to Yosemite and San Luis Obispo. The book is in press now and should be in bookstores by next summer. We have also begun work on a new book, *Geology Underfoot of Montana* - a more-detailed study of about 30 especially interesting geological sites in Montana. Like books in the *Roadside Geology* series, this one is addressed primarily to the educated non-geologist. But we will let our geologist friends read it too.

arsenic oxidation by Mn-oxide; basin-scale processes of arsenic contamination in sediment and surface water; mitigation of acid mine drainage metals contamination; particle-size effects on contaminant transport in sediment; redox and hydrologic controls on arsenic migration from contaminated reservoir sediment; redox pumps in contaminated systems; mobilization of metals and metalloids from contaminated floodplain soils; biogeochemical cycling of selenium in wetlands; modeling alternative methods for remediation of selenium contamination in wetlands; hyporheic zone contamination in rivers; role of coatings in fixing and mobilizing metals and metalloids; biogeochemical pumps in the mobilization of contaminants; long-term seasonal variations in metal concentrations in sediments of large rivers; and modeling metal contamination in large river systems. He presently has six graduate students working on master's degrees and two students working on doctor's degrees and is presently overseeing the remodeling and expansion of laboratory space in the Science Complex and the construction of a joint Biology/Geology Field Research Station at Fort Missoula. In his spare time he does a bit of canoeing in Montana and B.C.

Jim Sears

Jim Sears and his family are enjoying a semester sabbatical at the University of Wales in Aberystwyth. He is working at the Institute of Geography and Earth Sciences.

Aberystwyth means Mouth (Aber) of the Ystwyth River. The town has about 30,000 souls and is on the Irish Sea, about halfway up the coast of Wales. Jim and family are living in a cottage made of Silurian grit and Cambrian slate on a small sheep farm about 4 miles from the 'Uni'. Jim is working on an Appalachian-Caledonian tectonics problem and is studying the classic field geology of the British coast.

He will be giving a paper titled 'Balancing Iapetus: Restoration of an ancient ocean basin' at a Tectonics symposium in St Andrews, Scotland in December.

The children are in Welsh schools and are finding their way into the culture. Debra thoroughly enjoys Wales and keeps things running smoothly.

Jim says 'Bore-da' (howdy in Welsh).

Steve Sheriff

I mentioned in my "Message from the Chair" that we are constructing a Geology/Biology Field Research Center at Fort Missoula. I did not mention that I am head of the UM Committee charged with spending \$1,400,000 to further research via improved infrastructure; the Field Research Center and remodeling much of Geology's space in the Science Complex took about 70% of the pot. The committee took a little bit of time. Yet it was rewarding in that it just happened to work out well for Geology and the sciences.

This semester I have been teaching a new class, *Computation and Computers in Geology*, in the joint Geology-Physics computer teaching lab which Randy Jeppeson (Physics Chair) and I raised money for last year. We are finishing construction this month with the installation of an LCD video-projector which will display the instructors monitor on a slide screen at the front of the room so that students can see what is happening on the instructor's monitor. Too bad we didn't have this technology in my lab back when Chip Strayer, Jay Gunderson, Ted Doughty, Arthur Jolly and company linked my lab computers to fly flight simulator against one another. The class has been interesting to teach, the video projector should help a bunch. Since I've been developing the class from scratch, I have been forcing myself to put the notes and exercises on the web as I go. It is a lot more work to put your notes into HTML rather than scribble them on a yellow page or two. Anyhow, we'll see if it is helpful to the participants in the long run--take a look and see if the exercises make sense: http://www.cs.umt.edu/GEOLOGY/classes/Comp_Geol/compgeol.htm.

Research wise I have still been messing with developing a different way to use gravity to map sutures between contrasting chunks of lithosphere. In fact, Ron Anderson got a Ph.D. in math this past summer working on part of the problem. Ron tinkered with an existing statistical technique, known as expectation-maximization, so that it works for a spatial variable rather than just a random variable. I think we are getting close, I just need to

find some time to code up Ron's technique and force-feed it a heap of data. Carrier phase GPS equipment I got from NSF now lets us get elevations within +/- 30 centimeters so we can do detailed gravity observations just about anywhere we want to--no more sticking to benchmarks. Given that approach, Josh Lewis worked on a senior thesis determining local densities using gravity and elevation. Casey Evans incorporated Josh's data with her own detailed gravity net in the central Missoula Valley to finish her M.S. last year. Casey found some interesting sharp turns and offsets of the Clark Fork Fault; her solutions are really tightly constrained by now known densities and the old, deep drill hole in the Missoula Valley from the 1970's national uranium exploration project. I hope to con another industrious graduate student into tracing the subsurface structure from Casey's area east to Hellgate Canyon. Beyond that, I have a pending equipment proposal to acquire more environmental-scale geophysical equipment for my environmental geophysics class. If that gets funded I'll be busy characterizing and visualizing the shallow subsurface (while keeping an eye open for tectonic implications). Have fun, I am.

George Stanley

I spent all of last academic year (1997-98) on sabbatical leave.

First, I was at the University of Auckland, in New Zealand, most of Fall semester. Supported as the University of Auckland, Foundational Fellow, I enjoyed convenient campus accommodations above the University faculty club. In the Geology Department at Auckland, I worked with paleontology Associate Professor Jack Grant-Mackie, taking part in geology field trips to both North and South Islands. Most of New Zealand is composed of a mosaic of tectonic terranes and my project was to investigate fossils in two of these terranes. While in New Zealand, I also visited the capitol of Wellington and journeyed to the most down under university in the world--Otago University in Dunedin. Time was spent researching the rich Triassic fossils of New Zealand. I also enjoyed living, lecturing, and the stimulating interaction with New Zealand paleontology students. Hikes on isolated volcanic islands and coastal beaches, populated by penguins and sea lions, provided added attractions.

I also ventured briefly to the next island over--Australia--taking part in an international scientific meeting near Sydney. It was not only an academic

experience, but a cultural one as well. Even though New Zealanders speak our language, the cultural differences between us are more than one would imagine. Many boxes of collected research specimens were shipped back to the University of Montana for future study and I plan to return to N.Z. in the near future.

Spring semester saw my return to the U.S. where I was situated at the University of Arizona in Tucson. During the UM January semester break I ventured over the border to meet four UM students--David Goodwin, Jeanie Yarnell, Svea Rogers, and Tara Prestholdt for field work in the Great Sonoran desert, of Mexico. This was part of an ongoing National Geographic Society project to study the Mesozoic geology and paleontology of the region. In addition to field work, my students and I interacted with Mexican Geologists in the Institute of Geology in the Regional UNAM Station of the Northwest in Hermosillo, the capital of Sonora. My work was part

Thompson teaches a variety of courses at both undergraduate and graduate levels, including undergraduate mineralogy/petrology, two 100-level introductory geology courses, the clay mineralogy/shale petrology graduate course, and summer field mapping. He also continues to write books at a rate of one each year. During the past three years, Harcourt Brace/Saunders has published *Earth Science and the Environment 2nd Edition* (1998), *Introduction to Physical Geology* (1998), and *Modern Physical Geology 2nd Edition* (1997), all co-authored by Thompson and Jon Turk.

He acquired four X-ray diffractometers, two generators, a recorder panel, and a large array of peripheral X-ray diffraction equipment and literature when Montana Tech at Butte closed its XRD lab and kindly gave us the equipment. The units are compatible with our current X-ray diffraction equipment, and hence will allow us to replace worn parts and units in our Norelco diffractometers and maintain our X-ray analytical capabilities.

Thompson continues to climb, spending parts of recent summers in the High Sierras, which he describes as being "just like mountains but with good weather, no bugs, easy approaches, and good rock."

Don Winston

This was another wonderful year, chiefly because I continue to extend my field and other Belt research from the summer through the fall semester and devote spring semester to full-time teaching. The

of a cooperative project with geologists of the Mexican government. A variety of rock types and fossils were discovered and the project formed the basis of a UM masters thesis.

During my sabbatical leave I also took part in two other projects. One, sponsored by the National Science Foundation, on recoveries of reef faunas from mass extinctions and the other, an international workshop on the geology of northwestern Sonora. I'm acting as co-editor for a volume of the results of the workshop, slated for publication late November, 1998, in Mexico City.

My most recent endeavor is a new book on the evolution of reef ecosystems to be published by Plenum Press. Work is going slowly but the end product promises to be a new look at how reefs have changed during the past 600 million years.

Gray Thompson

202 sedimentology and stratigraphy class had lots of good students, many of whom joined the spring field trip to northern Utah, focusing on the Mesozoic rocks of the San Rafael Swell and Canyonlands National Park. The rocks and the weather were great, and we all had a good time. Next spring we may study the same rocks farther south in Utah.

In June, Bente and I took a marvelous trip to Namibia. John Grotzinger showed us the latest Proterozoic rocks in west-central Namibia that initiated the Cambrian biologic explosion. Farther north we met Galen Halverson and Paul Hoffman, who showed us the Late Proterozoic rocks of the Snowball Earth. We then continued farther north and visited the herds of animals in Etosha Park. The Belt work is going well. George Furniss, John Rittel, and I got a paper out promoting molar-tooth structure as calcite-filled gas expansion bubbles and cracks. Paul Link, Nate Hathaway, and I made our annual foray into the Yellowjacket rocks around Salmon, Idaho, documenting our new correlations of those rocks with the Belt. The new correlations erase some of the big faults. With the mining companies singing the blues and cutting costs, we have been offered huge quantities of Belt core. We recently secured a giant, 60 by 300 ft. barn out at Fort Missoula that belongs to the Army. It needs repair and an inside room for core description and research facilities, but it's just what we need. We are establishing the University of Montana Belt Core and Research Center and will house all the Belt data we can. We have support from the University and industry, and I am hopeful we can get the funding we need. When I can no longer get to the top of the

Mission Range, I can hobble around in the barn with my walker.



Bill Woessner

Bill has been continuing work on virus and bacteria transport at the Frenchtown High School where he and grad student Jeff Fink have been conducting joint experiments with two faculty in the Division of Biological Sciences. He has been developing grant proposals to look at passive reactive walls with the University of Waterloo and surface-ground water interaction assessments. This fall Bill was invited to be a keynote speaker at the annual meeting of the International Association of Hydrogeologists and the American Institute of Hydrology. He presented a paper entitled, *Changing Views of Stream-Groundwater Interaction*. Bill is also working with Mary Anderson at the University of Wisconsin-Madison to revise their popular groundwater modeling text.

Robert Weidman

As I write, it doesn't seem possible that eleven years have passed since I retired, but keeping busy and doing new things makes time fly (one of those new things was auditing German 201 and 202). To those who made possible the purchase of my first computer as a retirement gift, let me say I can't imagine being without a computer, and I recently purchased my third.

For me, the geologic highlight of the year was a one-day tour of Parque Nacional del Pinacate, located in Sonora just southwest of Organ Pipe Cactus National Monument, Arizona. Driving our pickup truck over some thirty miles of dirt roads, my wife and I were in constant view of a large shield volcano studded with some 400 subsidiary cones. Our most interesting experiences were standing on the rims of two different maar craters, each about a mile across. Desert wild flowers were spectacular, thanks to El Nino rains. A unique aspect of the traverse was that we encountered only five vehicles during the entire day!

It was good to renew acquaintanceships with many of our graduates at the summer field conference of the Tobacco Root Geological Society in Lincoln, Montana. Several of those grads helped organize the conference, presented papers, or were field trip leaders.

Last spring, Eleanor and I spent a memorable four weeks in Mexico, traveling by bus from Mexico City to visit Oaxaca, Valle de Bravo, Morelia, Patzcuaro, and finally, the mirador (overlook) for Particutin

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Robert Angelo, BA, 1996. Robert is an exploration geologist for Meridian Gold Company out of Reno, Nevada. Most of his exploration takes place in Nevada (Carlin Trend) and Chile.

Scott Bryan, M.S., 1974. Scott and his wife wrote *The Explorer's Guide to Death Valley National Park* (University Press of Colorado). It required two reprints in its first two years. This goes along with his long-standing *The Geysers of Yellowstone* (also University Press of Colorado, 3rd Edition) and *Geysers: What they are and How they Work* (Roberts-Rinehart). In 1991 Scott led the first American expedition to the "Valley of Geysers" in Kronotsky Nature Reserve, Kamchatka, Russia. On the professional front, he has now been a professor at Victor Valley College, Victorville, California, for seventeen years and is also the director of the new planetarium and instructor of astronomy.

Bill Clement, M.S. 1986. Bill is working for the Center for Investigation of the Shallow Subsurface a.k.a. CGISS at Boise State University. He does shallow, environmental geophysics to characterize aquifers. He has two daughters, Lauren (thirteen) and Emma (nine).

William Cobban, B.A. 1940. William was recently honored by having two books dedicated to him: N.L. Larson and Others: *Ammonites and the Other Cephalopods of the Pierre Seaway*, and the New Mexico Geological Society 48th Annual Field Conference Guidebook.

Mark Cunnane, B.A. 1984. Mark moved to Bozeman in November of 1997 after ten years in Seattle. He is now enjoying the dry climate with his wife Lisa and daughter Leslie.

Robert Ehinger, Ph.D. 1971. Robert has joined the staff of RAM Energy, Inc., as Senior Geologist/Explorationist, in their Tulsa, Oklahoma office. Previously, he had been a Consulting Geologist in the Tulsa/Oklahoma City area. Dr. Ehinger received a Certificate of Achievement from Hart's World Oil for his geologic work on Helmerich and Payne's Buddy 1-32 well in Washita County, OK. The Buddy 1-32 well was selected as the Best Wildcat Well in the Mid-Continent for 1997.

Sue Finstick, M.S. 1986. Sue received her Ph.D. in Geology and Geophysics from the University of Hawaii in 1996. She is employed by Bulloch Brothers Engineering, Inc. (Cedar City, Utah) as a hydrogeologist/engineering geologist/technical writer. She is also an adjunct faculty member at Southern Utah University (Cedar City) teaching intro courses and is active in the Geology Club--great field trips all over the southwest.

Brian Iverson, BA 1987. Brian graduated from the University of Nevada, Reno in 1992 with a Masters

Lee Woodward, M.S. 1959. Lee is now a Senior Research Professor at the University of New Mexico, having retired from full-time teaching after thirty-three years. He continues his research in tectonics and ore deposits.

Degree in Geology and has been working for Placer Dome Exploration, Inc. ever since. He is presently the Land Administrator/Geologist and oversees all land obligations for the western hemisphere. He and his wife, Marcia, have four children, ages 4, 6, 8, and 10.

Wendy Melgin, B.A. 1979. Wendy is a Regional Hydrologist for U.S. EPA Region 9 in San Francisco. She earned her M.S. in hydrology and hydrogeology from the University of Nevada-Reno in 1985.

Jim Melik, B.A. 1958. Jim has been semi-retired for several years after working overseas in petroleum geology for most of his career. He is now teaching part-time at Heritage College where his wife is the library director.

Steve Simpson, M.S. 1985. Steve is a Geology/Geography instructor at the Highland Community College in Freeport, Illinois. "With half a kilometer of sediment on the craton out here I've been getting more into paleontology than igneous petrology, but I did manage to talk somebody at the Illinois Survey into giving me a split section of core from 5000' beneath Freeport on indefinite loan. I pass it around my geology classes and keep it in my office to remind me that there really are iggies in Illinois." Steve has been married for about five years and lives on a farm with his wife, son Henry, and daughter Claudia.

Shifflett, Jeremy Mickey, Eric Roberts, Timothy Meckel, Matthew O'Brien, Ian Magruder

FRED HONKALA SCHOLARSHIP - Emilie Reagan, Outstanding Senior

STUDENT AWARDS

BERTHA MORTON SCHOLARSHIP - Betsy Cunningham, Sonia Nagorski

ESTWING PICK AWARD - Andrew Schott

GEOLOGY FACULTY SCHOLARSHIP - Jennifer DeMonge, Warren Phillips, Rene Foehl, Jeff Fink, Betsy Cunningham, Treavor Kendall, Andrew Schott, Jan

PATRICK McDONOUGH MEMORIAL SCHOLARSHIP - Warren Phillips

McNAIR SCHOLARSHIP - Anne Gellatly

MERIDIAN OIL INTERNSHIP - Matthew O'Brien, Betsy Cunningham

MICHAEL LEE WILSON MEMORIAL SCHOLARSHIP -
Warren Phillips, Jeanette Yarnell, Treavor Kendall

PHI KAPPA PHI SCHOLASTIC HONOR SOCIETY
NOMINATIONS Emilie Reagan, Andrew Schott, Peter
Taglia, Lana Coehn, James Castro, Diane Friend

SENIORS GRADUATING WITH HIGH HONORS - Emilie
Reagan, Peter Taglia, Andrew Schott, Ian Magruder

UM GRADUATE SCHOOL TRAVEL AWARDS - Jeremy
Mickey, Amy Waddell, Eric Roberts, David
Goodwin, George Furniss, Cindy Wilson, Mary
Beck, Sonia Nagorski, Jenni DeMonge, Treavor
Kendall

UM MORTAR BOARD OUTSTANDING SENIORS - Emilie
Reagan

WATKINS SCHOLAR - Ian Magruder

ROBERT & ELEANOR WEIDMAN SCHOLARSHIP - Lana
Coehn, Ian Magruder, Peter Taglia

1998
SENIOR THESES

Christa-Marie Tyrrell, 1998, Directed by William
Woessner, *Groundwater--Surface Water Interactions
in Mountainous Water Sheds and Possible
Implications for Reclamation of Placer Mined Areas*

Ian Magruder, 1998, Directed by William Woessner,
*Assessment of Ground Penetrating Radar (GPR) as a
Tool for Determining Preferential Groundwater
Flowpaths in a Heterogeneous Floodplain Aquifer*

1998
GEOLOGY GRADUATE THESES

James M. Castro, Ph.D., 1998, *Pit Lakes: Their
Geochemistry and the Potential for their
Remediation*

Catherine A. Evans, M.S., 1998 - *A Constrained
Gravity Model of the Central Missoula Valley and
Shape of the Ninemile Fault*

David H. Goodwin, M.S., 1998 - *Paleontology,
Paleoecology, and Depositional Environments
within the Upper Triassic (Norian) Carbonate Strata*

*of the Antimonio Formation, Northwest Sonora,
Mexico*

Randall J. Gould, M.S., 1998 - *A Hydrologic
Evaluation of Lower Ninemile Creek, Missoula
County, Montana*

Daniel D. Lauer, M.S., 1998 - *Hydrothermal Copper
and Platinum Group Element Mineralization in the
Revais Creek Intrusion, Flathead Indian
Reservation, West-Central Montana*

Timothy A. Meckel, M.S., 1998 - *Assessing
Sedimentary Architecture Using Ground-Penetrating
Radar: Cretaceous (Albian) Bootlegger Member,
Blackleaf Formation, Central Montana*

Jeremy W. Mickey, M.S., 1998 - *The Effects of
Discharge Variation on Dissolved Element
Concentrations through Milltown Reservoir,
Montana*

Carl M. Schafer, M.S., 1998 - *High Grade
Metamorphism, Melting, and Migmatization in the*

Bitterroot Range, Montana-Idaho

Amy M. Waddell, M.S., 1998 - *Cordilleran
Partitioning and Foreland Basin Evolution as
Recorded by the Sedimentation and Stratigraphy of
the Upper Cretaceous Carten Creek and Golden
Spike Formations, Central-Western Montana*

Cindy L. Wilson, M.S., 1998 - *Hydrogen Peroxide
Diel Cycling in Geothermal Waters: Photochemical
Formation through Metal Redox Cycling*

RECENT VISITING SPEAKERS
AND
FACULTY SEMINARS

December 9, 1997, Steve Sheriff, Department of Geology, UM, *Search for Sutures: The Free Air Anomaly and Lithospheric Strength.*

February 6, 1998, Derald Smith, University of Calgary, *Applications of Ground Penetrating Radar to Sedimentologic and Stratigraphic Problems.*

March 10, 1998, Tony Van der Poel, UM Alum and Exploration Geologist, *Lode Platinum Exploration, Goodnews Bay, Alaska.*

March 24, 1998, Paul Link, Idaho State University, *The Transpressive? Antler Orogen in Idaho.*

March 25, 1998, Paul Link, Idaho State University, *A Summer in Siberia: And You Thought You were Going to do Some Geology?!!*

April 3, 1998, Skip Cunningham, U.S.G.S., *Gold and Silver in Volcanic Domes in the Andes of South America.*

April 10, 1998, Donald Hyndman, Geology, UM, *Blackfoot River Landslide.*

April 21, 1998, Dennis Eberl, U.S.G.S., Boulder, Colorado, *Crystal Growth Mechanisms for Minerals.*

April 27, 1998, Chris Maples, National Science Foundation, *The NSF Process, Funding in the Earth Sciences, and Successful Proposal Preparation (Things I wish I'd been Told).*

April 27, 1998, Chris Maples, National Science Foundation, *Late Devonian Extinction Rebound and the Beginning of the Age of Echinoderms: Some Clues from Northwest China*

April 28, 1998, John Metesh, Associate Research Hydrogeologist, Montana Bureau of Mines and Geology, *Re-Activation of Supergene Enrichment in the Butte Mining District.*

October 27, 1998, Scott Payne, Geology, UM, *Fast Tracking Environmental Actions and Decision Making.*

November 10, 1998, Eric Edlund, Geography, UM, *Regional Paleoecology and Global Climate Change: Results from Ongoing Research in the Sierra Nevada, California.*

November 23, 1998, Sarah Gabbott, Department of Geology, University of Leicester, UK, *Fossils from the Ordovician Soom Shale, South Africa: How Geochemistry Affects Preservation.*

November 24, 1998, David McConchie, Centre for Coastal Management Southern Cross University, East Lismore, N.S.W., Australia, *Periodic High Energy Events and the Deposition of Banded-Iron Formation Sediments.*

December 1, 1998, David McConchie, Centre for Coastal Management Southern Cross University, East Lismore, N.S.W., Australia, *The Use of Seawater-Neutralized Red Mud from Bauxite Refineries to Control Acid Mine Drainages and Heavy Metal Leachates.*

December 2, 1998, Fiona Davies-McConchie, Centre for Coastal Management Southern Cross University, East Lismore, N.S.W., Australia, *Cadmium in Molluscs from Near-pristine Environments in Northern Australia: A Note of Caution on the Use of Molluscs to Monitor Heavy Metal Pollution.*

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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, Missoula, MT 59812.

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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!

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