

GEOLOGY NEWS

Department of Geological Sciences ▲ University of Colorado at Boulder ▲ Spring 1998

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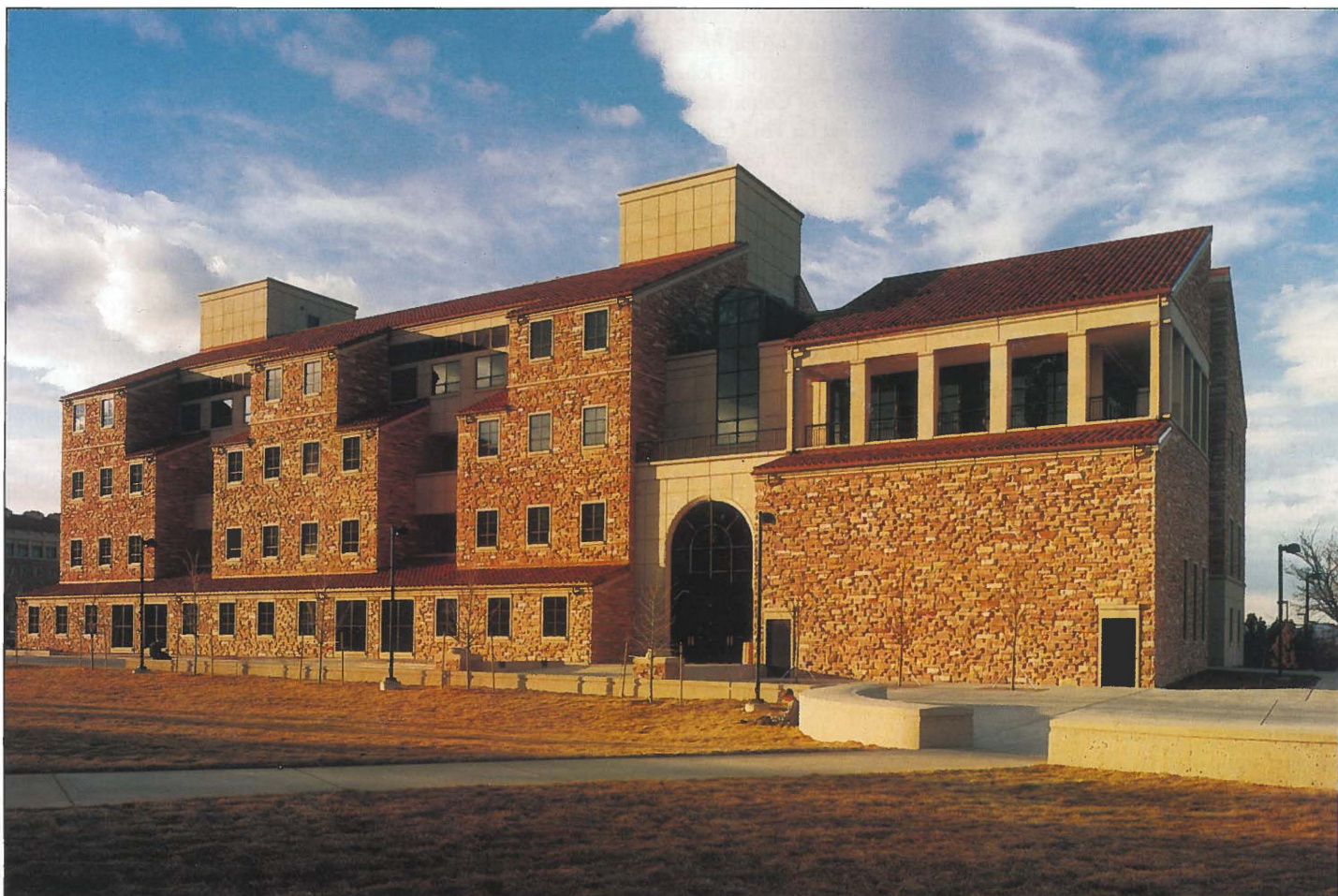
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Our new home, the Benson Earth Sciences Building, viewed from the southwest. (Photo courtesy of Thorney Lieberman.)

Message from the Chair

Gifford H. Miller

A new home at last

Culminating a determined 30-year effort, the Department of Geological Sciences, joined by our Earth Sciences Library partner, dedicated the Benson Earth Sciences Building on October 30, 1997. What a day! What a joyous celebration! And what a wonderful space for us all. The 85,000 sq. ft., \$14.5 M structure stands prominently on the main campus due south of Folsom Stadium. With a stunning four-story atrium flanked by the auditorium and the library, the entry defines the building. Six class laboratories, with sinks, microscopes, and space for samples, a large lecture hall (no more columns to block the view), and an instructional computing laboratory enhance our teaching program. Faculty are clustered into office plexes, sharing common dry lab space, interlaced with graduate student offices, that encourage interactions. Everybody has windows, even the grad students for a change. And the windows in the offices even open. The north side contains wet-chemistry laboratory space for our analytical and research programs.

We had more than just the completion of the building to celebrate at the Dedication Ceremony. Chancellor Byyny formally announced the Bruce Benson Chair of Petroleum Geology. This is the first fully endowed Chair in the College of Arts and Sciences. Creation of the Endowed Chair, coupled with completion of the Benson Building, propels the Department into the campus spotlight. Together, these two developments are a compelling testament to the strength of our program and our momentum as we continue to gain in national prominence. As a Department we extend our warm appreciation to Bruce and Marcy Benson (see article on page 2) for this most important gift, and thank Bruce for the vision and leadership he has shown over many years in promoting our discipline and the goals of higher education. The Department will be evaluating the most judicious implementation on the Benson Chair over the next year; watch for details in future issues of *Geology News*.

In recognition of the milestone represented by the Dedication Ceremony, we updated Larry Warner's seminal history of the Department, first published in 1986. Larry's final chapter was "A View to the Future," so we added a new section, "The First Dozen Years of the Future," that updates the activities of the Department since 1986. A rather remarkable amount of change occurred in those twelve years. If you would like a copy of the 1997 Commemorative Edition of *Profile of a Department: Geological Sciences*, please drop us a line with a check for \$9, which simply covers the cost of production and postage.

We tackled the disruptive process of moving into the Benson Building over the semester break. Although we had more than three weeks to accomplish the move, we

struggled to find a place for everything, get unpacked and geared back up for the start of classes by early January. To everyone's credit, we had the building operational on time, even if everything was not quite at 100%. The smart classrooms were working, the Computer Lab was functioning, class labs had microscopes and specimens, and most of the building had heat. I enjoyed watching from the second floor mezzanine as students entered the four-story atrium for the first time and looked around in wonder as they wandered to their classrooms. With stone in prominent display, there is no question this is a geology building. And students respond favorably to the space, entering their classes in an inspired frame of mind.

Recruitment activity

The Department was successful in our search for a new faculty member in the field of Aqueous Geochemistry. After a two-year search, we are very pleased to announce that Kathryn Nagy joined our faculty last fall as Associate Professor of Geology (see separate story). Kathy specializes in rock-water interactions, using her strong foundation in the principles of low-temperature aqueous geochemistry to address a wide array of important questions ranging from such applied concerns as how we preserve stone structures from deterioration to fundamental scientific inquiry into the nature of mineral surface chemistry in the aqueous environment. She uses an Atomic Force Microscope as one of her major investigative tools, and will be setting up an AFM facility and a wet chemistry lab for experimental projects. We are very pleased to have Kathy with us. She meets recognized needs in our graduate and under-

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from the Chair, cont.

graduate programs and reaches out in collaboration to a variety of other faculty.

This year we are conducting two new faculty searches, one in Continental Dynamics, and a second in Biogeochemistry. The latter position reflects the fundamental changes that are occurring nationally in higher education. Faced with projections of relatively flat budgets for the near future, investments in new programs and new directions, essential to the health of any organization, can only be accomplished by reallocation. To provide a pool for reallocation, all programs on the Boulder Campus are in the process of returning more than 3% of their budget back to a central pool. We are then eligible to compete for this new resource. It is clear that proposals reviewed favorably will be those that bridge between conventional disciplines. It is the teaching and research that cuts across, rather than follows, traditional avenues that often has the highest return and student demand. Geological Sciences joined with the newly created Environmental Studies Program to propose a joint hire in Biogeochemistry: an individual who specializes at the interface between the solid earth, the biosphere and our enveloping hydrosphere and atmosphere. It is a new type of search for us all, but offers exciting new dimensions for our faculty and students. If the caliber of the applicants is any indication, we should have another world-class faculty member by the fall.

The turnover of faculty that started in earnest nearly a decade ago continues. In addition to our recruitments, we also acknowledge one departure. Bill Hay, who served as Director of the Henderson Museum in the early 1980s, then was a member of our Department, accepted an offer to head up the Paleocyanography Division at GEOMAR, a major governmental research facility in Kiel, Germany. We will miss Bill's contributions a great deal, and wish him well in his new position.

Improving our majors

As we were developing a new Strategic Plan during Program Review a few years ago, and simultaneously considering building design issues, we held meetings with our various constituents. In one meeting attended by both undergraduate majors and our graduate students, a couple of substantial points emerged. The majors expressed their concern that it was difficult to maintain a connection to the program outside of formal classroom activities. In Old Geology there was simply no place to go after class, except out. To encourage greater interaction with our majors, we included an Undergraduate Study Lounge and added 100 built-in lockers for the majors in the Benson Building. The Geology Club has furnished their space with a networked computer, fridge and microwave, and couches and smaller study tables. All the majors look happier with a real space of their own in the Benson Building.

And with considerable assistance from our alumni, we are able to continue sponsoring the Undergraduate Mentoring Program, highlighted elsewhere in this Newsletter. With this program we are able to involve the majors in the research activities of the Department.

And the future

As we look to the future from our new vantage point, there are many optimistic views. Employment opportunities are up in the private sector, the decline in federal support of basic science that has been of concern recently appears to have abated, and many areas within NSF where we compete regularly have seen substantial increases in funding. Support of graduate students continues to be a major concern throughout higher education. We have made the creation of an endow-

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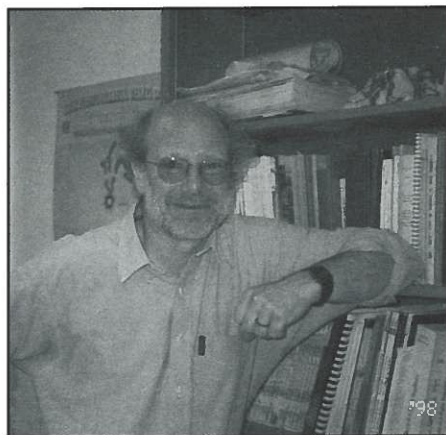
New Chair

The faculty has selected Chuck Stern to replace Giff Miller as the new department chairperson beginning this summer.

Chuck is a petrologist/geochemist/volcanologist who came from Cornell University to the University of Colorado in 1979. Prior to Cornell, he had done post-doctoral work at Lamont-Doherty Geological Observatory of Columbia University. Chuck received his PhD from the University of Chicago, where he also was an undergraduate.

Chuck's research concerns understanding how magmas are generated and the role they play in the chemical evolution of the Earth. He also studies volcanic hazards and, in collaboration with his wife Alex Skewes, the generation of ore deposits related to igneous activity. Much of his research efforts have been focused in the Andes of southern South America, and he has also conducted research in Turkey, South Africa, the Himalaya of India and Nepal, as well as here in Colorado. Recently he has been involved in geo-archaeology projects in Patagonia, characterizing the chemistry of obsidian artifacts and searching for their sources, as described in the section of faculty news updates.

Chuck teaches undergraduate majors a laboratory class in optical mineralogy and



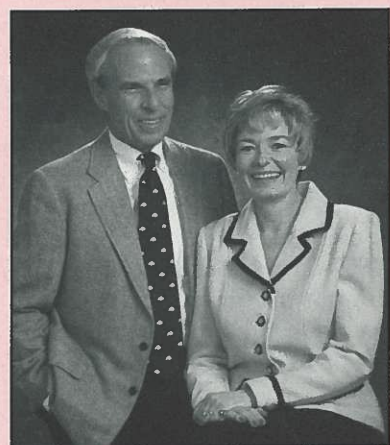
Chuck Stern, newly elected department Chairman.

introduction to petrology, and also gives a field course concerning igneous and metamorphic rocks along the Colorado Front Range and in the Rio Grand rift valley. He teaches a popular, large upper division course for non-majors, Natural Catastrophes and Geologic Hazards, which covers topics such as earthquakes, volcanic eruptions, climate change, meteorite impact, global mass-extinction, and fossil fuel depletion. At the graduate level Chuck has taught classes in advanced igneous petrology and planetary chemistry, the latter involving the study of the petrology and chemistry of meteorites and moon rocks.

Alumni appreciation—Bruce Benson

Bruce Benson, a 1964 graduate from our department, majored in petroleum geology. He is now owner and president of Benson Mineral Group, Inc. and President/CEO/Chairman of the Board of United States Exploration, Inc. He was the former Chair of the Colorado Commission on Higher Education and currently is President of the Denver Zoological Foundation. Mary and he are active volunteers and major donors at the University of Colorado.

At the dedication ceremony for the Benson Earth Sciences Building last fall, we celebrated our long-awaited move into our splendid new home. Realization of this dream, initiated almost exactly 30 years previously, came about only through a remarkable partnership between the alumni and friends of the Department, the University, and the State of Colorado. There would be no building but for the generosity of our alumni. We wish to extend a special thanks to the Benson family for their steadfast support of our program. They not only provided the major contribution to the building fund, but did so at a time when it was uncertain whether there would ever be support at the state level.



Bruce and Marcy Benson.

New Faculty—Kathryn Nagy

Our long-awaited new aqueous geochemist has arrived! Kathryn Nagy started in October, just in time to move into the new building. We worked hard to steal her away from her previous position as a research geochemist at Sandia National Laboratories in Albuquerque and to prevent her from accepting another offer from a major university. Kathy is a native of Pennsylvania and spent her secondary school years in Delaware. Her undergraduate geology degree is from the University of Delaware. She obtained a master's in geology from Brown University and a PhD from Texas A&M University, also in geology. Her post-graduate experience includes a post-doctoral position at Yale University, three and a half years at Exxon Production Research Company in Houston, and three and a half years at Sandia.

Kathy fills the void in the department left by the departure of Don Runnells at the end of 1992. She is currently co-teaching the undergraduate Introduction to Geochemistry class with Lang Farmer and is going solo on the graduate course in Aqueous Geochemistry. Her experience as Associate Editor for the *American Mineralogist* and *American Journal of Science* is proving valuable in teaching Writing in Geosciences to senior undergraduate majors as well.

Kathy's chief research interests are in the area of mineral/water interactions. Although primarily a "lab-rat," she prefers working on problems directly related to field observations and applications. One of her new projects is to investigate the coupling between recrystallization of hydrous oxides and adsorption/desorption of environmental contaminants. The application for this work will be to model reactions during the processing of radioactive sludges in waste tanks at Hanford, Washington, and during the inevitable leakage of waste solutions into the underlying ground. In a related environmental project, she is quantifying clay growth from aqueous gels in an attempt to devise a new kind of subsurface containment barrier to prevent flow of contaminated groundwater. Kathy is an expert in the use of a relatively new instrument called atomic force microscope (AFM). She uses this to characterize fine details of mineral surface morphology and charge. While at Exxon, she used the AFM to quantify how growth rates of illites in sandstones

Chuck played an important role in obtaining the electron microprobe and X-ray fluorescence equipment now housed in the department's analytical center. He chaired the search committees that brought the director of the analytical facilities John Drexler, mineralogist Joe Smyth and isotope geochemist Lang Farmer to the department. For the last two years he has served the department as the associate chair for undergraduate affairs.

As chairperson, Chuck hopes to take advantage of the opportunities the new building has provided the department for greater collaboration in better laboratory and teaching space. He wants to continue the department's tradition of hiring new faculty dedicated to both teaching and research, and expand the scope of the current undergraduate program to incorporate classes concerning new field and laboratory techniques in the ever expanding scope of earth sciences. He desires to continue to strengthen the department's undergraduate mentor program, which with the generous help of alumni has allowed many undergraduates to participate in faculty research activities. He also hopes to begin developing an endowment for graduate fellowships to maintain and improve the department's ability to attract and retain the best graduate students.

vary with depth and temperature. The breadth of her research includes the roles of minerals in materials science problems. In November she was quoted in the *New York Times* on her work with collaborators at Sandia to design a new coating that protects limestones and marbles used in monuments and buildings from weathering in response to acid rain. With her diverse background and interests, we feel she will provide students with a strong educational resource in aqueous geochemistry.

Kathy's husband Ray Fletcher has also joined the department in a research position. Ray's main research interest has been in analytical continuum mechanics approaches to a broad range of problems in structural geology



New faculty in aqueous geochemistry, Kathryn Nagy.

and tectonics such as the emplacement of salt sheets in the Gulf of Mexico and the deformation of fold-and-thrust belts. Ray was formerly a professor at Texas A&M in the Center for Tectonophysics and a researcher at Exxon Production Research Company. Ray's specialty complements well the department's existing specialties in structural geology which employ kinematic and geometric approaches. We feel extremely fortunate to have them both on board. Kathy and Ray and their two cats, Tycho and Ophelia, have settled in the foothills of the Flatirons.



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Faculty News

John T. Andrews

The main event of 1997 from a research viewpoint was participation in a highly successful research cruise around north and northwest Iceland. The cruise left port on July 17 and returned on July 31. This joint research effort between Icelandic and USA researchers involved the Iceland Marine Research Institute (IMRI), the University of Iceland, and the University of Colorado (INSTAAR & Geological Sciences). The ship, the *Bjarni Saemundsson*, was provided by IMRI and the project was led by Gudrun Helgadóttir. Participants from the University of Colorado included: Nancy Weiner (micro-paleontologist), Micki Smith (PhD), Jorun Hardardóttir (PhD), Stephanie Cartee (MSc), Greta Kristjansdóttir (MSc, University of Iceland) and myself. Kjartan Thors provided and operated the sub-bottom profiling system (3.5 KHz). Excellent weather and a great boat crew and officers resulted in a cruise that achieved virtually all its objectives. We retrieved over 180 m of sediment from 39 sites. Most of this was shipped to Colorado where it resides in the Cold Room in RL#1, and is being studied by a number of people on an NSF grant to John Andrews, Anne Jennings, and James Syvitski.

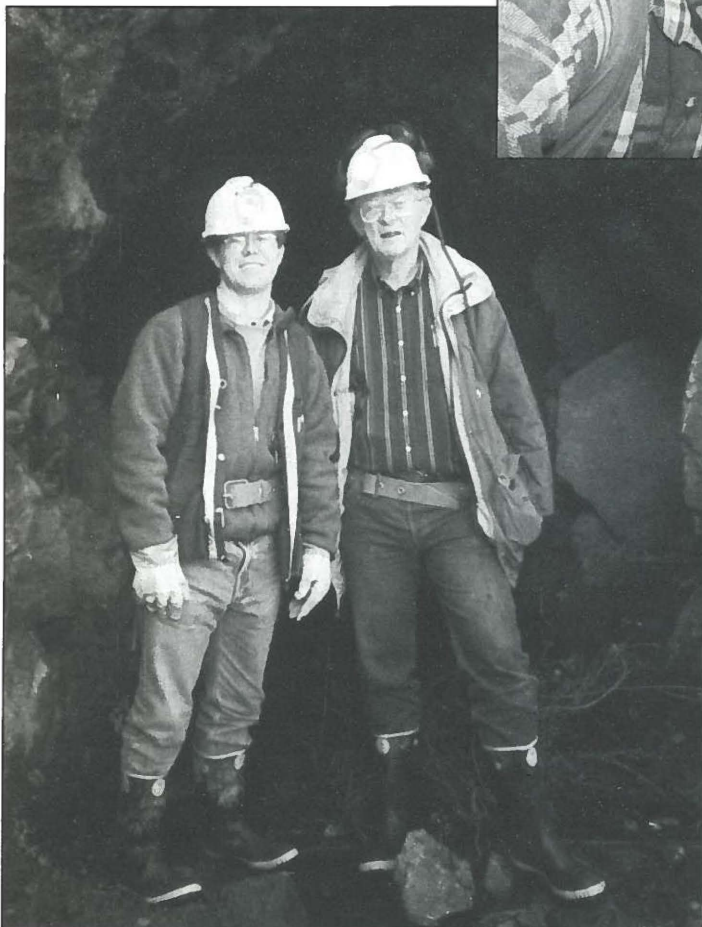
This cruise complemented a 1996 cruise to East Greenland on the Norwegian research vessel *Jan Mayen*. Anne Jennings was co-chief scientist and Nancy Weiner, Micki Smith, and Andrew Stein (MSc, 1996) were part of the research team on board.

John was honored to attend the August commencement and receive the University Medal. Apart from that, John turned 60 in November and as of January 1998, Martha and John have been in Boulder 30 years. Time surely does fly.

Bill Atkinson

The year 1997 was rather busy for Bill. He and his economic geology students managed to get through it. An outstanding event was the graduation of Michele Murray, after many years of plugging away at her MS thesis while she worked full-time. Paul Boni has also plugged away at his thesis while working full-time, but he is close to the end of the thesis. Paul presented a poster at an international symposium on trona, and wrote a paper for publication in the conference proceedings.

Bill Atkinson (below, right) and Cotton Worth (below, left) in a mine near Alhué, Chile.



Worth Cotton took classes, taught labs, and went to Chile to map in the field for his thesis. He is working on epithermal gold-bearing veins at an active mine near Alhué, in the coastal cordillera. Lupe Espinoza finished his comprehensive exams, and did some isotopic work in Lang Farmer's lab on samples from his thesis area in Mexico at Cerro de Oro, Sonora. The Mexican geologists joke that it is "zero de oro" or zero gold! Peter Hanke also took classes, taught labs, and went to Bolivia to map gold veins produced by regional metamorphism at a small mine owned by our alumnus George Papic's family. He was visited by Sara Martinez, who went to Bolivia to present a short course on remote sensing at the Universidad Técnica de Oruro. Together, they witnessed the yearly miners' ceremony of the sacrifice of a white llama to the spirits of the mine. Sara is continuing her PhD thesis on sericite from porphyry copper and epithermal deposits. Alex Iriondo is progressing on his PhD thesis, doing radiometric age dating at the USGS on samples from a metamorphosed area of northern Sonora, where there are a number of gold deposits. Abbas Sharaky spent most of the summer in the field, working on his PhD thesis at Jamestown, where he intends to demonstrate the nature of the connection between epithermal and porphyry moly deposits. Armando Zaragoza had to leave Boulder in January to resume his job in Mexico, but is writing his MS thesis on the structural setting of vein deposits in the Sierra Madre Occidental in Chihuahua, Mexico. Bill has a new student in his group, Becky Sauer, who is working at the USGS in a Pb-U dating lab. She intends to date intrusions in the Ortiz-Los Cerrillos area just south of Santa Fe, N.M.

The students kept Bill rather busy, but he found time to teach four courses during the year and do a few other things. In March,

Peter Hanke doing underground mapping at the Khory Mina Gold Mine in Bolivia.



he went to Durango, Mexico, where he presented a two-day short course in Spanish on the geochemistry of gold to 100 members of the Asociación de Ingenieros de Minas, Metalurgistas y Geólogos de México. Late in May, Bill and his wife Carol traveled to Poland to visit their daughter and her family. It was a nice trip, and they enjoyed Poland. The Polish language turned out to be a bit difficult, however! They saw only one outcrop; much of the country is as flat as North Dakota! At the end of May and early June, he gave an extended talk, also in Spanish, at a conference on mineral deposits, to alumni of the University of Sonora. In July, he flew to Chile to advise Worth Cotton on his thesis, then to Bolivia, where he helped Peter Hanke. After a few days at home, he went to Mexico, where he consulted for a Mexican company, visiting a number of mines and exploration projects. The big challenge came when he had to present his findings to the company president and a board of chief geologists, in Spanish, again.

In September, just as classes started, Bill and his wife were joined by their daughter, Ellen, and their grandson, Marty. Ellen was expecting her second baby, and had opted not to have it in Poland, where she would have some difficulty communicating with the doctors and nurses. Bill's third grandson Kristian Eduard Avila was born on September 11.

At the end of May and in October, organized Bill put together picnics for the Department. Judging from the amount of food eaten and beverages consumed, the picnics were enjoyed by all. Later in October, Bill presented a poster on his research at the national GSA meeting in Salt Lake City. He attempted to attend a 3-day field trip, but was snowed out the second day. Finally, we got to final exam week, the week before Christmas, and then started moving to the new building. No rest for the weary!

Roger Bilham

The rift revisited—Africa fragmenting

In 1997 Roger Bilham and his students returned to the rift zone of Ethiopia with GPS receivers to find out how much their 1992 markers on the African and Somali sides of the rift had moved. Although the African rift is one of the largest geological features on the planet, its rate of rifting has hitherto remained a mystery. Fault reconstructions on the margin show that 40 to 120 km of widening has occurred in the past 20 million years, implying a rate of 2 to 6 mm/year. Could the rift be slowing down as suggested by the measurements of 1970 survey markers installed by Paul Mohr of the University of Galway? Or could the rift be acting now as a transform fault, permitting the Somali block to follow Arabia and India to the northeast?

Armed with six GPS receivers, the group retrieved all the 1992 points except one. Some of these consist only of tiny drill holes in the rock (holes in basalt, unlike brass pins, can't be stolen). The one that couldn't be retrieved had an Ethiopian army tent upon it and nothing would persuade the soldiers to move their tent a few meters from the mark. It was probably best not to upset the army. To ensure that the 120-km-wide measure of the rift was sufficient to catch the entire rift signal, some remote points were installed in the interiors of the two plates. This was applauded by the Ethiopian Mapping Authority who arranged for the group to measure at two airports remote from Addis Ababa. Accordingly Rebecca Bendick and team went north and west toward Eritrea, and Roger headed south and east toward the Somali border. Despite a daily flight, the tourist bureau had never heard of Gode, his selected destination, and neither had anyone else he had met before or since. Compounding the mystery was the curious discovery that Gode's position on the map was many miles from its advertised position, having been moved bodily



Roger Bilham wowing the crowd at the building dedication.

during the Ethiopia/Somali wars, which had left all prominent targets leaning or blasted to pieces. It was possible to obtain four days of perfect data by weighting the tripod down with spent mortar shells. Meanwhile, Becky's GPS measurements had not gone well. Actually rather badly. She found herself in jail for doing suspicious things with GPS receivers near airports. Her jail time was alarming but fortunately short, and she headed for northern Eritrea for more adventures. There she attempted to negotiate future locations for GPS measurements near the coastal city of Massawa, while Roger headed to the southern Eritrean port of Assab to do the same.

Afterwards they compared notes. The temperatures were unimaginably hot, the humidity was 100%, and there was a tense situation between Yemen and Eritrea that suggested that unpacking GPS receivers might be interpreted in terms other than an interest in plate tectonics. There was talk of war, and spies, and jails again. It all sounded a bit tense. Moreover, there was definitely far too little ice and far too much humidity. Independently and without mutual consultation, the two decided that Eritrea was not yet ready for some precise metrology.

Back in Colorado, the Ethiopian data showed that the rift had opened by 20 mm in two years, a rate of 4 mm/year with an uncertainty of 25%. No detectable rift-parallel slip was evident, indicating that the Somali plate is heading south-east toward Madagascar. But it was the location of the rifting that was perhaps most intriguing. 80% of it occurs at the lowest, narrowest part of the rift zone, requiring there to be a very thin neck of lithosphere holding the sides of the rift together—perhaps as little as 5 km thick and 20 km wide. A pair of GPS receivers have been running continuously across the rift since their September visit to investigate the possibility that tidal strains are larger than they should be. Thus far the 120-km-wide GPS data suggest that the signal is normal. If this is the case, the rift processes are relatively superficial. The next step is to take a closer look at the central part of the rift. Watch this space next year for more news on Ethiopian jails.

Lang Farmer and Craig Jones

Mountains, mountains, why are there mountains?

If you were one of the very, very few to be hiking in Tehipite Valley, far in the backcountry in Kings Canyon National Park this past fall, you might have been annoyed as a helicopter buzzed back and forth one day—but it was for a good cause. The chopper carried Lang Farmer and Craig Jones over one of the deepest canyons in the United States to collect rocks and seismic equipment before winter snows made both inaccessible. This represented the final field work of the year in a project to understand the origins of the High Sierra of California.

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Faculty News, cont.

The basic problem is that the mountains, culminating in 4418 m-high Mt. Whitney and having average elevations approaching 3 km, require a buoyant keel to keep them up. For many years this was thought to be found in a very thick crust under the range. But an earlier series of experiments Jones was involved in showed that this is not the case: the crust beneath the Sierra is only slightly thicker than under Death Valley, lowest point in the Western Hemisphere. The earlier experiments suggested the source of the buoyancy lies in the mantle, but the nature of this body remained cryptic.

To figure out what was down there, Farmer and Jones teamed up with researchers at Caltech, U.C. Riverside, University of North Carolina, and Princeton University to study the range more. Working out of a house in Three Rivers, California, just outside Sequoia National Park, Jones and 5 CU-Boulder undergraduates (Jason Edwards, Amy Jiron, Seth Mueller, Sarah Keyser, and Karen Doty), one new Geological Sciences graduate student (Jake Wegmann) and Prof. Robert Phinney of Princeton deployed and maintained 24 state-of-the-art portable seismometers, including 3 in the wilderness of Sequoia/Kings Canyon National Parks. Installing and maintaining those instruments required about 200 miles of backpacking during the summer (one hike allowed Doty, Edwards, and Jiron to summit Mt. Whitney after servicing two instruments and rescuing a lost hiker). The instruments remained after the CU team returned to Boulder in early August; their removal in October required the helicopter travel. This final task was aided by CU graduate Noah Hughes.

Seismograms from these instruments were downloaded into field computers on loan (as were the instruments) from PASSCAL, a university consortium for seismological research. Most of the students

worked through the data on the computers, picking arrival times of seismic waves from local earthquakes. Jason Edwards completed this work back in Boulder and presented information about the local earthquakes to a meeting of the Seismological Society of America in Boulder in March, 1998.

Meanwhile, preliminary analysis of seismic waves traveling up through the Sierra from distant earthquakes shows large variations in arrival time and waveform across the range. This data set reconfirms the relatively thin crust of the Sierra and suggests that large variations in the mantle are indeed present. Now additional work must be done to convert these raw observations into images of the mantle under the Sierra that might reveal variations in the petrology or mineralogy of the mantle under the range.

As the seismic work progressed, Lang Farmer, working with collaborators at the University of North Carolina and assisted by junior Seth Mueller, began analysis of samples of volcanic rocks erupted through the Sierra over the past 15 million years. Some samples came from backpacking/car camping expeditions in September 1996 and May and July 1997, some from collections of the U.S. Geological Survey, and some from the infamous helicopter trip in Kings Canyon. These samples will provide important insights into the evolution of the deep continental lithosphere beneath the southern Sierra Nevada, and have already provided a great excuse to visit some of the most remote and least traveled portions of the mountain range.

Shemin Ge

Shemin's hydrogeology group welcomed two new graduate students this fall, John Marler and S. Chereé Stover. John has a BA from Vanderbilt and is interested in integrating hydrology with water policy. Chereé has a BA from Harvard and expects an MS from the University of Washington in the spring of 1998. Her main interest is fluid flow in het-

erogeneous marine sediments. Both new students have adjusted well to the vibrant working environment of the hydrogeology research lab.

After her 1996 to fall 1997 postdoctoral research with Shemin, Liz Screaton accepted an assistant professor position at the University of Florida, and began teaching this spring. During the year prior to her departure, Shemin and Liz, joined by Chereé in the fall, continued their research on coupled processes involving subsurface fluid flow, heat transfer, and mass transport in actively de-



Shemin Ge's new students, Chereé Stover (middle) and John Marler (right), and Miles Waite (left).

forming marine sediments. Their latest work examined the three-dimensional effects of prism geometry on fluid migration and heat transport patterns at the Barbados Accretionary Complex. They also studied the physical processes affecting porewater chemical profiles in the shallow submarine environment, which can be applied to infer historic fluid flow patterns.

The ongoing research of rock fracture properties continues to progress well. Graduate student Miles Waite, co-supervised by Shemin and Hartmut Spetzler, has been combining physical experiments and numerical modeling. He conducted a series of laboratory experiments using a constant head permeameter on parallel-plate and sinusoidal fracture geometries. He also developed a lattice gas automata numerical model to simulate the complex nature of fluid transport in irregular rock fractures. While searching for a better way of quantifying hydraulic permeability of rock fractures, they found that the conventional cubic law overestimates flow in rough fractures. They reported their findings in a paper in *Geophysical Research Letters* and at the AGU fall meeting in San Francisco.

In collaboration with Robert Stallard of the USGS, graduate student David Kinner continues his work on hydrology in the tropics. In order to better understand the interrelationship between forestation, precipitation, geomorphology, and moisture movement in soil zones, Dave spent two summer months in the jungles of Central America. While isolated from the rest of the world, Dave devoted all of his energy to field mapping and testing. After gathering field data on topography, soil type, and hydraulic parameters, David is now focusing on data analysis and computer simulation.

In addition to Liz (departed in '97), two of Shemin's graduate students, Jennifer Hinds and Andy Horn, also departed in 1997. Jennifer completed her master's thesis on perched water formation and capillary flow in unsaturated heterogeneous porous media. She graduated in the spring of 1997 and took a position at Lawrence Berkeley National Laboratory of the University of California as a senior research associate. Upon the completion of his MS degree, Andy accepted a position at an environmental consulting firm in Denver. Gordon McCurry and Jeff Bails are next in line to graduate. They both are working diligently to complete their research on water resource management and water quality in the Front Range areas.

On the teaching front, Shemin's annual fall hydrogeology class continued to grow. She is longing to utilize the new computer and laboratory facilities in the new building for

this class. Shemin continued teaching the introductory-level geology class, which proved to be quite a fruitful experience for her. Much to her surprise, she actually started to enjoy the intro-level class. Finally, the field summer course on surficial geology and hydrogeology, co-taught by Shemin and Pete Birkeland, is still alive and well.

Bill Hay

Bill Hay was in residence during the spring semester, teaching two courses in Oceanography, an Introductory course for undergraduates, and an advanced course for advanced undergrads and graduate students. Both have become increasingly popular and have large enrollments. In March he returned to Europe to attend the meeting of the European Union of Geoscience Societies in Strasbourg, France, where he presented a talk on climate, tectonics, erosion, and sediment transport. At the end of the semester he returned to Europe, via Sundvolden, Norway, where he was invited to give a keynote talk on tectonics, climate, and oceanic sedimentation to the 6th Workshop of the European Consortium for Ocean Drilling. During the year he was involved in the development of a new web site for work with data from the Deep Sea Drilling Project and Ocean Drilling Program, at <http://www.odsn.de>.

In June he journeyed to Budapest, Hungary, via Vienna and a couple of great performances at the Staatsoper to attend the meeting of the Editorial Board of the *Acta Geologica Hungarica*. He also attended a meeting on tectonics of the Balkans, which had representatives from Bulgaria, Serbia, Croatia, Montenegro, Slovenia, Slovakia, the Czech Republic, Poland, Ukraine, and Hungary. In July he returned to Vienna to give a public lecture to a standing-room-only audience at the Museum of Natural History, in conjunction with the 2nd European Paleontological Congress. There was opportunity for more opera, a Schubert mass, Beethoven concerts in Heiligenstadt, and a fabulous performance of Orff's *Carmina Burana* in the grandeur grand baroque church.

In late July and August he attended the Bicentennial meetings on the anniversary of the birth of Charles Lyell in London and on the anniversary of the death of James Hutton in Edinburgh. In conjunction with the former, he visited the boyhood home of Lyell as well as a number of famous geological localities Lyell had described. From Edinburgh there were two excellent excursions, to the famous unconformity at Siccar Point, where Playfair had "become giddy staring so deeply into the abyss of time" and to Glen Tilt where granites intrude sedimentary rocks. At the beginning of September he attended the meeting on Paleontology in the 21st Century, held in Frankfurt-am-Main, Germany. The reports of the meeting are on the Web at <http://www.nhm.ac.uk/paleonet/paleo21>. At the end of September, International Geological Correlation Programme Project 362, Tethyan and Boreal Cretaceous had its final meeting at Stara Lesna, in the Tatra Mountains of Slovakia. Bill presented a keynote lecture on the effect of changes of the mean salinity on ocean circulation.

He attended the Geological Society of America Annual Meeting in Salt Lake City, and the opening of the Benson Building. On his way back to Germany he stopped to attend the Symposium in Honor of the 70th Birthday of Cor Drooger held in Utrecht, The Netherlands, Nov. 7-8, 1997. In November he returned to Ernst-Moritz-Arndt University in Greifswald to deliver a series of lectures on sea-level change and sedimentation. In December he spent two weeks in Tübingen working with Joachim Kuhlemann and Wolfgang Frisch on the elevation of the Eastern Alps since the Oligocene. Just before Christmas he returned to Amsterdam for the meeting of the Advisory Board of the Netherlands School of Sedimentary Geology.



Above: Helicopter carrying Craig Jones and Lang Farmer invading the backcountry of Sequoia National Park. Below: Undergraduates Amy Jason and Karen Doti installing station Santa Rita Flat in the Inyo Mountains, with the Sierran crest in the background.



Mary Kraus

At the end of spring semester, Mary Kraus completed a period as Associate Chair. During fall semester, she was on sabbatical during which she completed research on channel avulsion, which is the process by which a river breaks through its bank and establishes a new course on a lower area of the floodplain. Two papers resulting from that research were published this year, one in Palaeogeography, Palaeoclimatology, Palaeoecology and one in Sedimentary Geology (with former grad student Brian Gwinn). Mary and grad student Tina Wells completed and submitted a manuscript that summarizes five years of research on ancient avulsion deposits and proposes a model for recognizing avulsion deposits in the stratigraphic record. Tina graduated in August is now with BP in Alaska. Mary also began a new NSF-funded study on Eocene rocks in the Bighorn Basin, Wyoming. The focus of this research is to field test recent computer simulations of alluvial architecture, which is the three-dimensional arrangement of sandstones and mudstones deposited by ancient rivers. Andy Pulham is a co-investigator on the project, and new grad student Mason Dykstra will be working on this project for his MS research.

In September, Mary attended the 6th International Conference on Fluvial Sedimentology held in Cape Town, South Africa. She



Mary Kraus and recent PhD graduate Steve Hasiotis at the building dedication.

participated in a week-long field trip through Upper Paleozoic-Lower Mesozoic fluvial rocks, including paleosols, in the Karoo Basin. Although the Karoo is too dry to support a diverse animal population, the group saw numerous zebra, ostrich, and antelope. At the end of the year, Mary moved into the new building where she shares an office suite with Dave Budd and Karl Mueller. Mary and Dave also share a new wet lab dedicated to research in sedimentology. Finally, the Department will be hosting the 1999 GSA Annual Meeting to be held in Denver. Mary and Dave Budd are acting as General Co-Chairs for this meeting.

Karl Mueller

Karl has been busy during the past year with research projects in Southern California and the New Madrid seismic zone, mostly involving modeling and mapping of geologic structures and geomorphic features produced by coseismic folding. Some exciting results include the discovery of a new, potentially active blind thrust in the southern Los Angeles Basin and structural analysis of blind thrusts beneath the Lake County Uplift in western Tennessee. The latter results are a first for the New Madrid seismic zone—determination of fault slip rates using geological data. Work begun in earlier years is nearing completion, including structural modeling of active folds in east and south-central Los Angeles, an altimetry experiment in the northern Transverse Ranges and work on the timing of extensional fault systems in NE Nevada. Karl's first graduate students are nearing completion of Master's degrees and hopefully will enter the working world next summer and fall. The end of the year was the much anticipated move to the Benson Earth



Karl Mueller and Becky Bendick at the building dedication.

Sciences Building where Karl's structural geology group is housed in a new lab space equipped with a number of new computers and graphics peripherals.

Karl's teaching in 1997 involved developing the curricula for new courses in active tectonics (grad) and structural field geology (undergrad). An exciting aspect of the tectonics class included an epic field trip to Baja California over Spring Break. Rattlesnakes, blown tires, suburbans buried in playas—they saw them all. The local field course has taken advantage of the spectacularly exposed structures along the Front Range, mostly between Boulder and Fort Collins.

On a more personal note, Karl has begun climbing and biking again, trying to keep up with other faculty members much fitter (and older) than he. Rides up Flagstaff have evolved into something approaching competitive road races, with much wide-eyed sucking of wind toward the top. On the home front, wife Chris, daughters Taryn (one) and Katie (five) fill those few moments not occupied with geology of some sort.

Mark G. Rowan

Assistant Research Professor Mark Rowan kept up an active schedule of research, writing, teaching, and travel during 1997. In the spring, he taught a mixed graduate/undergraduate class in structural geology for the first time. This was Roy Kligfield's old class, "Fold Belts and Extensional Basins," resurrected because of student demand. Participants came from varied disciplines such as structure, neotectonics, stratigraphy, and petroleum engineering, and included students from both Colorado State University and the Colorado School of Mines.

Time not spent teaching in the spring was devoted to getting ready for the first annual meeting of the new EMARC Gulf of Mexico industrial consortium on "Salt, Faults, and Minibasins." Approximately 90 oil company representatives showed up for two days to hear EMARC staff and students present their research. This was the first time that Mark was in charge, which should have frightened others, if not Mark. Luckily, the experience of Paul Weimer (who, along with

Bruce Trudgill, is a co-PI in the project) in running such meetings proved invaluable and contributed to the overall success. Although the purpose of the meeting was the technical work, the highlight was probably the evening at Laudisio's, where close to one hundred people enjoyed Italian food and the requisite liquid accompaniments.

The fall semester was a period of travel. There were several short trips, mostly to Louisiana and Texas, for visiting companies, attending research meetings, and teaching industry short courses. But there were also three international trips: first, to Cartagena, Colombia, for a research conference on Andean basins; second, to São Paulo and Rio de Janeiro, Brazil, where Mark was invited to give a keynote talk and teach a course on salt tectonics at an international geophysical congress; and finally, to Ravenna, Italy, to give an invited lecture at Agip Petroleum's exploration managers' meeting. Needless to say, some free time for R&R was added on to several of these trips. For three-and-a-half months, Mark was never in Boulder for more than 6 days at a time—fun but exhausting. Most of the time back in town was spent catching up at home and with his students' research.

Mark had five graduate students and one undergraduate working with him during 1997. Barry McBride (co-advised with Paul Weimer) received his PhD and is now working for HS Resources in Denver, probably making more than either of his advisors! Josh Turner and Erik Bartsch are working on problems of fault-array geometry and evolution using Gulf of Mexico 3-D seismic data, and Guillermo Fajardo and Freddy Corredor are working on structural problems in the Eastern Cordillera fold-and-thrust belt of Colombia using a combination of field, remote sensing, and seismic data. Josh and Freddy had 1997 summer internships with BP (Houston) and Occidental (Bakersfield), respectively. Freddy decided to switch over to the PhD program in the fall, proving that the lure of big bucks was not enough to drag him away from Boulder at this time. Finally, undergraduate mentoree John Roesink worked out a methodology for making animations from three-dimensional structural

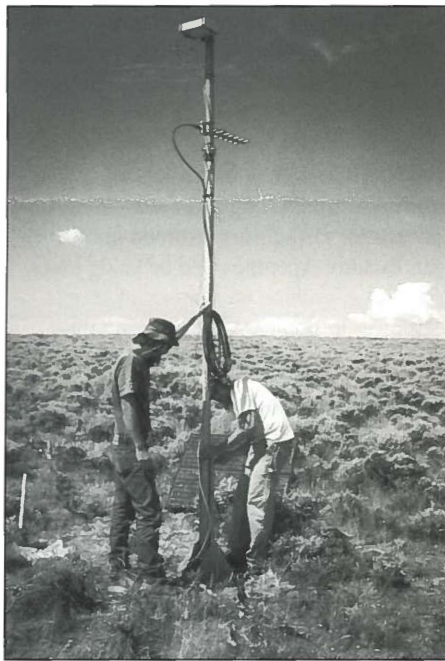
restorations, which should wow our industry sponsors.

All in all, 1997 was a busy and rewarding year for Mark. 1998 looks to be much the same.

Anne Sheehan

The Department of Geological Sciences and CIRES Seismology Group, led by Assistant Professor Anne Sheehan, was involved with numerous projects and several major experiments during 1997. Sheehan is a data analysis team leader for the Mantle Electromagnetics and Tomography Experiment (MELT), an interdisciplinary project sponsored by the National Science Foundation Ocean Sciences Division. The MELT experiment included the deployment of 40 ocean bottom seismometers for a period of six months in the vicinity of the East Pacific Rise. The geometry of the experiment allows for the most extensive mapping of mantle structure beneath a mid-ocean ridge axis to date, and the results are providing new insights on the deep architecture of mid-ocean ridges. Graduate student Hersh Gilbert and Postdoc Ken Dueker have also been involved with the data analysis, and both Gilbert and Sheehan presented results of ongoing work at a MELT workshop held at Brown University in Rhode Island in October 1997.

Graduate student Shannon Hazler has been focusing on crust and mantle structure beneath North Africa, using seismic surface waves. This work is sponsored by Lawrence Livermore National Laboratory, as the de-

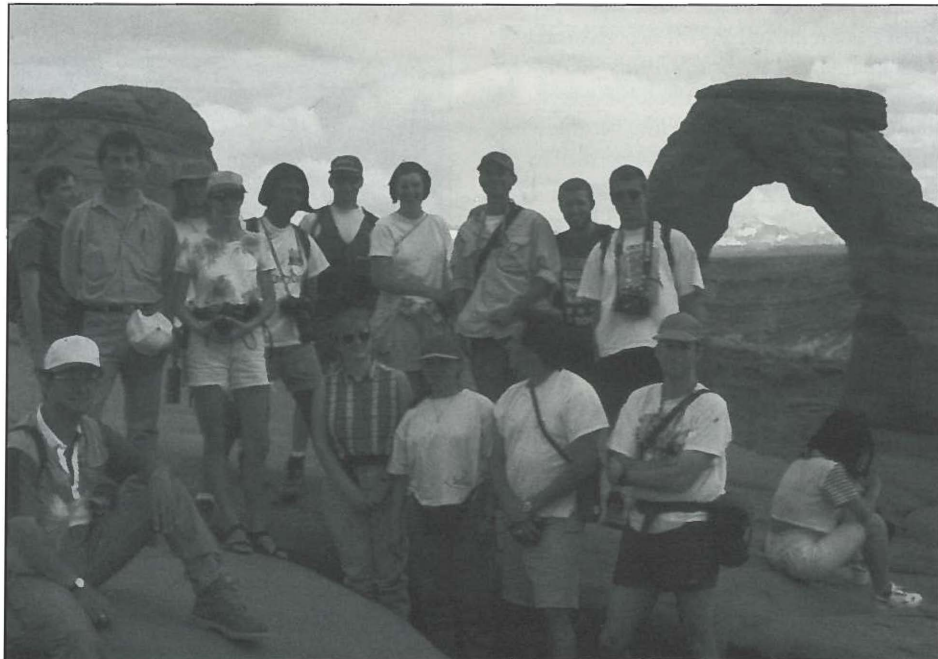


Undergraduates installing Broadband Array in Deep Probe.

tailed maps of subsurface structure and charts of surface wave dispersion provide important information needed for regional nuclear test ban treaty monitoring. The continent of Africa has been largely unexplored seismically, and another objective of this project is to better understand the high mean elevation and lack of well-developed passive margins of the continent, and the nature of the variations between its tectonic provinces.

Analysis of data from a major field experiment across the Basin and Range and Colorado Plateau, led by Anne Sheehan and Craig Jones, is ongoing. Jeff Schneider completed his MS thesis on surface wave analysis of the Colorado Plateau—Great Basin data, and Jeff is now with Texaco Offshore in New Orleans. Jeff's work on interstation phase velocities provides information on lateral velocity variation in the crust and upper mantle of the Basin and Range and Colorado Plateau, placing constraints on the mechanisms of formation of these provinces and for the relative lack of deformation in the Colorado Plateau relative to the adjacent Basin and Range and Rocky Mountains. Undergraduate student Julie Bartsch focused her research efforts on the study of seismic wave anisot-

continued on page 6



Geol 4350/5350 (Fold Belts and Extensional Basins) field trip to Arches National Park, Utah

Faculty News, cont.

ropy beneath the Colorado Plateau and Basin and Range, which helps give information on the history of strain in the mantle beneath these regions. Graduate student Hersh Gilbert is now studying the deep mantle structure beneath these regions using seismic converted phases.

Research associate Ken Dueker has been very busy with two major seismic field deployments this year. The first experiment, titled "Deep Probe," is a multi-institution project funded by the National Science Foundation Continental Dynamics program. The project included the deployment of 84 seismometers in Idaho, Wyoming, and Colorado. The second major deployment, still ongoing, was of the IRIS Array, a 33-component dense array of seismometers which includes radio telemetry to a central recording site and real time transmission of the data from NW Colorado and Wyoming to our research lab in Boulder. The data is analyzed in Boulder as well as transmitted on to Indiana University and UC San Diego.

Undergraduate student Noah Hughes completed a study of microearthquakes in the Boulder area. His work included the deployment of three seismic stations throughout Boulder County (done with assistance from the Field Geophysics class), supplemented by two USGS seismic stations in Golden and Idaho Springs. Within the three month deployment of the network, Hughes identified and located 23 small seismic events in the Front Range near Boulder. His work was presented at the Rocky Mountain GSA meeting in El Paso, and at a National Undergraduate Research Symposium in Austin, Texas.

New undergraduates joining our group include Aaron Shoolroy and Richard Eden. Aaron is working on a geophysical study of the Green Mountain diatreme, and is also assisting with locating and determining amplitudes of earthquakes recorded in the Sierran Paradox experiment led by Craig Jones. Richard is working on a survey of gravel resources in Boulder County, using time domain electromagnetic techniques.

Field Geophysics

The fall 1997 Field Geophysics course, taught by Assistant Professor Anne Sheehan, included a mix of geology, geophysics, and geological engineering students. Projects completed by the students include a magnetics, electrical resistivity, and seismic refraction experiment at an abandoned smelter site north of Boulder, a gravity survey to look for subsurface mine cavities at the Marshall site south of Boulder, and a ground penetrating radar experiment at the Denver Federal Center GPR test pad. The 2-credit course was held during the first half of the fall semester in order to take advantage of the longer days and favorable weather of the fall. The timing was perfect, as a 24" snowstorm struck Boulder and the Front Range the week after the field course was completed. Other activities included a field trip to a drill site for a Colorado Interstate Gas company underground gas storage facility near Wiggins, Colorado. New ground penetrating radar and ground conductivity equipment has been purchased in preparation for the 1998 course.



Undergraduate Aaron Banks collecting ground penetrating radar data in Geol 4740 Field Geophysics.

Hartmut Spetzler

Hartmut has expanded his role in the involvement in undergraduate education by becoming one of two undergraduate advisors. Dave Budd had been the major advisor for several years and it was time for a change. While Hartmut is phasing in with advising our freshmen and sophomores for the first year, Dave has continued with the juniors and seniors. The entire advising system in the University is being made more personal as part of the president's emphasis on the "total learning environment." Dave has been successful in establishing a good relationship with our undergraduates, which Hartmut hopes to emulate.

Some of you remember the "good old days" when "Doc" Thompson was head of the department and the department was small and there was a family like atmosphere. While we cannot turn the clock back and do not wish to, we are trying to recreate the feeling of belonging and having a home in the department. The associate chair for undergraduate education, Chuck Stern, and the

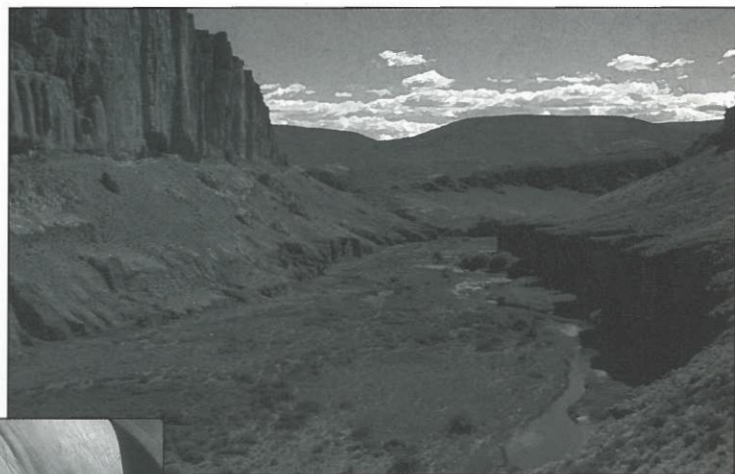


Hartmut Spetzler (right) is congratulated by Giff Miller for the award he received from the U.S. Department of Energy for the best university research presentation at an annual DOE conference.

designated undergraduate advisors see it as a large part of their mission to support our students in their academic pursuits as well as in their personal growth. A new undergraduate lounge and individual lockers provide the infrastructure for our efforts. We have also produced a University-wide brochure to help those interested through the maze of the many offerings in Earth and Environmental Sciences at CU. You can find it on the Web at <http://www.Colorado.EDU/EES/> or request a paper copy from the department.

Even though Hartmut is attempting to curtail his traveling, it seems that there are so many events and places that lure him away, that total abstinence is simply not an option. Whenever possible Ria, his wife, and he travel together. In support of a "Critical Thinking" course Hartmut teaches each spring, they went with students or on their behalf to the nation's proposed nuclear waste repository sites, a salt mine in New Mexico and Yucca Mountain near Las Vegas, Nevada. Relatively simple technical problems become exceedingly complicated when politics become involved; they are fascinating nevertheless. Two faculty members, Shemin Ge and Joe Smith, traveled with Hartmut and the students to Las Vegas and then on to Yucca Mountain. The five-mile-long tunnel was nearing completion. Below ground they were able to see some of the controversial veins (see photo, right) which they had seen above. The whole undertaking is overwhelming in its scope. The tunnel-boring machine advanced at an incredible rate of tens of feet per day leaving a 25-foot-diameter hole behind it. There were expert field guides above as well as below ground and at the end of the trip it was not clear whether everyone had profited most from the geology, the hydrology, the technology, or from the interpersonal relationships which are parts of such trips.

On their way to Bayreuth, Germany, where Hartmut collaborated in research again



Above: The valley of the Rio de las Pinturas in west-central Patagonia. The Cave of the Hands is half way up the left hand wall, at the contact between two cooling units of Cretaceous ignimbrites.



Left: Three fish-tail arrow heads from southern Patagonia. The one in the middle is made from black obsidian.

this year, Ria and Hartmut joined a group from the US, and Hartmut bicycled across the Pyrenees from just south of Barcelona, Spain, to Biarritz in France. Ria enjoyed the scenery and changing culture from the comfort of a van. For Hartmut it was a fantastic vacation, a nice blend of exercise and relaxation. In spite of having climbed 50,000 vertical feet cumulatively and having peddled 500 miles, Hartmut gained almost 10 pounds. The food was too good and the flesh too weak. The bicycle is a very special mode of transportation with which to see the countryside. Walking is too slow and a car or train too fast to appreciate the subtle changes in vegetation, geology, agriculture as well as the architecture, and culture in general. Going across Catalonia, and the Spanish as well as the French Basque country, and taking 12 days to do it was a not to be forgotten experience.

Charles Stern

Chuck and his family began 1997 with a National Geographic sponsored expedition to southern Patagonia in search of the sources of the black obsidian used by the prehistoric inhabitants to fashion artifacts (see left photo above). No outcrops of obsidian have ever been reported by geologists in southern Patagonia, which is covered in large part by Cenozoic basaltic lavas and Mesozoic rhyolite ignimbrites. However, abundant black obsidian artifacts have been recovered by archaeologists in locations from as far north as Peninsula Valdez on the Atlantic coast of Argentina (42°S) to Punta Arenas over a 1000 miles to the south along the Straits of Magellan in southernmost Chile (52°S), and from different occupational levels in these sites dated from 12,000 BP right up to the 19th century.

Chuck had shown that all these obsidian artifacts had the same chemistry and geologic age (late Miocene as determined by alumni Bill McIntosh at New Mexico Tech in Socorro). This suggested a single source and a great range of human distribution, but the source remained unknown. Chuck expected it to be in the vicinity of the Cave of the Hands in west-central Patagonia (see right photo above), where the concentration of such artifacts are high and near where Thomas Musters, a 19th century explorer, had described seeing his native guides collect obsidian. Unfortunately, the exact location of Muster's route through Patagonia remains unclear.

After six days of driving from Santiago, Chile, Chuck and his family met with a group of Argentinian archaeologists at the foot of Cerro Pampa, the Hill on the Plain, where these archaeologists had found large quantities of obsidian fragments in a site at which artifacts had apparently been fashioned for many years. Cerro Pampa overlooks Pampa del Asador, a broad Quaternary fluvial-glacial plain covered with fine wind blown sediment. Walking across the plain, Chuck found cobbles of obsidian concentrated in dry stream channels which cross the pampa, channels barely noticeable on the ground but clearly visible in satellite photos. The obsidian in these "placer deposits" proved to have the same composition and age as that of the artifacts previously analyzed, and Chuck has suggested this area to be the sole source for all the black obsidian artifacts in southern Patagonia. The results will be published in Argentina in a volume resulting from a session concerning lithic materials in Patagonian archaeological sites held in conjunction with an international symposium on Patagonian archaeology. In support of these results, Ar-



The group from Hartmut Spetzler's class inside the tunnel, a potential site for hosting the nation's high level nuclear waste, Yucca Mountain, Nevada.

gentinian archaeologists have shown that the quantity and size of obsidian artifacts decrease away from the vicinity of Cerro Pampa and Pampa del Asador, consistent with this being the sole source of this material.

Back in Colorado, Chuck advised an honors thesis done by undergraduate Jonathan Funk, who used Sm-Nd isotopic techniques in the laboratory of Lang Farmer to date the Green Mountain kimberlite just west of Boulder at approximately 570 Ma. This is almost 200 million years older than the age of other kimberlite pipes along the Colorado-Wyoming state line, some of which have yielded diamonds of more than 20 carats. The new date implies that kimberlite formation in the region of the Colorado Front Range during the Paleozoic took place over an extended period of time.

James Syvitski

Professor Syvitski is part of a vibrant stratigraphic modeling team that includes research fellow Dr. Lincoln Pratson, research associate Dr. David Bahr, PhD students Mark Morehead and Damian O'Grady, and numerical analyst Eric Hutton. The group runs INSTAAR's Geophysics and Oceans Laboratories and is associated with an academic consortium involving ONR, NSF and oil company financial support. The group continues to make strong advances in developing computer simulation models for use in the study of basin stratigraphy. Research

topics include sediment delivery of world rivers, iceberg processes, turbidity currents, debris flows, climate and sea level effects on river discharge, marine particle dynamics, formation of continental margins, continental slope processes, abrupt climate changes, high-resolution acoustic imaging of margins, and general hydrology and oceanography subjects. Of the 24 presentations in 19 locations, the following noteworthy addresses were provided in 1997: 1) 9th Congress of the European Union of Geosciences, Strasbourg; 2) CSPG-SEPM Joint Conference, Calgary, Alberta; 3) AGU 1997 Fall meeting in San Francisco; 4) Land-Ocean Interaction in the Coastal Zone (LOICZ) Open Science Meeting in Noordwijkerhout, The Netherlands; 5) the International Association of Mathematical Geology, CIMNE-Barcelona; and 6) ONR-



James Syvitski

STRATAFORM meetings in Monterey, Woods Hole, Keystone, and Minneapolis. Substantive research-oriented gifts have been transferred from MOBIL's Strategic Research Center to INSTAAR, to enable INSTAAR to bridge the high-resolution interests of the Navy with the more geological interests of an oil company. Professor Syvitski accepted the Editorship of the internationally-respected journal, *Arctic and Alpine Research*. He also edited a special volume of *Marine Geology* published last year on COLDSEIS, a project designed to try to understand seismic facies of glacial deposits.

Paul Weimer

In the fall, Paul Weimer taught Geology 6330 (Applied Sequence Stratigraphy and Basin Analysis) to 24 graduate students and two visiting professors. The highlight of the course was a three-day field trip examining the Upper Cretaceous strata of the Book Cliffs with John Van Wagoner of Exxon Production Research. Also attending the field trip were Peter Vail, John Anderson, and their students from Rice University.

Scott Tinker (Marathon Oil, and former student) gave a one-day short course on constructing reservoir models using the newest visualization techniques.

For the spring semester, Paul taught Geology 1020 (150 students) and co-taught Geology 6060 (Petroleum Geology of Turbidite Systems) with Roger Slatt at CSM. The class visited the Jackfork Formation in Arkansas for a one week field trip over spring break. Special lectures included Trevor Elliott (University of Liverpool), Ron Steele (University of Wyoming), and Mick Casey (BP-Alaska).

Paul served as the 1997 President of the Gulf Coast SEPM, as well as on the technical program committee for the Research Conference in Houston on shallow to non-Marine siliciclastic reservoirs. He gave two posters on Colombian reservoirs with Mario Suarez and Claudia Malagon, and chaired one session.



Paul Weimer has recently been selected as a 1998-99 AAPG Distinguished Lecturer.

He is a co-convenor (with Roger Slatt, Mike Bowman, Peter Dromgoole) of the third AAPG/EAGE research conference on Turbidite Reservoirs in Almeria, Spain for October 1998. He organized two sessions for the 1998 AAPG International meeting to be held in Rio De Janeiro this coming November. He will be the oral session chairperson for the 1999 AAPG International Convention to be held in Birmingham, England in September. He organized two sessions for the 1998 AAPG Hedberg Conference in Galveston on reducing risk on the Gulf of Mexico. Paul serves on the subcommittee on sequence stratigraphy for the International Stratigraphic Code of Nomenclature and continues to serve as an Associate Editor for the *AAPG Bulletin* and *GeoMarine Letters*. He taught several short courses for both companies and associations, including Petrobras (Rio de Janeiro), Royal Dutch-Brunei, SEPM, and AAPG.

Paul is currently chairing the committees of ten graduate students. Four students have graduated this past year under his supervision.

EMARC

The real highlight for EMARC will be the publication of the May 1998 *AAPG Bulletin*. A special issue is being published that is entirely dedicated to the research of EMARC in the first Gulf of Mexico consortium. Nine papers will be published that summarize various aspects of the petroleum systems including an overview, atlas of producing fields, sequence stratigraphy, biostratigraphy, 3-D seismic interpretation of turbidite elements, structure of the area based on restorations, a mega-regional cross-section across the entire margin, salt-sediment interaction, and petroleum systems analysis. The circulation of the *AAPG Bulletin* is 33,000—the largest geologic journal in the world. No one group has ever been given an entire issue of the *Bulletin* in which to publish their research results. This publication will help cement EMARC's reputation in the petroleum geology field.

On January 8-9, 1998, the first meeting of the reservoir research consortium, supported by 15 companies, was held in the Benson Building. PIs are Andy Pulham, Paul Weimer and George Pemberton. The research focuses on the influence of key stratigraphic surfaces in reservoirs, and how these compartmentalize and affect reservoir performance. George Pemberton (University of Alberta) focuses on the trace fossils of the reservoirs and their implication for environmental interpretation and reservoir continuity. Six fields from the North Sea, U.S. and Canadian Rockies, and northern South America were chosen for the first year of study. This next year will see an expansion into a more global distribution of reservoirs. A second reservoir research project continues that focuses on the reservoirs of the giant Cusiana Field in Colombia.

On May 28-29, 1997, the first meeting of the new Gulf of Mexico Research Consortium was convened. PIs are Mark Rowan, Bruce Trudgill and Paul Weimer (see Mark's write-up). Attendance was extremely good—100 people—from 30 companies. This year's meeting will be held on May 27 and 28. Visiting professors Jamie Barcelo (National University of Mexico) and Dong-Lim Choi (Korean Oceanographic Institute) have worked with EMARC staff on the 3-D seismic stratigraphic interpretation of two areas.

After a lot of arm twisting, ten oil companies appeared to recruit again on campus. The mini-boom in the oil industry during the past two years has translated into good opportunities for both graduates and undergraduates.



Part of the EMARC space before the move, now filled with workstations. From right to left: Paul Weimer, Andy Pulham, and Bob Graebner, the "Daddy Warbucks" of the original EMARC Gulf of Mexico industrial consortium.

Engaging Undergraduates in the Research Enterprise:

The Department's Mentoring Program for Geology Majors

Since 1995 the Department has attempted to involve our Geology majors more formally in the research activities of faculty and graduate students. Many undergraduates are uncertain about the possibilities available to them. Their experience with our discipline is too often limited to the classroom; rarely have they been engaged in the excitement of geological discovery. Through the generosity of alumni and the private sector we have been able to provide 25 to 30 mentorships each year that allow graduate students and faculty to incorporate undergraduates in their research, either in the field or in the laboratory. In exchange for this research assistance, each sponsor assumes a one-on-one mentoring responsibility for the undergraduate major, providing advice on professional development, graduate school, and employment opportunities. The Department holds informal social gatherings for mentors and mentorees during the academic year, usually centered around a specific topic, such as career options, choosing a graduate school, etc.

The undergraduate majors benefit by exposure to the research environment at an early point in their career, and by developing personal ties to graduate students and faculty. Faculty and graduate students have access to motivated assistants as they pursue their research objectives. And our ability to recruit outstanding new majors from the general student body is enhanced as word of the program grows.

The University recognized our Mentoring Program as one of the best examples on the Boulder Campus of personalizing the educational experience for undergraduates; this year they matched our funds through the SURF Program (Summer Undergraduate Research Fellowships). Together we are able to offer full-time summer stipends to involve five students fully in our research activities.

As interest in the Mentoring Program has grown, we have begun to move to permanently endow the Program. We have committed the Bruce Curtis Fund for this purpose, and this year, thanks to generous contributions from several alumni and oil companies, we were able to meet a large challenge grant from alumnus Bill Hiss (Class of 1975). The Bruce Curtis fund is now our largest endowment, at over \$200,000. It provides a substantial portion of the funds needed to cover the cost of the Mentoring Program each year. But to be fully endowed, we need to reach our goal of about \$500,000. We feel this is one of the most cost-effective programs we offer, providing the very best majors with opportunities that are likely to enhance their careers in the geosciences. Often we can leverage donations. Please contact us or the CU Foundation if you are interested in contributing.

Welcome Home!

**Dedication of the Benson Earth Sciences Building,
October 30, 1997**



*Bill Hay, Jonathan Overpeck,
and Julie Cole*



*Giff Miller unveiling the portrait of
Bruce Benson.*



Edith Ellis



*Melissa Lester, Lisa
Campbell, Allen Lester,
and Sue Long*



Bruce Jakosky lecturing on life on Mars.



Left: Jim White lecturing on global change.



*Above: Giff Miller (center) chatting with Mark
Fitzwilliam (right), project manager for building
contractor AMD, and (left, back to camera) Curt
Dale, building architect with AMD.*



Don Runnells chatting with Karen Nordstrom



Eric Leonard

GEOLOGY NEWS



Left: Pete and his soil friends gathering at the spring reception.

Below: Micky Smith and Kathy Licht at the spring reception.



Above: Pete Birkeland, happy at last, at the spring retirement reception.

Spring Fling



Above: Louis Bradley, Martha Andrews, John Andrews, Sue Birkeland at the spring reception.
Left: Jeff Swope and Joe Smyth



Kathy Freeman, Pam Topping, and Alex Goetz



Ann and David Budd

An appeal for IN THE FIELD support

Eugene M. Shearer

Chair, Department of Geological Sciences Advisory Board

The opportunity to include comments from the Department of Geological Sciences Advisory Board in the Spring 1998 *Geology News* is appreciated. Most of you alumni and friends of the Department are aware of the existence of the Advisory Board. For the uninformed and as a reminder to the informed, a brief summary of the Advisory Board "Statement of Purpose" includes: 1) the Board shall "foster closer ties among the Department, alumni, friends, and private industry"; 2) the Board shall "guide and assist the Department in improving the quality of education for undergraduate and graduate in the geological sciences"; and 3) the Board shall support "the acquisition of private financial support for the Department." If any of these goals stir your inclination to become involved, contact the Department Chair and enjoy participation.

During the past ten years that I have been associated with the Board, we have addressed the above goals and attained success in several areas. One area of study that the Board emphasizes at every semiannual meeting is the teaching of field geology IN THE FIELD! University of Colorado at Boulder administrators have become convinced that the geological laboratory is outdoors: north, south, east, and west of Campus Box 399,

Boulder, CO. Funding of IN THE FIELD instruction, although supported fiscally by UCB administration, requires additional, nonuniversity support. IN THE FIELD classes need to be limited in size to be effective; transportation requires capabilities beyond transport to a local industrial complex; multiday educational excursions require either camping equipment or funds for local accommodations and food (adult beverages excluded).

No doubt you readers have guessed what I'm approaching—the Advisory Board would appreciate your financial support of IN THE FIELD geological instruction. There are many funds within the Department of Geological Sciences to which you may contribute dollars for the support of field geology instruction. Choose your special professor fund, or category fund, and restrict your donation to facilitate IN THE FIELD geology instruction at UCB. In the Board's opinion, UCB can become the most prestigious university in the U.S. for teaching IN THE FIELD geology. Adequate funding and first-class professorial instruction are prime requirements to attain this goal. Your participation will be most appreciated!

If you have any advice for the Advisory Board, please drop us a line or give one of the members (listed on the front page) a call.

Help with internships

The department has a very successful mentoring program for its undergraduate students. With funding from alumni, faculty are taking undergraduates under their wings and enabling them to experience what research is like in a university setting. Now we are seeking to also increase the opportunities for our students, undergraduate and graduate alike, to gain further enrichment through off-campus internships. Internships can provide the interns with a view of the working environment of a geoscientist, a basis outside academe for career decisions, practical experience, and an expanded network of contacts. If arranged in advance, students can also elect to receive up to three hours of credit toward their degrees.

Currently, the campus's Career Services office (<http://www.colorado.edu/careerservices/ceipjf.html>) lists a very small number of internships of a quite varied nature for earth scientists, most of which are with governmental agencies along the Front Range.

A number of students also managed to find their own, but demand far exceeds supply.

Here, then, is our appeal. Please let us know if you can provide an internship for a student. Part-time work within commuting distance of Boulder during the semester as well as summer work anywhere in the world would be appropriate. Since very few students are financially independent, they are especially interested in internships that provide stipends sufficient for them to survive. In most cases the student will more than earn her/his keep. If you have an opportunity that is just too good to miss, but cannot provide full support, then let us know and we'll try to use funds provided by the department's friends to support the project. Conversely, if you do not presently have an appropriate opportunity for an internship, but would like to support one anyway, we would certainly welcome your financial contribution. We'll use it to match a student with an underfunded internship.



Gene Shearer (left) talks with a guest at the Building Dedication.

1997-98 Mentoring Program

MENTOR	MENTOREE	PROPOSAL
Andrews, John	Eastman, Kay	SURF/Mentoring
Budd, David	Michael Liguori	SURF/Mentoring
Farmer, Lang	Seth Mueller	SURF/Mentoring
Ge, Shemin	Matt Peebles	Significant fluid flow exchange between ocean and marine sediments
Horn, Andy	Brady Van Matre	Groundwater quality, part of a long-term project being conducted at the USGS toxic substances hydrology program study site on Cape Cod, MA
Jacobsen, Steven	Brian J. Graham	Study of phengite which is currently thought to transport significant amounts of potassium and water as (OH) on subducting slabs into the upper mantle
Kaplan, Michael	Winston Seiler	Late quaternary ice-sheet dynamics in the Cumberland Sound Region, Baffin Island, Canada
Kinner, David	Dierck Kirsten	Applying TOPMODEL to a lowland tropical rainforest, Barro Colorado Island, Panama
Kraus, Mary	Rebecca Bortnick	Research on the fluvial sedimentology and paleosols of the Paleocene Fort Union Formation, Bighorn Basin, Wyoming
Licht, Kathy	Diane Fordik	Determining the glacial history of the Ross Sea, Antarctica
Manley, Bill	Gavin Malia	Stratigraphic correlation among interglacial sediment sections in southwestern Alaska based on magnetic susceptibility, organic carbon, and particle size variations
Morrow, Jared	Terry Church	Sedimentological and geochemical changes associated with the loss of late Frasnian coral/stromatoporoid-dominated framework carbonates in the southeastern Great Basin
Murphey, Paul	Dan George	Preparation, curation, and identification of the specimens collected during the 1997 field season
Pulham, Andy	Charlie Boas	Comparing petrophysical information such as core analysis and or wireline logs with core descriptions from Colorado and/or Wyoming, or quantification of bioturbation textures in selected core projects.
Rowan, Mark	John Roesink	Animation of 3-D structural restorations
Sharaky, Abbas	Oliver Hippert	Study of alteration mineralogy, associated trace elements, radiometric dating of the different ore deposits in the area, light stable isotopes and fluid inclusion study of a number of these deposits
Skewes, Alex	Liz Shannon	The genesis of mineral deposits in the central Andes
Smyth, Joe	Kristopher Nuttycombe	The stability of carbonate minerals may play an important role in controlling the abundance of CO ₂ at the surface of the earth over the course of geologic time
Spetzler, Hartmut	Scott Cook	Water flow through complex fractures and the presence of contaminants
Stern, Chuck	Funk, Jonathon	Dating the Green Mountain kimberlite, Boulder, CO
Trudgill, Bruce	Ned Frost	Take interpretations from our seismic analyses in the Gulf of Mexico and generate fault displacement models for a number of fault arrays
Urban, Frank	Jessica Kelleher	Employing long lived coral records to gain insight into pre-instrumental variability of the tropical oceans
Weimer, Paul	Ryan Crow	Stratigraphic studies in the sub-salt areas of the present Louisiana outer shelf
Wolfe, Alex	Abigail Geary	Arctic ecosystem evolution on glacial-interglacial timescales, Paleolimnology of alpine lakes on the Bolivian altiplano and Sky Pond in the Colorado Front Range



Above: Giff Miller (left), Fitzwilliam (right), contractor AMD, and Dale, building architect.

Don Runnells chatting

The Administrative office . . .

The Front Office is always the heart of the Department. It is the one spot where nearly all faculty and students make an appearance each day, if only to check their mail. If the Front Office is running smoothly, the whole Department is happy. We are very pleased to report that we have a wonderful Front Office staff with us who approach their jobs with a can-do attitude. Beth Hansen is our lead administrative officer. She supervises the office and works closely with the Chair to establish budget priorities, handle personnel

actions, implement a wide range of policies, and respond to what seems to be an ever-increasing paperwork load. Kathy Freeman takes care of the Graduate Students, from their application to the program until they walk out the door with their advanced degrees. Sue Long has a lead role in scheduling courses and is our front line on questions from the general public, while Jane Sims oversees our accounts, an increasingly complex task as research activities within the Department continue to increase, and federal

regulations require more complete documentation. We are also fortunate to have had excellent student assistance through the years; currently Carrie Kocik helps out on a daily basis with all those little tasks that would otherwise be postponed. We don't know what we'd do without her.

As most of you know, activities come in cycles, from enrollment, through drop-add, and on into scheduling courses for next year, keeping track of recruiting and promotion letters, and eventually final examinations and commencement. Everyone in the Front Office pitches in to help as the work demands ebb and flow. And with the move to our new home, the entire staff were under extra pressure to simultaneously organize a completely new office complex while at the same time continuing to meet all of the normal expectations that the students, faculty and staff have of them. That they managed to do this is an indication of their professionalism and commitment. As a Department, we want to express our warm appreciation for their hard work, their competence, and their ability to maintain a cheery disposition handling the myriad of tasks and requests from all of us.

. . . and the new Computer Lab

The new computer lab in the Benson Building was created partly with funds from the student computing fee administered by ICWG (an all University committee), and partly with funds from the Department. ICWG provided money for the hardware and some software, and the Department provided space, and money (about \$33,000) for the geologic specific software.

ITS (Information and Technology Services) of the University installed the computers, developed the local area network, loaded a Windows NT server for the network, and maintain the hardware and the software. Of course the network is connected to the internet, and Web surfing is great.

The computer lab is Room 385, has 1,078 carpeted square feet, windows on the north and east walls, and is a very friendly room. Twenty computers form the core of the lab. These are Pentium Pro 200 MHz computers; each has a 2.1 GB hard disk, 32 MB RAM, and 17-inch color monitors.

The software includes Microsoft Office with standard word processing, spread sheet, database, and presentation software. In addition, 11 major software items provide help with statistics, 3-D graphing, process modeling, computer assisted drawing, GIS, geologic map preparation, geochemistry, groundwater, and mathematical analysis.

At present four classes have reserved time in the lab as part of their regular activities, and more classes are expected. Between reserved times, student use is fairly heavy, and is bound to grow.



The front office staff—those at the top of the hierarchy in the new building. From left to right, Kathy Freeman, Beth Hansen, Jane Sims, and Sue Long

What's new in the Jerry Crail Johnson Earth Sciences Library

Suzanne T. Larsen

The Jerry Crail Johnson Earth Sciences Library opened its doors on the first day of classes for the spring semester, January 12, 1998. We began moving from the old Earth Sciences Library on December 29th. That part of the move took four days. Beginning the 6th of January we began moving the map library from Norlin. This was a huge undertaking involving taking the map cases apart and reassembling them in the new library. Of course this was done during the coldest weather of the season, while it was snowing! We were still moving maps in on the 12th.

We have added two new staff members with the map collection. Maureen Taylor is our new Map Librarian. She is a recent graduate of the University of Rhode Island with a Master's Degree in Library Science and has an undergraduate background in Geography. She is actually the first Map Librarian ever in the history of the University Libraries. She brings a great deal of knowledge and enthusiasm to the position. Our other new staff member is Judy Anderson, who was a Library Technician III in the map collection when it was in Norlin. She has been with the collection several years. Terrie O'Neal, Library Technician III, and Phyllis Hunt, Library Technician

II, continue their positions in the new library. Terrie has been in the Earth Sciences Library since 1983 and with the University Libraries since 1980. Phyllis has been with us since 1993 and also worked elsewhere in the library system prior to coming to Earth Sciences.

Our new environment has lots of light, temperature control, and an abundance of great space. (All of these things are new to us!) We moved from 2,400 sq. ft. in "old" Geology to 11,000 sq. ft. in the Benson Earth Sciences Building. The Map Library was in a separate room of about 2,500 sq. ft. in the basement of Norlin. In its new home, the map collection is in an open environment, sharing space with the compact shelving and study areas. Already, visibility alone has raised interest in this collection.

The entry to the library is through the dramatic atrium at the heart of the Benson Building. The atrium looms three stories high with a floor and wainscoting of Lyons Sandstone. The entry to the library is flanked by a curving, custom-designed circulation desk of golden oak with a slate top. Oak cabinetry and wainscoting is used extensively throughout the first floor of the library. The entire south wall of the library is windowed, looking out onto a grassy field and beyond to the Flatirons. Large window wells in the first floor send natural light down to the map library in the lower level.

The new library is designed to highlight electronic access to current resources. A bank of Web-based computers at the entry and a reference network farther back in the center of the library provide access to the online catalog and subject oriented databases, as well as the Web. Current journals and the last ten years of unbound journals are on this level. The older bound journals, government publications and books are in the compact shelving on the lower level. While the map collection is primarily in paper format, we have been getting a number of digital map products,

primarily from the USGS. We hope to support GIS applications at a moderate level in the near future. Our biggest map issue right now is that most of the collection does not show up in the online catalog. We will be working to rectify this over the next few years.

At our building dedication on October 30th, 1997, we learned much more about Jerry Crail Johnson, for whom the library is named. Eric Johnson gave a moving tribute to his mother during the dedication ceremony presentations. She had severe asthma as a

Emma Rainforth	Jeffrey Schneider
PhD	
Barry McBride	The Geometry and Evolution Systems, Northern Dimensional Analysis

Fall 1997

BA	
Aaron Banks	Jonathan Funk
Eric Dole	Erin Marsh

MS	
Oliver Boyd	Layrn Smith
Kristin Lippoldt	Gerart Soto

PhD.	
Eric Hiatt	A Paleocyanographic Model of the continental Sea: A Chemosynthetic Ecosystem
Konrad Hughen	Development and Application of Paleoclimatic Reconstructions from the Speleogenesis of Cave of the Hillslope Evolution Model
Fred Luiszer	Ecosystem Dynamics
Nan Rosenbloom	Records of Climate and Paleosol Development, Eastern Canada
Peter Sauer	Single-Crystal X-ray and Neutron Scattering Studies of the Chemical Effects of OH=O Substitution in Biotite, and Ferromagnesian Micas
Jeff Swope	

battling both her illness and the perception of the time that only men could be geologists! When she began to raise a family, she instilled in them her own love of books and libraries. She died in 1983 and in 1988 the Johnson family first approached the University Libraries and Department of Geological Sciences with their offer of a gift towards the new library in a new building. A second gift about five years later was instrumental in completing the funding for the building. All four children of Jerry Crail Johnson and their own children were in attendance at the October dedication and celebrated the library that will be a lasting tribute to her memory.

Please come by to see us. The University Libraries online system, Chinook, can be accessed on the web at www-libraries.colorado.edu or in text version by telnet to libraries.colorado.edu.



Saint Suzanne (Larsen) at the dedication

Departmental Colloquium Speakers (Spring and Fall)

To learn more about each other's research, we decided to have both outside and inside speakers at the department colloquium.

David Budd—University of Colorado, *From Mass Transfer to Permeability Spatial Structures: Lessons in Sedimentology from the Limestones of the Floridan Aquifer*

Michael Blum—University of Nebraska, (Econ Resources Group Distinguished Lecturer), *Pleistocene Wadi-Lacustrine Depositional Cycles and Sequences, Northern Margins of the Sahara, Tunisia*

Chris Daughney—McGill University, *Treatment of Bacterial Surfaces as Thermodynamic Entities: Implications for Contaminant Transport in Groundwaters*

Robert DeConto—NCAR / CIRES, *Modeling Cretaceous Climates and Oceans*

Kenneth Dueker—CIRES, *Emerging Image of North American Continent from Crust to 660 km Discontinuity: How Deep do Continental Processes Extend?*

Gregor Eberli—RSMAS, Miami, AAPG Distinguished Lecture, *Carbonate Platform Architecture: A Record of Dynamic Processes in Facies and Diagenesis*

Lang Farmer—University of Colorado, *Application of Nd Isotope Data to Sediment Provenance Determinations: Systematics and Examples from the Western U.S.*

William Hammer—AAPG Distinguished Lecturer, Augustana College, *Dinosaurs on Ice: Jurassic Dinosaurs from Antarctica*

Ted Habermann – NOAA National Geophysical Data Center, *There Is So Much, There Are So Many: Presenting Science Content to Diverse Audiences on the World Wide Web.*

William Hay—University of Colorado, *Towards a Global Plate Tectonic Model: A Never-Ending Story*

Laurence P. James—James GeoAssociates PC, Denver, *Epithermal Gold and Porphyry Copper-Gold Ore Systems in Island Arc and Cordilleran Geological Settings: How Are They Related?*

Donna Jurdy—AAPG Distinguished Lecturer, *Applying Cenozoic Plate Motion Models to Proterozoic and Paleozoic*

Kristine Larson—Dept. of Aerospace Engineering, University of Colorado, *Geodetic Constraints on the Eurasia-India Collision Zone*

Al Linde—Carnegie Labs, *Watching, Through the Eyes of Borehole Strainmeters, How the Magma Moves: Evolution of the Eruption of Miharayama, Izu-Oshima, Japan, in November 1986*

Patricia Maurice—Kent State University, *Applications of AFM to Studies of Environmental Particles, Fundamental Controls on Reactivity of the Mineral-water Interface*

Barry McBride—University of Colorado, *Petroleum Systems of the Northern Deep Gulf of Mexico*

Gifford Miller—Professor and Chair, Dept. of Geological Sciences, University of Colorado, *Disappearing Fauna and Vanishing Lakes: Was Megafauna Extinction and Demise of the Megalakes in Australia a Consequence of Aboriginal Immigration?*

Peter Molnar—MIT (Geodynamics Group Distinguished Lecturer), *Mantle Dynamics, Uplift of Tibet, and the Indian Monsoon*

Kathryn Nagy—Sandia National Laboratories, Albuquerque, New Mexico, *Clay Growth Kinetics: Atomistic to Global Perspectives*

Pete Palmer—Research Associate—Denver Museum of Natural History, *The Importance of Geological Concepts to the Understanding of Sustainability*

Brian Schroth—University of California-Berkeley, *Landfill Leachate Pollution of Groundwater: Surface Reactions Affecting Heavy Metal Mobility*

Wayne Shanks—United States Geological Survey, *Fluid Flow and Chemical Reactions in Seafloor Hydrothermal Systems: Alvin Dives, Black Smokers, and Cellular Automata Modeling*

Payson Sheets—Department of Anthropology, University of Colorado, *The Ceren Archaeological Site: A Challenging Research Problem for Geology and Geophysics*

Joseph Smyth—University of Colorado, *Hydrous Minerals at Pressure: An Ocean in the Earth's Interior*

Carl Steefel—University of South Florida, *Geochemical Kinetics and Transport in the Crust: Meter to Global Scale*

Claus Siebe—UNAM, *Pococateptl Volcano, Mexico; Past and Future Eruptions*

Tonie vanDam—NOAA / CIRES, *Absolute Gravity & GPS Measurements in Greenland*

Chris Wold—CIRES/NCAR, *Proxy Models for Climatically Sensitive Sediments for the Late Cretaceous and Present Day*

Brian A. Zaitlin, 1996-97 AAPG Distinguished Lecture—PanCanadian Petroleum Ltd., *High Resolution Sequence Stratigraphy of Incised-Valley Systems: General Characteristics and Common Variants with Examples from the Western Interior Seaway*

full support, then let us know and we will use funds provided by the department's friends to support the project. Conversely, if you do not presently have an appropriate opportunity for an internship, but would like to support one anyway, we would certainly welcome your financial contribution. We'll use it to match a student with an under-funded internship.

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Emeritus Activities

Our emeritus continue to be active in both academic and non-academic life.

Mark Meier has been invited to deliver the Walter B. Langbein Memorial Lecture at the Spring Meeting of the American Geophysical Union, Boston, Mass, May 26-29, 1998. His tentative title is, "Sno'n'ice, Scaling, and Sea Level."

Bill Braddock has taken control of the new computer laboratory, and he and Carol took their annual trip to Norway—this time to Lofoten Islands. **Bill Bradley** continues to spread the good word on Colorado Plateau geology for participants on Audrey Benedict's canyonland rafting trips. Lucky Louise gets to tag along and provide entertainment. **Ted** and **Barbara Walker** went to Switzerland for this year's bike trip. They rented a house for 3 weeks and biked out and back, or took a train for part of the daily trips. Ted is doing some skiing and a lot of redbed investigations of the Fountain Formation. **Ed Larson** and **Pete Birkeland** are busy cleaning out their 3-decade messes in the old building. Both have moved into the new building, where they have done some creative rearranging so they can keep most of their stuff. Pete, the computer-challenged one, continues to struggle with finishing the soil book—save

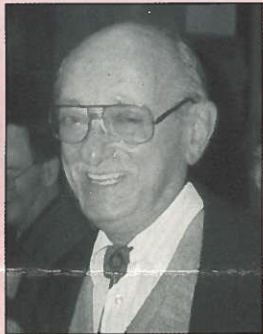
your money for the 1999 edition. He and Sue used an invitation to talk at the University of Wisconsin, thanks to Vance Holliday, to bike on the rails to trails. Soon they head off to Norway to cross country ski. We all were happy to see both **Warren Longley** and **Erle Kauffman** at the dedication of the new building. **Don Eicher** has moved too, downsized from 30 drawers to 6, 5 file cabinets to 2, 4 tables to 1/2 and 5 bookshelves to 3, and probably all to the good. He shares an office with Pete and said "Pete Birkeland is definitely the neatest office mate I have ever had." Don is teaching intro and field geology in this spring.



Bill and Carol Braddock at the building dedication.



Don Eicher and Dawn Kaback at the building dedication



Carl Kisslinger

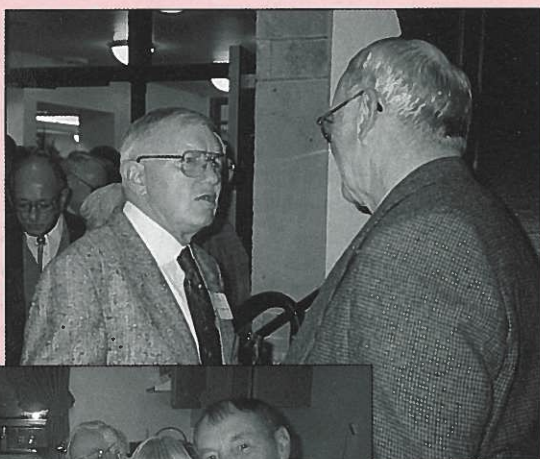


Mark Meier at the spring reception.



Above, Ed Larson and Robin Warner at the building dedication

Below, Earl Kauffman at the building dedication

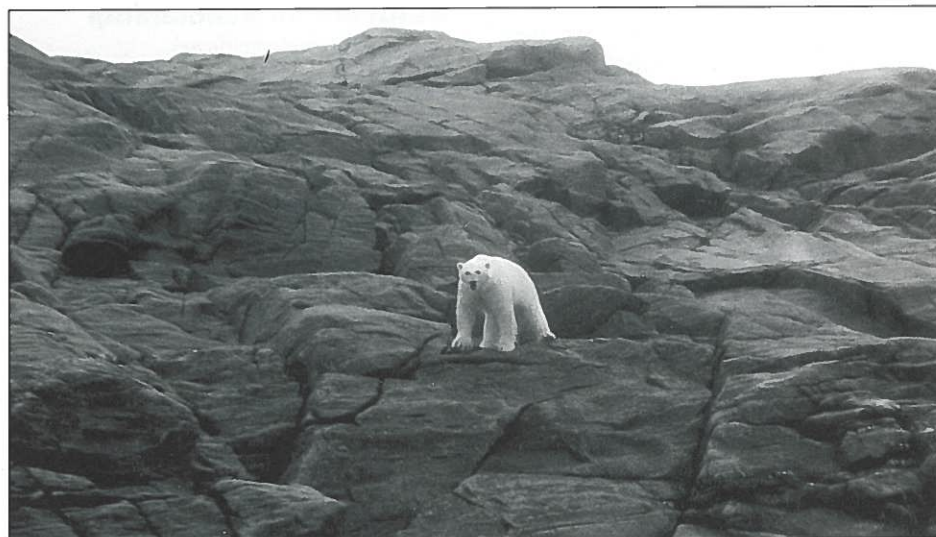


Below, from left to right, Louise Bradley, Barbara Walker, Ted Walker, Sue Birkeland, Bill Bradley.



Student News

Michael Kaplan won first place honors at the 1997 Colorado Scientific Society Student Night for his presentation entitled "Late Quaternary glacial history of the mid-outer Cumberland Sound area, eastern Canadian Arctic."



Michael Kaplan's polar friend.

New Geology Graduates

Spring 1997

BA

Benjamin Burger	Kimberley Duran	Travis Nelson	Robert Wand
Gregory Danziger	Julie Dutton	Steven Quane	
Denis Duran	Alexander Krolick	Scott Tangenberg	

MS

Wendy Cunningham	Sharmila Hutchins	Elizabeth Medlin	James Shiroma
Eleanor Griffin	Sarah Jones	Randall Mrugala	Mario Suarez
Jennifer Hinds	Claudia Malagon	Michele Murray	

PhD

Stephen Hasiotis	Redefining Continental Ichnology and the Scoyenia Ichnofacies
Daniel Levis	Late Pleistocene Sedimentation in Glacial Lake Missoula and Revised Glacial History of the Flathead Lobe of the Cordilleran Ice Sheet, Mission Valley, Montana
Jared Morrow	Shelf-to-Basin Event Stratigraphy, Conodont Paleocology, and Geologic History Across the Frasnian-Famennian (F-F, mid-Late Devonian) Boundary Mass Extinction, Central Great Basin, Western U.S.
Gregg Swayze	The Hydrothermal and Structural History of the Cuprite Mining District, Southwestern Nevada: An Integrated Geological and Geophysical Approach

Summer 1997

BA

Noah Hughes

MS

Emma Rainforth	Jeffrey Schneider	Nathalie Smith	Tina Wells
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PhD

Barry McBride	The Geometry and Evolution of Allochthonous Salt and Its Impact on Petroleum Systems, Northern Gulf of Mexico Basin: Studies in Three-And Four-Dimensional Analysis
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Fall 1997

BA

Aaron Banks	Jonathan Funk	Matthew Peebles	John Roesink
Eric Dole	Erin Marsh	Meghan Quinlivan	Elizabeth Shannon

MS

Oliver Boyd	Layrn Smith	John Andrew Horn
Kristin Lippoldt	Gerart Soto	Brent Lewis

PhD.

Eric Hiatt	A Paleoceanographic Model for Oceanic Upwelling in a Late Paleozoic Epicontinental Sea: A Chemostratigraphic Analysis of the Permian Phosphoria Formation
Konrad Hughen	Development and Application of Varied Sediment Records for Geochronological and Paleoclimatic Research
Fred Luiszer	Speleogenesis of Cave of the Winds, Manitou Springs, Colorado
Nan Rosenbloom	A Hillslope Evolution Model for the Coupled Prediction of Soil Texture and Ecosystem Dynamics
Peter Sauer	Records of Climate and Paleoclimate From Stable Isotopes in Lakes and Lake Sediments, Eastern Canadian Arctic
Jeff Swope	Single-Crystal X-ray and Neutron Diffraction Studies of: The Crystal Chemical Effects of OH=O Substitution in Mantle Rutile and C1-OH Substitution in Biotite, and the Crystal Chemistry of 1M Trioctahedral Ferromagnesian Micas

Student Awards

The department annually gives the following awards to our students in April. The 1997 awards were published in the previous *Geology News*. Because we moved forward this year's *Geology News* publishing date, these awards had not been announced as the newsletter went to press. We will list the 1998 awards in the next *Geology News*.

Zena H. Andrews Fellowships
(to support outstanding women doctoral students in geology)

Association of Women Geoscientists Awards
(recognizes excellence in academics)

Elaine Bass Parkison Memorial Scholarship
(recognizes outstanding women at any level)

Bruce F. Curtis Scholarship
(scholarships to graduate students in energy resources, environmental geology, and engineering geology)

Estwing Award (top Junior)

Johnston Scholarship (top Senior)

Keith Marks Scholarship
(outstanding undergraduate)

W.O. Thompson Awards
(funds are used to assist graduate students with their research)

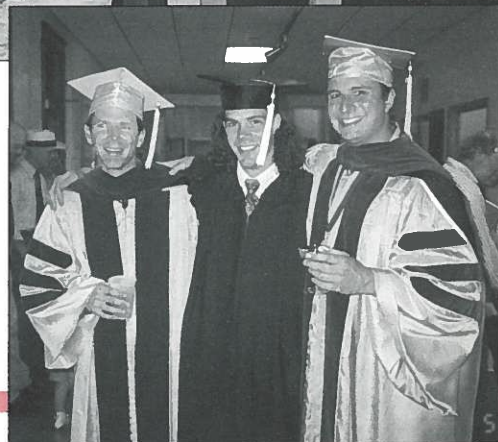
Rocky Mountain Association of Geologists Award (top Senior)

Waldrop Fund Award (top Senior)



Above: Denis Duran receiving the Rocky Mountain Association of Geologists award. From left to right, Chuck Stern, Denis, Hartmut Spetzler, Giff Miller.

Right: Jared Marrow, John Sosulski, and Steve Hasiotis at the spring graduation ceremony.



Alumni News

Judith Pierson Anderson (BA, '53) Judith worked for several years in cartography for Jeppesen & Co. in Denver following graduation. Now you'll find her and husband, Chilton, down on their Angus ranch in Taos, NM. Chilton is director of the Taos School of Music and ski school supervisor at Taos Ski Valley, where he has taught for 40 years. Judith is excited about the new building and remembers attending classes amidst construction in the old Geology Building. She recalls a gypsum plaster ceiling collapsing during a class, causing frantic students to jump out windows, huddle under desks and attempt to maneuver through clouds of plaster dust! Fortunately, no one was hurt. Those of us in the new building hope this won't be repeated!

Ray Batson (BA, '62) retired from the U.S. Geological Survey in Flagstaff, AZ in 1992. He co-authored two books with Ronald Greeley; *NASA Atlas of the Solar System* (1997) and *Planetary Mapping* (1990). His career was devoted to research in cartography and photogrammetry in support of the geological exploration of the solar system. Ray and his wife, Rhoda, spend a lot of time using their airplane to explore remote locations. They spent last summer in South Africa touring Safari camps and lodges in Zimbabwe and Botswana.

Charles S. Content (BA, '34) is retired and doing some consulting work, chiefly in hydro development. He worked as an engineering geologist for the U.S. Bureau of Reclamation from 1935-56, and later for Bechtel Corp. from 1956-76 as Manager of Geotechnical Services. His career took him to many exotic places such as Greenland, northcentral Australia and Papua, New Guinea, where he observed a small glacier very near the equator! Charles has fond memories of attending classes at CU from 1929-34, and is indebted to Professors R.D. Crawford, Walter Toepelman, and Warren O. Thompson for his "reasonably successful career of 55 years in Engineering Geology."

Bruce A. Geller (PhD, '93) keeps busy working on many interesting mineralogy consulting assignments—from kidney stones to bone carvings to inclusions in gem emeralds. He is still selling retail and wholesale minerals and gems. He also volunteers his time teaching petrography to several CU grad students, and looks forward to continuing

this in 1998. Bruce thoroughly enjoyed the dedication to the new Benson Earth Sciences Building, and says "it was truly an historic occasion."

Jim Glendenning (BA, '54) spent three years with AMOCO, thirteen years with the U.S. Navy as a pilot, and twenty five years as a pilot with United Airlines. Today he pilots a lawn tractor over his yard in the Eastern Cascade mountains. He is currently Chief Operating Officer for SCRUFFI (Society of Crafty, Rod wielding, Unreformable, Fly Fishermen Inc.). Jim was sorry to read of John Chronic's passing, and has fond memories of his advisor's incredible eye for finding Mississippian fossils in the Dakota Sandstone.

Leonard W. (Bill) Heiny (BA, '49) retired from the Conoco Minerals Department in 1983, and also did consulting work from 1983-89. He is presently Corresponding Secretary and board member for Clear Creek-Gilpen Metal Mining Assoc. You can find him volunteering as a guide at Dinosaur Ridge, and demonstrating gold panning at the Children's Water Festivals. Leonard also likes to take in the Thursday luncheons at the Denver Mining Club.

Warren H. Hill (CU, '60) retired in March, 1997, as Superintendent of Niobrara/Missouri National Scenic Rivers Office in O'Neill, NE. His 36-year career with the National Park Service included eight years as Superintendent of the Home of Franklin D. Roosevelt and Vanderbilt Mansion National Historic Sites in Hyde Park, NY. He also served as park ranger for Death Valley in CA, Great Sand Dunes in CO, and Grand Canyon National Park in AZ. He and his wife, Betty, have chosen Colorado Springs as their retirement home.

William L. Hiss (PhD, '75) is the Senior Vice President for Hambrecht & Quist LLC, an investment banking firm in San Francisco. His exciting life is balanced with intensive dance training; focusing on the Argentine Tango. In fact, he spent several weeks in Buenos Aires over the holidays studying the dance.

Marlowe D. Melvin (BA, Ohio State Univ.; graduate work at CU, '39) passed away November 29, 1996. He was an independent geologist and oil producer in the Tri-State area since 1951, and formerly worked for Carter Oil Co. He was a captain in the Anti-Tank Co., 379th Regiment, 95th Infantry

Division of Gen. Patton's Third Army in France and Germany in World War II. Marlowe and his wife, Ruth (Duffus), enjoyed traveling with their children, as well as creating stain glass windows, faceting gem stones and woodworking.

Elizabeth Nagy (BA, CU, '89; MS, Caltech, '91; PhD, Caltech, '97) completed her PhD in Geology from Caltech in June 1997, and is now doing post-doctoral research with Urs Schärer in Paris, France. (It's tough work, but someone has to do it!) Her research involves exploratory geochronology and isotope geochemistry of magmatic and metamorphic events in northern Vietnam. In addition, Elizabeth was awarded a "Chateaubriand Fellowship" from the French government for 1997-98.

Keene Swett (MS, CU, '62; PhD, Univ. of Edinburgh, '65) retired from teaching after thirty years with the University of Iowa Department of Geology. He is still involved with students, volunteering as a guide for field trips (and sometimes river trips) to the Colorado Plateau. Keene and his wife, Joan, spent last summer in Iceland and Scotland visiting friends and former colleagues at Edinburgh.

Barbara J. Tewksbury (BA, St. Lawrence Univ., '73; MS, CU, '78; PhD, CU, '81) is Chair for the Department of Geology, and the Stephen Harper Kirner Professor of Geology, at Hamilton College. Barbara was named the 1997 New York Professor of the Year. She has been a faculty member at Hamilton since 1978. Barbara is past president of the National Association of Geoscience Teachers, was part of the NAGT's Distinguished Speakers Series and received three Dwight D. Eisenhower Title IIA awards from the New York State Education Department. One of her most impressive accomplishments is a new introductory course "The Geology and Development of Modern Africa." The course is quite successful in attracting students of color to enroll in geoscience courses, and is generating significant interest among educators nationwide. Barbara and her husband, Dave, live with their daughter in Deansboro, three miles south of the Hamilton campus.

John Thvailkill (BA, CU, '53; MS, CU, '55; PhD, Princeton, '65) retired after twenty seven years at the University of Kentucky, as an Assistant, Associate and full Professor of Geology (hydrogeology) and

Department Chair. He and his wife, Lavine, stay busy doing volunteer work and playing tennis and golf. The highlight of 1997 for them was a cruise from Buenos Aires to Chile around the southern end of South America and through the Beagle Channel.

Don Freeman Tobin (BA, CU, '37; J.D., St. Mary's University, '43) is currently President for Rio Bravo Royalty Co. as well as President for South Texas Gas Co. He is former President for American Association of Petroleum Geologists (1993-94), and an Honorary Member of both the South Texas Geological Society and Gulf Coast Association of Geological Societies. Don also received AAPG's Distinguished Service Award.

Lyons Witten (BA, CU, '83; MS, UMass Amherst, '94) is currently the Hydrogeologist / Project Manager at Coler & Colantonio, Inc. in Amherst, MA. Efforts to build an Environmental Consulting Division with the company are paying off with continued growth and an increase in their client base. He and Laura Fitch (CU, ENVD, '82) have two boys, Eliot (4 1/2) and Thomas (1 1/2), who keep them quite busy. You can reach Lyons at Wm.Lyon.Witten@Coler-Colantonio.com.

Gail Van Hine Young (BA '53) came to the building dedication and here is what she wrote to us the next day. "Thank you for a wonderful, joyful day! What a building, what a celebration! What a treat to see what is in store for the geology students of the future! How could anyone see this facility and not want to come to CU! I graduated in 1953, the only female in that class (but not the first woman to graduate). It has given me great pleasure to see the number of women in the department rise to about 50%. The original building received its addition during my years there. I have a clear memory of the stone mason cutting the Lyons sandstone out in front. It was a special treat yesterday to see Warren Longley. He and Ted Walker are the only ones left from my era. Ted had just come to CU, and his sedimentation course gave me what I needed to work in the Denver Basin. Congratulations on a magnificent achievement!"

Alumni Support

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Attention Alumni

By completing and mailing in this form, you can help us do a better job of keeping up with you, your whereabouts, and your career or family news. We all enjoy reading about classmates and not-so-close-mates who survived Boulder in whatever era! So send us some news or some recollections—we promise to use them.

Name _____ Date _____

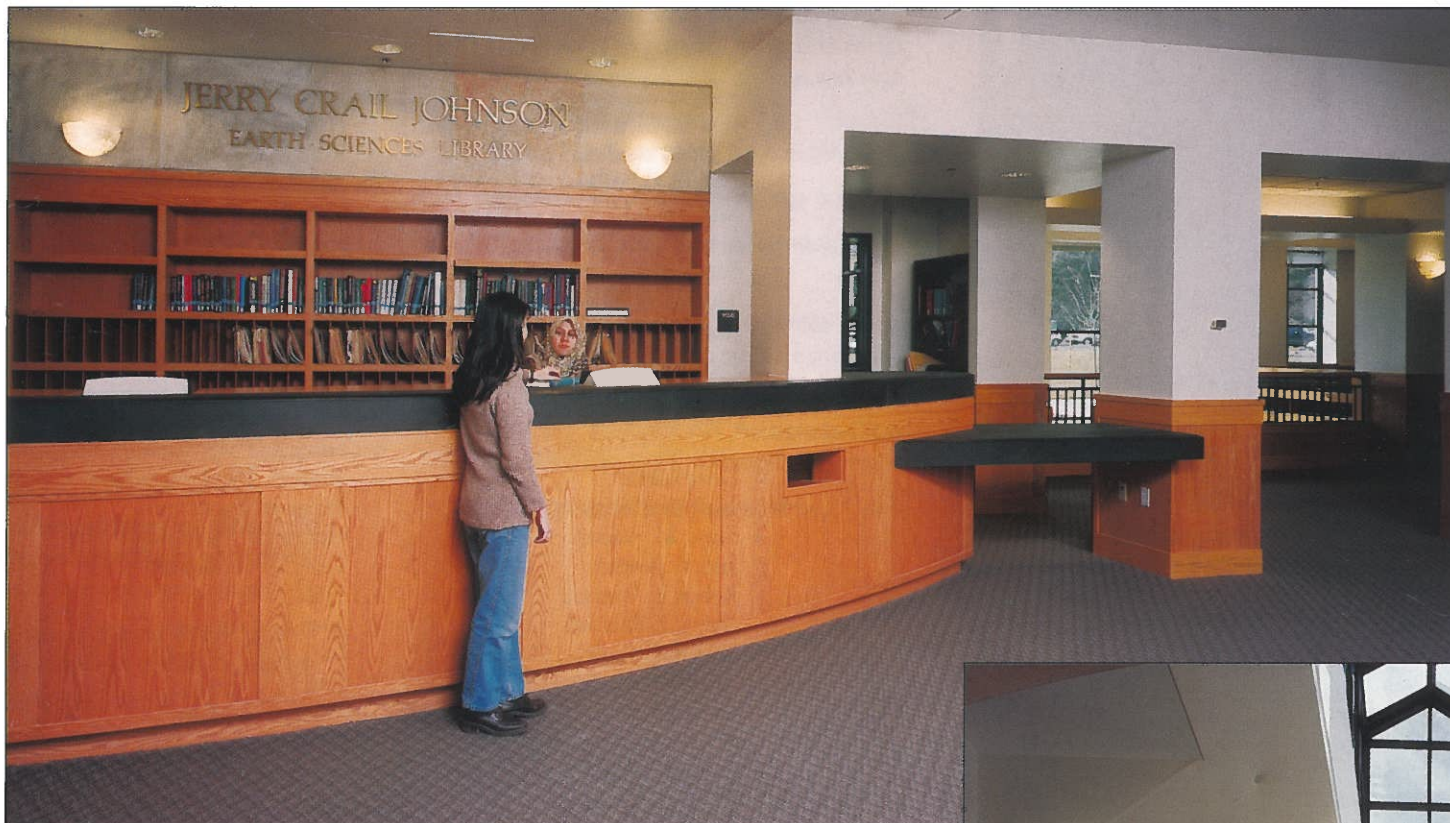
Address _____

Degree(s) (years and institutions) _____

Current Position/Employer _____

News About Yourself/Family/Friends _____

Comments _____



Below: The southwest entrance and the atrium. The Jerry Crail Johnson Earth Sciences Library is on the right and the Auditorium on the left (Photo courtesy of Thorney Lieberman.)

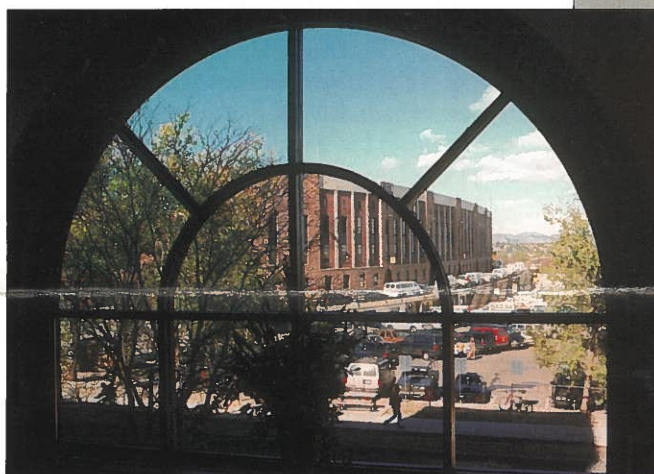
Inside the Jerry Crail Johnson Earth Sciences Library (Photo courtesy of Thorney Lieberman.)

from the Chair, cont.

ment for the graduate program one of our highest priorities for the University's upcoming Capital Campaign. Enrollment of undergraduates in our introductory courses continues to increase, and is now higher than at any time in at least the past 15 years. And with the new building, we are anticipating a continued increase in the number of majors. It is a future filled with exciting potential.

This is my last year as Department Chair. The past five years have been quite an experience for me. We received notice of approval for the new building only three months after I assumed the Chairmanship; I couldn't have asked for a greater opportunity. Lang Farmer, Suzanne Larsen and I, assisted by Pam Topping, learned more about the details of building construction than we ever thought possible. But through a team effort, we were able to mold the final product into a building that is distinctive, and designed to maximize our programmatic strengths.

I plan to be on sabbatical next year, spending most of my time in Australia where I am conducting field studies to evaluate long-term controls on the Australian summer monsoon, and the impact the first human immigrants may have had on vegetation, the marsupial megafauna, and ultimately on the monsoon itself. I will be based at the Australian National University in Canberra when I am not in the field. Stop by and say hello if you are passing through. And even if you only make it to Colorado, stop by and marvel at the Benson Earth Sciences Building. Pop in and chat with the faculty and students. It was all created through a partnership between you, our alumni, the University, and the State. Many thanks for your interest and assistance in the past, and in anticipation of an even stronger interaction with our alumni as we move into the next millennium.



The view from the second floor mezzanine looking north



A view of the atrium from the second floor mezzanine: what a gathering!

