

Geology News

Department of Geological Sciences ▲ University of Colorado at Boulder ▲ Spring 1993

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Runnells Retires

Late in the fall, Don Runnells (photo) was offered a position he could not refuse, that of president of Shepherd Miller, Inc., an environmental consulting firm based in Fort Collins. In fairly rapid order, he retired from the University, bought a house, and moved up the urban corridor.

Don arrived in Boulder in 1969, when he was lured away from the University of California, Santa Barbara. He has had an enormous impact on the directions taken in the Department. His courses in the general area of aqueous geochemistry were always well received, and engineering students recently have discovered them. His service to the Department and University has been excellent, and for the last several years he was Department chair. As chair, he defended our case for a new building, re-emphasized our teaching role in undergraduate education for both majors and nonmajors, spearheaded a study of future directions of the Department, and helped develop the hydrological sciences program on this campus, among other achievements.

The research he pursued was mainly in the field of environmental geochemistry. It was funded by a variety of governmental and private sources, and supported many students. He supervised a total of 48 students while here. In the early 1970s the group focused on the impact

of molybdenum mining on the environment in central Colorado. Late in the 1970s and into the early 1980s the emphasis shifted to the contamination of ground and surface waters by



Don Runnells, Chair 1990-1992.

uranium mining and milling, the mobility of trace elements in oil shale leachate, and the geochemistry of the water-sediment system of the Orinoco River, Venezuela. More recently, he, John Drexler, and three students have been working on the geochemistry of mine waste in Leadville, an EPA superfund site. Finally, he and graduate student Chuck Patterson have developed a method of using underground electrodes to clean up near-surface groundwater. Much of Don's research had a practical angle; hence, consultants were always eager for his input.

Don's service to the profession has been very broad. His contributions are too many to list, but they include membership on committees, journal editorial boards, councils, and workshops at the state, national, and international levels. Recently he served as president of the Association of Exploration Geochemists.

His departure leaves a huge gap in our program, one that we hope to fill before too long. On another front, however, how will Coach McCartney view this situation? Don and Erika have been fans of football all these years, and Coach Bill is losing one of his team's most devout fans. Will Don and Erika switch from the Buffs to the Rams? Stay tuned! In the meanwhile, we wish them the best in this new endeavor.

Interim Chair

Don Runnells' departure left the Department with a vacated chair. In situations like this, one tends to act globally and bring in somebody from overseas. It just happened that John Andrews was completing a sabbatical leave in Europe. He must have misread our FAX because he agreed to be the interim chair. John (photo) moved into the job as if he had never been out of it, and the Department is running smoothly.



John Andrews spun around and said, "Who me?" when we informed him he was the interim chair.

Advisory Board Meeting

Gene Shearer, chair of the Department Advisory Board, presided over the board meeting held November 6, 1992. What follows are some of the topics discussed.

1. There was broad discussion regarding the importance of continuing the undergraduate course in field geology, trying to get it offered in summers, and perhaps even adding a graduate course, such as Ted Walker used to offer.
2. Dean Chuck Middleton addressed the board on several issues. One that stands out is that the University is following a national trend in paying more attention to the teaching abilities of the faculty. The board received the dean's assurance that the hard rock-structural program

will not be diminished in light of past and future resignations and retirements.

3. The new building was discussed, and it was mentioned that \$4.3 million has been pledged toward the \$14 million building. When one realizes that 16 percent of the funding comes from the State of Colorado, this is actually a state-assisted school, and much of the money for the new building will have to be raised from private sources.

The meeting was followed by a social hour in Room 311. During the social hour the board meets informally with faculty, staff, and students. These are great opportunities for faculty to renew old acquaintances.

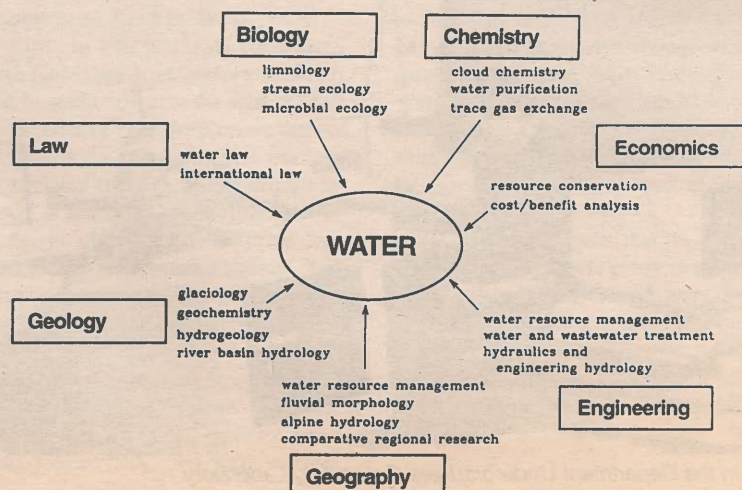
Miller New Chair


As we go to press, Giff Miller has been elected as the new chair. Giff is all rested up from a fruitful sabbatical leave in Australia (story elsewhere), so he should hit the ground running. Vice chairs will be Mary Kraus (Undergraduate Affairs) and Jim Munoz (Graduate Affairs).

Water Resources at CU

For years Don Runnells and others have been trying to add a faculty position in groundwater. This is a fast-growing field with many opportunities for research, teaching, consulting, etc. We soon will hire a hydrogeologist (see article elsewhere) who will complement the hydrological interests of Vijay Gupta, David Budd, Mark Meier, and others. We can thank Don for helping us get this position as well as for helping put together a campus-wide graduate program in water resources.

The water resources program combines many disciplines at CU (see figure). Various departments, colleges, schools, institutes, centers, the museum, and government agencies (such as USGS) are working together to offer a full complement of faculty and courses. We are confident that this will evolve into an excellent program, so please spread the word, especially to potential students.



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National Ice Core Laboratory

New CU-NSF-USGS joint laboratory facilitates paleoclimate research

Cores from polar ice caps and ice sheets are providing exciting new insights into how the Earth's climate system functions. In contrast to tree rings, ocean sediment cores, and similar sources of paleoclimate and paleoenvironmental data, polar ice contains detailed records of precipitation, air temperature, air chemistry, fallout from sources ranging from cosmic through volcanic to anthropogenic, and even samples of ancient atmosphere. Furthermore, cores from the right locations have very high time resolution: In cores obtained by the new Greenland Ice Sheet Program (GISP2), individual annual layers can be counted back more than 40,000 years.

Major changes in carbon dioxide, methane, and other gases trapped in ice have recently been shown to have occurred before and after ice ages and at other times of rapid climate

change. Perhaps most surprising is the fact that some of these major changes in climate can be seen to have occurred in time intervals as short as 1-3 years! Through analyses of ice cores, the history of greenhouse gas concentrations can be traced and their relation to the growth of population and industrialization clearly defined. These are just a few of the results that are just now coming to light. This new knowledge will have important implications to our understanding of atmospheric and oceanic circulation, will be essential for the testing of general circulation models, and will be useful in predicting the future course of greenhouse warming and other aspects of our changing Earth system.

Because of the increasing interest in ice core research, the National Science Foundation, the University of Colorado, and the U.S. Geological

Survey have created the National Ice Core Laboratory (NICL). This facility consists of 50,600 cubic feet of storage space maintained at -35°C , a laboratory area at -20°C with a clean room and necessary instruments and equipment, and other areas for controlling the temperature and humidity as people or ice core move in and out.

NICL is a building within a larger building, the USGS Core Research Center, which is the largest core-handling facility in the nation. The first ice core material was moved into the new facility on January 28, 1993, and the first use of the facility by visiting scientists was on February 17, 1993.

Mark Meier and Tad Pfeffer, professor and assistant professor, attendant rank, in the Department and of INSTAAR, are director and scientific coordinator of NICL, respectively.

Joan Fitzpatrick of the Branch of Sedimentary Processes, USGS, is technical director. Gene Gay, of the USGS Core Research Center, is curator. As chair of the Ice Core Working Group and an active researcher in this field, Jim White, of the Department and INSTAAR, will also be involved in the interface between NICL and the national and international ice core science community. This facility will create new opportunities for research and graduate education in the Boulder-Denver area.

What's New in the Earth Sciences Library

by Suzanne Larsen
Head, Earth Sciences Library

The name of the library in the Geology Building is, appropriately, the Earth Sciences Library. This name suggests both the interdisciplinary nature of the sciences dealing with the Earth and the collection in the library. The earth sciences are playing a critical role in the increased public and academic interest in environmental concerns from groundwater quality to global climate change. As an example, new journals added to the Earth Sciences Library last year are indicative of both the traditional geological and evolving environmental aspects of the earth sciences. They include *Coral Reefs*, *Fossils and Strata*, *Geographie Physique et Quaternaire*, *Geomicrobiology Journal*, *Journal of Coastal Research*, *Journal of Micropaleontology*, *Journal of Paleolimnology*, and *Meteoritics*. The University of Colorado is one of the few major academic institutions in the country, public or private, that has not had to make major cuts in its journal subscriptions over the past few years. Since 1988, we have added close to two dozen

new titles. In this time of difficult budgetary decisions, this is indicative of the strong support of the libraries by the University administration.

Our monographic collection continues to be greatly enhanced by the ongoing gift from the Crail-Johnson Foundation. The Foundation has also provided support to expand information access through CD-ROM, on-line databases, and equipment. The Earth Sciences Library is extremely fortunate, and to some extent unique in the world of earth science libraries, to have such strong institutional and private support.

Unfortunately, the growth of the collection in this manner has only served to speed the inevitable: overcrowding on the shelves and an increasing percentage of the library collection being put into storage. At this point, close to 30 percent of the collection is in the basement of Norlin Library. Currently the material is readily accessible, but this may soon not be the case since that area will be full by mid-1993

and the prospect of remote, possibly off-campus, storage is in the very near future.

An expanded Earth Sciences Library is an integral part of the proposed Geological Sciences Building. With the use of a compact shelving system, it is anticipated that the entire collection could once again be put under one roof—with room to grow! The proposed library would almost double the seating available, provide group study and instruction rooms, and allow better information access via electronic workstations.

While we look forward to the proposed Earth Sciences Library, we are still dedicated to providing the best information access and collection we possibly can. The University of Colorado Libraries are open not only to those associated with the University but to all citizens of Colorado. If you are a resident of Colorado, you may obtain a borrower's card at no cost. Call Norlin Library at 492-7477 for information.

Petroleum Geology Seminar

At the Petroleum Geology Seminar, under the direction of Jack Edwards, special guest lecturers gave 1-day short courses in their areas of expertise. On February 5, 1993, John Gustavson, of Gustavson Associates in Boulder, presented an all-day course entitled *Appraisal of Oil and Gas Properties*. Fifteen students and 30 Denver industry members, who donated \$50 each to EMARC, attended. An additional course on economic evaluation by Sidney Moran, a new member of the Department Advisory Board, was presented jointly with the RMAG in Denver on March 17-18, 1993. Other leading-edge topics in petroleum geology were covered in special 1-day courses. These included *Petroleum Geochemistry*, *3-D Seismic*, *Horizontal Drilling*, and *Reservoir Geology of Beri Field*, a Saudi Arabian giant. The final class project, "The Stratigraphic Occurrence of Source Rocks," will cover 25 basins worldwide, with each student presenting his or her research on one or two basins. The intent is for the class to edit, assemble, and offer these basin analyses for publication by the AAPG.

Undergraduate Computing Laboratory

Many of you will recall a dark room in the basement where Chris Harrison taught the laboratory for geophysics. Later it became Bill Braddock's office. Now we have moved Bill to the side and created the Department Undergraduate Computing Laboratory (photo).

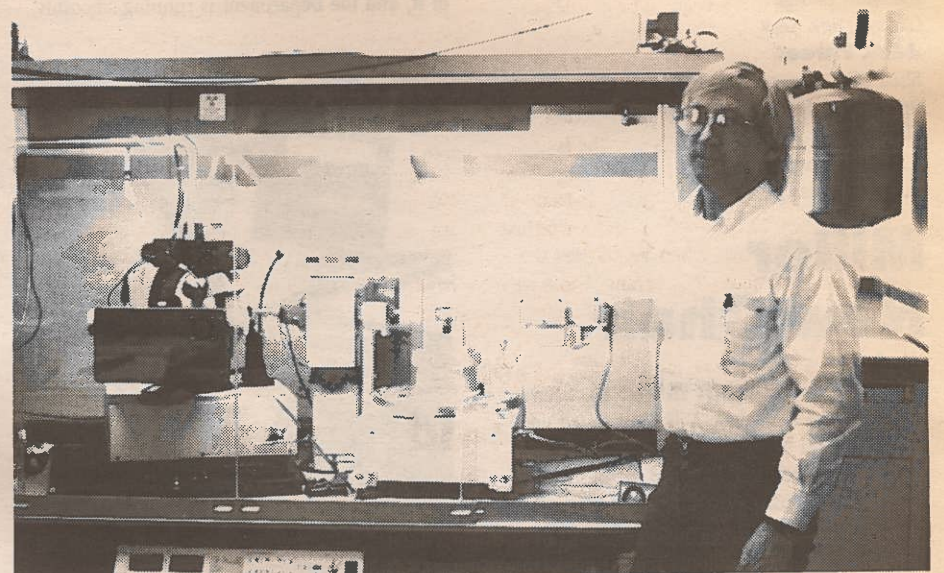
Bill Braddock was instrumental in getting this lab going. With funds from both the Department and College, and equipment Bill already had at hand, we now have a first-rate facility. Maintained by the University Comput-

ing and Networking Services, there are six workstations on local area network, connected to ETHERNET, and an excellent collection of graphics and computation software.

A course entitled *Computer Techniques in the Geological Sciences* is taught by Bill in the laboratory. This is one way in which students can satisfy the College computer literacy requirement. In addition, other professors bring students into the laboratory to work on class projects.



Students in the Department Undergraduate Computing Laboratory.



Joe Smyth showing off his new X-ray equipment.

New Mineralogy Laboratory

With capital funding grants of \$160,400 from the National Science Foundation, and \$15,000 from the Department of Energy, plus matching funds from various University sources, including the Department of Geological Sciences, CIRES, the Department of Physics, the College of Arts and Sciences, and the Graduate School, Joe Smyth has acquired a new state-of-the-art mineral structures laboratory for the Department. The new facilities, which have been installed in Room 334, include a Siemens 18KW rotating anode X-ray generator, an automated single-crystal X-ray diffraction goniometer equipped for high and low temperature studies, and an automated powder diffractometer equipped for

characterization of very small crystals (micro-diffractometer) and studies of minerals at high pressures in the diamond anvil cell (photo). The systems include two 386 PC computers to control the experiments and two Silicon Graphics IRIS UNIX-based workstations for data reduction. In addition, there is a new 3KW X-ray generator, a new automation package, and a pair of miniature diamond anvil cells for our existing single-crystal diffractometer. There are now four PC computers, two SG IRIS workstations, and an existing IBM 6000-series workstation, forming a local area network that is connected to the campus Ethernet.

Some Recollections of University Camp

a Contribution by Franklin Folsom

About 1922, when I was 15, I was hired by the Recreation Department of the University to be a camp helper at University Camp (photo). I had to get up early in the morning, sometimes about 4 a.m., to start the fires in the cook-stove. I had to split wood, peel potatoes, help around the kitchen, and wash dishes. The volume of dishes varied greatly from day to day, depending on the size of the parties that came into camp. One day the Chamber of Commerce organized a huge hike up Arapaho. The hikers were bussed from University Camp to Rainbow Lakes. From there they hiked up over Baldy to the Saddle and South Peak. The crowd was large. The result was that I washed dishes from 4 a.m. until midnight! This experience no doubt had something to do with my decision to follow some line of work other than dishwashing for my career.

I increased my knowledge of the area in the summer of 1923 when I worked in the Geology Camp adjoining the University Camp. With others I went up before the camp opened and helped clean the big cabin where the students took their meals. To our astonishment, none of the knives, forks, or spoons were where they had been left the preceding fall. We found most of the small utensils on the second floor in pack rat nests. The place had been taken over by the critters. I remember battling with one, using a piece of stove wood as a weapon. I won the battle, but I did not relish my victory when I beheld the bloody mess I had made in one of the cupboards in the kitchen. In the Geology Camp, my immediate boss was Frances "Peg" Thompson, daughter of "Pop" Thompson, who had established the first University Camp closer to Silver Lake.

Dean McCourt, director of the Geology Camp, led hikes all over the area, and I was *allowed to go along*. I also attended all the lectures at night around the campfire, and before I left high school I had picked up as much knowledge of geology as most college students get from an introductory geology course.

My knowledge of the area got me a promotion from camp helper to assistant guide. For several summers while in college, I helped guide Recreation Department parties. Sometimes they went up to Arapaho over Baldy, sometimes they went up Fourth of July Canyon. We also climbed Navajo, Albion, Audubon, and other points among the Indian Peaks.

Charles Hutchinson, professor in the Engineering School, was recreation director during one or two of the summers when I guided, and A. Gayle Waldrop, a teacher in the Journalism Department, was in charge during other summers (Gayle's son, Harry, was a graduate of our Department). Waldrop was so deeply attached to University Camp that when he married the artist Gwendolyn Meux, they arranged to have



The dining hall at Science Lodge, or Geology Camp, now part of the Mountain Research Station. Constructed in 1920, this building is still in use. Adjacent to it is the John Marr Alpine Laboratory and the Kiowa Environmental Chemistry Laboratory. The Tundra Laboratory was recently constructed on Niwot Ridge at the saddle.

the wedding at the camp, outdoors. They sent out invitations for the wedding that were beautifully lettered by Gwen on sheets of aspen bark.

On one trip from University Camp to Arapaho via Rainbow Lakes, we had about 100 hikers. At the saddle, the party divided. Warren Gilbert took half of the people back over Baldy to Rainbow Lakes. I, with Rachel Gilbert as an assistant, took the other half of the party up over the South Peak and on to the North Peak of Arapaho. On the ridge between the south and north peaks, a Miss Stonebreaker sprained her ankle. The distance was just as far back to help as it was forward, so we kept on going to North Peak. From there the route went down over what we called Henderson Glacier and on down to Silver Lake where the busses would meet us. At the top of Henderson Glacier, I got a big husky fellow to help the hikers scramble down onto the snow. I planned to have the hikers slide down Henderson Glacier (which I've since learned is not a true glacier). Before we got well started, the big fellow gave a yelp and ran, slid, and tumbled down the big snowbank. I had to find out what was wrong with

him. Leaving the party in Rachel's charge, I slid down the snowbank, standing up ski fashion. At the bottom I found the big fellow sitting in the snow and sobbing. By way of explanation, he took off his hat, which was a kind of hard hat, and put my finger on his scalp. There was a soft place there — no bone. At the top of the snowbank a hiker had kicked loose a small rock that had struck his hard hat. The vibrations had reached his brain and disoriented him. He didn't really know what he had done. It seemed to me that he was in no immediate danger. I got him on the rocks, climbed up to the top of the snowbank, and directed the hikers how best to slide down while sitting in the snow. Then I had the problem of getting Miss Stonebreaker down. I sat her down and sat in front of her with her legs around me. I held the injured leg up above the snow. Then down we went with Miss Stonebreaker's oilskin raincoat doing excellent service as a sled. At one point Miss Stonebreaker got frightened, kicked her good leg into the snow, and we pivoted around. Now we were going head first, face up, speeding along with only my heels and elbows serving as brakes!

Just when Miss Stonebreaker was due to crash into the rocks at the bottom, Warren Gilbert dove into us and saved our lives, or at least saved the life of Miss Stonebreaker.

If you are interested in what effects life in University Camp and Geology Camp had on one teenager, I can report that imagery from the area turned up many years later in books written for young readers. I did a series of mystery adventure novels published by Whitman of Racine, Wisconsin, and distributed in the dime stores. Several of these yarns drew heavily on events that occurred in the beautiful area where scientists now conduct research.

Franklin graduated from CU, went on to Oxford University as a Rhodes Scholar, and is a writer. He gained much local publicity in 1986 by walking from Los Angeles to Washington, D.C., on the Great Peace March, which advocated nuclear disarmament. Folsom Field is named after his father, a former football coach and law professor.

Faculty and Staff Establish New Endowed Fund for Undergraduates

Faculty and staff of the Department have entered into an agreement with the University of Colorado Foundation to establish the Geological Sciences Undergraduate Enrichment Fund. Earnings from this newly endowed fund will be used to benefit undergraduate programs and the undergraduate experience. Examples of how the proceeds from the fund might be used include:

- support of undergraduate independent study or Honors thesis projects
- support of the Geology Club
- expenses for special field trips
- registration fees for geology/geophysics majors at scientific meetings
- acquisition of teaching equipment and special teaching aids

Actual spending priorities will be determined by our chair in consultation with the executive committee. This fund is intended to complement the existing endowed funds, which are primarily

targeted to scholarships for our most outstanding students.

The establishment of this new endowed fund is part of a greater University-wide fund-raising effort within the faculty and staff. Faculty and staff of the Department have made pledges to the fund, and these gifts will be matched (\$.50 on each dollar) by the dean of the College of Arts and Sciences. The dean's matching funds come from gifts made by alumni and friends of the University in support of the College of Arts and Sciences. In this way, the dean hopes to help those academic units that are willing to help themselves. Gifts by the faculty and staff will be matched for a 5-year period, and the fund will become effective once it totals \$10,000. The ultimate goal is an endowment of at least \$50,000. Gifts from alumni and friends to the Undergraduate Enrichment Fund are also welcome, but they are not subject to the matching incentives from the dean.

Heinrich Layers: University of Colorado Research Connection

Based on studies of changes in the isotopic composition of foraminifera, we have known that substantial changes in the Earth's climate system appear to be forced by Milankovitch orbital changes. In 1988 a German researcher, H. Heinrich (published in *Quaternary Research*), noted that in marine cores to the west of Spain there was a series of very sharp events denoted by an increase in the coarse sediment fraction (medium sand and coarser) and a reduction in the numbers of near-surface planktonic foraminifera. Several of these events occurred during the last glaciation. Heinrich suggested they represented periods of intense iceberg rafting. W. Broecker and his colleague Gerard Bond, from the Lamont Geological Observatory, took up the investigation from cores across the North Atlantic between 45° and 50° N. At the same time John Andrews and a graduate student, Kathy Tedesco (M.S., '93), were working

on cores from the NW Labrador Sea at sites close to the margin of the Laurentide Ice Sheet. By radiocarbon dating small (2–4 mg) samples of foraminifera they were able to show that at ca. 14 and 20 ka massive amounts of detrital carbonate sediments, derived from glacial erosion of Hudson Strait and Hudson Bay, were shed into the Labrador Sea. These two events were coeval with Heinrich layers 1 and 2 in the eastern North Atlantic, west of Spain, between 45° and 50° N.

This research suggests that the North American ice sheet was prone to repeated surges/collapses every 10,000 years or so. This presents a radically different picture of the long-term stability of large continental ice sheets. If you want to read more of John and Kathy's involvement in this, consult both *Nature* (Nov. '92) and *Geology* (Dec. '92).

1992-1993 EMARC Lectures

The EMARC Lecture Program continued with these presentations. Alumni are welcome to attend.

Li DeSheng, Oil Minister, People's Republic of China: "Tectonic Classification of Petroleum Basins, China"

William Muehlberger, University of Texas, AAPG Distinguished Lecture: "Tectonics of North America—Some Unsolved Problems"

John Gustavson, Gustavson & Associates: "Appraisal of Oil and Gas Properties"

Steve Boyer, University of Washington, AAPG Distinguished Lecture: "Sequence of Deformation and Structural Variation Within Thrust Belts: Implications for Mechanical Models and Hydrocarbon Exploration"

J.T. Smith, Shell Oil, retired: "Petroleum Geochemistry: Maturation, Expulsion, and Migration"

Wendy Harrison, Colorado School of Mines, AAPG Distinguished Lecture: "Paleohydrology of the Gulf of Mexico Basin"

Randy Ray, Consulting Geologist: "3-D Seismic Interpretation: An Overview"

Sid Moran, Shell Oil, retired: "Evaluation of Settled Oil and Gas Properties, and of Exploratory Ventures"

Peter Flemings, Penn State University: "Modeling Stratigraphic Sequence in Foreland Basins"

Bill Ross, Marathon Oil: "Deep-Water Sand Distribution as a Function of Basin-Fill Geometry: An Empirical Relationship for Quantitative Stratigraphic Modeling"

Ru Smith, Royal Dutch/Shell: "3-D Seismic Interpretation of the Forties Field, North Sea"

Ross Clark, Canadian Hunter: "Horizontal Drilling in Exploration and Production"

Shea Penland, Louisiana State University, AAPG Distinguished Lecture: "New Environmental Geoscience Frontiers: Coastal Geology, Oil Spills, and Coastal Land Loss"

Mark Rowan, EMARC: "Extensional Tectonics and Basin Subsidence—North Sea"

Jim Markello, Mobil: "Reservoir Geology of the Super-Giant Beri Field, Saudi Arabia"

Robert Winn, Marathon Oil: "Results of Coring Program in Late Quaternary Outer Shelf and Slope Deposits, Northern Gulf of Mexico"

Gregory Ulmishek, USGS—Denver: "Petroleum Geology of the CIS (former Soviet Union)"

Steve Greenlee, Exxon Production Research: "Sequence Stratigraphy in Reservoir Development of Cretaceous Strata, Abu Dhabi"

Robert Mitchum, Consultant: "Recognition of High Frequency Cyclicity in Siliciclastic Sequence Stratigraphy"

Ray Buchanan, Royal Dutch/Shell, AAPG Distinguished Lecture: "Ocean Cycles and Cordilleran Ores: A 3-D Seismic Application of New Technology to Oil Field Development"

Roger Anderson, Lamont-Doherty: "Tracking Active Fluid-Flow in Sedimentary Basins: Example from the Gulf of Mexico"

John Sangree, Consultant, SEG Distinguished Lecture: "Integrated Exploration and Sequence Stratigraphy"

Charles Kerans, Bureau of Economic Geology: "Characterization of Carbonate Ramp Reservoirs Within a Sequence Stratigraphic Framework, San Andres Formation, Permian Basin, New Mexico"

1992-1993 Colloquium Talks

Our successful colloquium series continued with the following presentations at 4:00 p.m. on Wednesdays. Please join us if you are in town, or call for a schedule.

Peter Huntoon, University of Wyoming: "Chairman Mao, the Great Leap Forward, and the Deforestation Ecological Disaster in South China"

Tom Wildeman, Colorado School of Mines: "Engineered Wetlands Technology for Control of Acid Mine Drainage"

Jonathan Overpeck, NOAA, Boulder: "Assessing Future Climate and Vegetation Changes: The Past As a Key to the Future"

Jim Smith, USGS, Water Resources Branch: "Toward Developing an Understanding of Flow and Sediment Transport Mechanics Suitable for Environmental Interpretation and Reconstruction"

Gordon Eaton, Director, Lamont-Doherty Geological Observatory: "Significant Constraints Between Southern and Middle Northern Rocky Mountains"

Susan Kidwell, University of Chicago: "Applications of Skeletal Concentrations to Stratigraphic Analysis"

Anne Jennings, INSTAAR: "High Latitude Benthic Foraminifera: Applications to Paleoenvironmental and Paleo-Environmental Research"

John Pallister, USGS, Denver: "A Basalt Trigger for the 1991 Eruptions of Pinatubo Volcano"

Michael Ritzwoller, Department of Physics, University of Colorado: "Problems in Global Seismology"

David Fountain, University of Wyoming: "The Granulite-Eclogite Transition: A New View"

Jane Silverstone, CU Boulder: "Fluid Migration in Subduction Zones: Inferences from High Pressure Metamorphic Rocks"

Gerald Schaber, USGS, Flagstaff: "The 'Remarkable' Impact Cratering Record on Venus: What Are We Learning from Magellan?"

Julie Cole, INSTAAR: "Reconstructing Tropical Climate Change from the Geochemistry of Long-Lived Corals"

William Hay, CU Boulder: "Results of a New Climate Model for Triassic Pangea"

William Muehlberger, University of Texas: "Studying Earth from the Perspective of the Space Shuttle"

Allen Glazner, University of North Carolina: "Origin of Isotopic Variations in Continental Basalts"

Darby Dyer, University of Oregon: "Crystal Chemistry of Micas: A Very Flaky Problem"

Roger Clark and Greg Swayze, USGS, Denver: "Mineral Mapping at Cuprite, Nevada, and Geological Mapping at Canyonlands and Arches National Parks Using Imaging Spectroscopy"

Giff Miller, CU Boulder: "Drought in the Outback: Climate Forcing of the Australian Megalakes"

Spencer Titley, University of Arizona: "Ocean Cycles and Cordilleran Ores: An Unconventional View"

Gary Axon, CICESE, Mexico: "High Fluid Pressure: A Mechanism for Frictional Slip on Low-Angle Normal Faults and for Their Propagation into the Brittle Crust"

Musical Chairs in the Office

How often can a chairman leave and the office remain running without skipping a beat? Not often, except when Edith Ellis (photo) runs the show. Edith maintains the usual smooth operations. Mark Bishop is the accountant and will accept ski-waxing tips from anyone. Gloria Figueroa-Timmons has replaced Kris White and handles grad student administrative needs and coordinates the add/drop madness each semester. Sandra Swanson is in Kay Fox's position



Busy times in the office. From left to right, Edith Ellis, Gloria Figueroa-Timmons, and Sandra Swanson.

and keeps her hands full processing graduate applications and performing various other administrative duties. Jennifer Gelvin (photo) has been the "go-fer" person for 2 years now. She sports a good tan from the flashing light of the photocopy machine. Finally, down the hall is Colleen Velie (photo), the secretary of EMARC.



Colleen Velie, running the show at EMARC.

Annual Fall Picnic and Field Trips

The annual fall picnic and field trip has become a tradition and has served for several years as a good start for the new academic year. Returning faculty, staff, and students get reacquainted and meet the newcomers. Last year, the Student Union Food Services again did an outstanding job in feeding about 100 hungry mouths. Loads of stories were told and friendships made and refreshed around the campfire until late at night. The foreign members of the group were introduced to the sticky custom of marshmallow roasting. Many camped and were ready for the early departure of the Saturday field trip into the Precambrian geology and volcanic rocks of the Front Range, lead by Professors Ed Larson and Bill Braddock.

Chuck Patterson, a senior graduate student, led the Sunday field trip on a study of environmental concerns and what is and has been done about them.

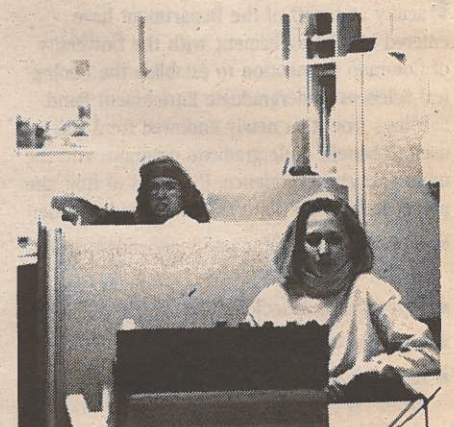
This year we plan again to use the Kelly-Dahl campground between Nederland and Rollinsville for the picnic and camping. We encourage our alumni and emiriti and other friends of the Department to join us on the weekend after Labor Day for the picnic and field trips. Professor Erle Kauffman has indicated that we might have one field trip concentrating on the depositional environments in this area of Colorado. The plans are not firm yet, and we ask you to contact Edith Ellis at the Department for details.



Look who came to one of the parties for graduating seniors! From left to right: Jim Munoz, Mark Bishop (Department accountant, running and skiing coach), Kris White (secretary emeritus), Bill Braddock (in his usual pose), and Edith Ellis.



Jennifer Gelvin sending out mail to the alumni.



We obtained funds from the main library to revamp the circulation office of the Earth Sciences Library. Many of you will recognize Terrie Seeley at the back desk. Shannan Cody is ready to check out books from the front desk.

Geology Club Activities for 1992

The Geology Club is a semi-formal association of graduate students in the Geological Sciences. The purpose of the club is to provide a social setting in which people of similar academic interests may interact with one another. Activities include picnics, ski trips, volleyball, and bi-weekly get-togethers know as "Friday Afternoon Club." At these FAC meetings, slide shows of trips or practice talks for scientific meetings are the keynote events and occur prior to socializing. Faculty, staff, and undergraduate students are welcome at all events, as are the various significant others, children, and dogs of the graduate students.

In the '91-'92 school year, several enjoyable activities were conducted by the Geology Club. A mineral collecting trip led by Chuck Patterson (photo) to the Mica Lode pegmatite



Chuck Patterson, Ph.D. student of Don Runnells and long-time president of the Geology Club, on location sampling wells in eastern Colorado.

mine yielded many fine beryl, mica, and graphic granite specimens. The yearly ski trip to Loveland Basin Ski Area had a good turnout and, as usual, superb snow conditions. The picnic/barbecue at Chautauqua Park hosted by the club and financed in part by a donation from AMOCO Production Company was a whopping success. There was a turnout of over 80 people who, according to rumor, all had a great time. An award was presented to Suzanne Larsen (photo), the earth science librarian, for her great efforts to help students and keep the library running so well. It is rare at the University to find someone whose motto seems to be "What can I do to make your job easier"!



Suzanne Larson ready to help the next person.

Undergraduate Geology Club

The undergraduate students have organized themselves for various geo-social matters. Last fall they went to the Denver Gem and Mineral Show, were taken on a backstage tour of the fossil laboratory at the Natural History Museum in Denver, and saw the *Ring of Fire* movie at the IMAX Theater. Graduate student Jeff Swope is their unofficial advisor and took them on a field trip to the Green Mountain diatreme. They anticipate more field trips this spring.

Students from Overseas

We have quite a few students from overseas in the Department. Here is information on a selected few of them.

Li Xiao-Ming (photo) is from Tianjin, PRC, a coastal town where Vance Holliday's father spent some time while on duty in the U.S. Army in the late 1920s (photo elsewhere in newsletter). Xiao-Ming is here to study for the Ph.D. with Joe Smyth. He earned his M.S. degree at Peking University and then worked in applying stable isotopes to a variety of problems in geology, hydrology, and atmospheric sciences. His wife just joined him, so he will become a part-time English teacher.

Tomas Villamll is a student from Colombia working with Erle Kauffman on Cretaceous stratigraphy and paleobiology of Colombia and Venezuela. Last summer this topic took him to Tunisia, where he reports that the customs officers on entering the country were a bit suspicious of him and that the fieldwork conditions were hot! He just got married, and his wife, Claudia, will begin a graduate degree with a thesis advised by Don Eicher.

Dilci Rosetti is here from Brazil working under the direction of Mary Kraus. An award from the Walker Van Roper Fund (Museum) will help defray her dissertation expenses. For the past 6 years she has been working in the Amazon region of Brazil. She tells us that when you undertake fieldwork there you have to consider working under such conditions as tropical diseases (malaria, yellow fever, cholera), high temperatures (95° F), high humidity, bugs, muddy roads and trails, etc. These, plus the rain forest and the fact that the area is so extensive, are the reasons given for the area not being better-known geologically (photos). These are more than compensated for by the positive aspects of working there: exotic terrain and vegetation, working in places seldom visited, and being able to do the original work for a patch of the globe. She returns to Amazonia for 3 months this coming summer, and although excited about the work, she will remember fondly the snowy and icy days we have been having in Boulder this winter.

Samson Tesfaye (photo) hails from Ethiopia and comes here after having made contact with Roger Bilham and Michael Jackson (the one who doesn't sing). Samson lived most of his life in Addis Ababa and graduated in geology from the university of the same name. Since then he has been employed by the Ethiopian Institute of Geological Surveys (EIGS). He has worked on a variety of mineral exploration projects, and when EIGS wanted to get involved in remote sensing, Samson went to learn these methods at the University of Dundee, Scotland, where he earned the M.S. degree. Now he is involved in regional geological mapping using a variety of images. For his dissertation he will work with Roger and focus on tectonic and natural hazards (earthquakes and volcanic activity) in the spectacular Ethiopian Rift Valley.

Natasha Vidic (photo) came here from Yugoslavia and will return to Slovenia. She is working on her Ph.D. under the direction of Pete Birkeland. The topic is the morphology, geochemistry, and thin-section analysis of a chronosequence of river-terrace soils, Sava River. When finished, she will return to a position at Edvard Kardelj University, Ljubljana.



Natasha Vidic working out the mineralogy of silts for Slovenian soils.



Two scenes along the Rio Acre, headwaters of the Amazon River in Brazil, where Dilci Rosetti works in the field. Check out the double tent; when it rains it must really pour!



Samson Tesfaye studying the volcanic rocks near Arba Minch, southern Ethiopian Rift Valley.



Li Xiao-Ming learning how to run the instruments in Joe Smyth's laboratory.

Ph.D. Language Requirement

Many of the alums, when students here, struggled with various foreign language examinations. For some, this took up more time than did geology courses. After trying several revisions of the examination, the faculty voted to discontinue this requirement. The last person to take the exam will get a free vacation to a country where that language is used. The money for this will come from all former students who were required to pass the exam—we will take your money at any time.

Recent Field Research Areas

Students, former students, and faculty have worked in some unusual areas. Here is a pictorial sampling of some of those areas.



Volcanoes, glaciers, offshore sediments, Antarctica.



Effect of El Niño on hyperarid Peruvian Coast.



Geomorphic history, Negev Desert.



Sedimentology and ore deposits, Baja California.



Quaternary history, Mt. Washington.

Igneous, metamorphic, and Quaternary geology, Rocky Mountains.



Ore deposits and Quaternary history, Andes.



Bedrock and surficial geology, Northwest Territories.



Seismic stratigraphic outcrop, bottom of Gulf of Mexico.

GEOLOGY NEWS



Mt. St. Helens, pre- (here) and post-eruption.



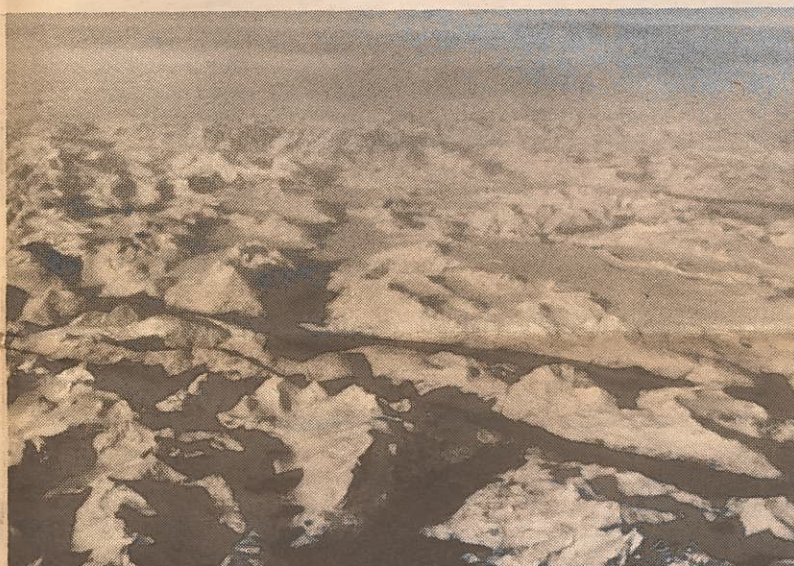
Prediction of Mt. Pinatubo eruption.



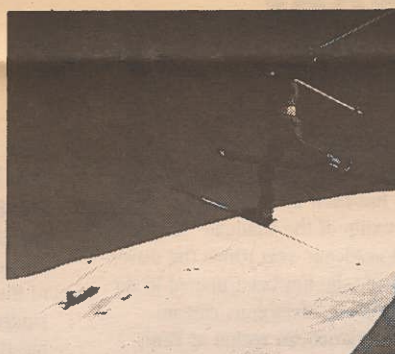
History of the High Plains.



Sequence stratigraphy, Western Interior.



Greenland ice sheet (distance) and offshore sediments.



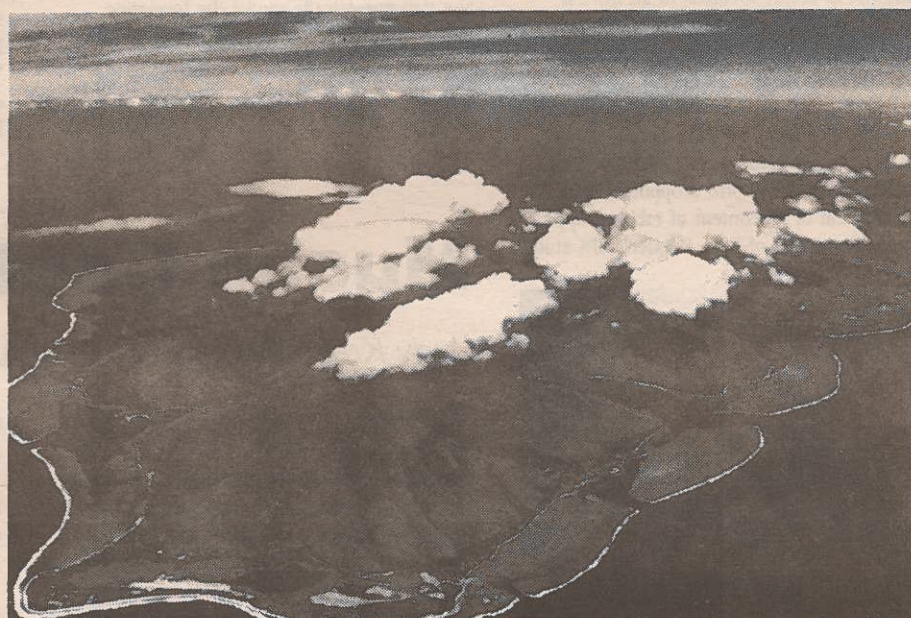
Is this Ted Walker?



Western U.S. neotectonics.



Rate of uplift, Mt. Everest region.



Coral reefs, modern and ancient, this being Moorea.

Students Lead Field Conference

Two students will be co-leaders of the fall 1993 Friends of the Pleistocene (FOP), Rocky Mountain Cell, Field Conference. They are Ralph Klinger and Dan Levish. Both work for the Bureau of Reclamation in Denver, where their basic mission is to undertake neotectonic studies of dams across the western United States. Former students Larry Anderson, Fred Hawkins, and Lucy Piety also are part of the Bureau neotectonic group. The field conference will take place in Mission Valley, Montana, where the Cordilleran Ice Sheet and alpine glaciers of the Mission Range calved into Glacial Lake Missoula. The focus of the trip will be the ice-lake interactions, determining the history of glaciations in the area as well as the lake emptyings, and neotectonic activity. The history of this area is crucial, as it should help date the gigantic floods that swept across eastern Washington to carve the channeled scablands as the lake emptied in a catastrophic fashion. The floods were the topic of Vic Baker's dissertation in 1971.

CU commonly has a large contingent of present and former students at the annual FOPs (photo).

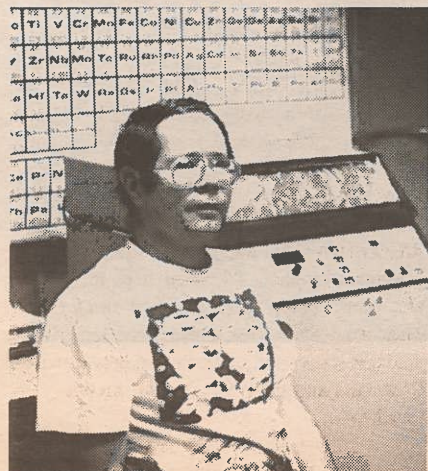


CU students (present and former) pose for class photo at a recent FOP field conference in Yellowstone National Park. From left to right: the rear half of Freeway, Al Werner's dog, Charlene Locke (Geography), Pete Birkeland, unknown, Scott Lundstrom, Al Werner, Aslaug Geirsdottir, Eric Leonard, Emily Taylor, Bud Burke, Fred Hawkins, Mary Gillam, Keith Hadley (Geography), Margaret Berry, Lucy Piety, Vance Holliday, Marith Reheis, Don Rodbell, Bruce Stover, Bill Locke (co-leader), and Gerry Richmond (co-leader). Gerry was the first Ph.D. student in Quaternary studies from the Department. His dissertation was on the Quaternary history of the La Sal Mountains of Utah.

Fred Luiszer and the Analytical Laboratory

If you want to be impressed with our old building, stop in at the Analytical Laboratory on the first floor, which is under the direction of John Drexler. It houses the microprobe, ion chromatograph, scanning electron microscope, X-ray fluorescence, image analysis system, cathodoluminescence, wet chemistry lab, and a bank of computers. What makes the lab work is the combined effort of John and graduate student Fred Luiszer.

Fred (photo) tried out various majors and jobs and then landed in the geology program, where he is working on his M.S. under the direction of Ed Larson. Fred's love in life is caves, and he is a Fellow of the National Speleological Society. His thesis topic is the geology of Cave of the Winds, and there is absolutely no analytical method he has not submitted those cave sediments to. When John Drexler is too busy to help students in the facility (he is deeply involved in an EPA Pb study of Leadville), Fred takes over and is most helpful to everyone. Among some recent analytical triumphs he lists an SEM study of dinosaur eggs for Karl Hirsch, chemical characterization (XRF) of dust in Pacific Ocean island soils for Pete Birkeland (seems one site with high P could be paleo-bird droppings), and determination of Pb content of rabbit droppings in Leadville as part of John Drexler's EPA study.



Fred Luiszer cranking out chemical analyses from the XRF machine.

Student Awards

Claudia Johnson is finishing up her Ph.D. dissertation under the direction of Erle Kauffman and has been awarded a Zena Hunter Andrews Fellowship of the Graduate School for the 1992-1993 academic year. Once the dissertation is accepted, she has been invited to do post-doctoral work in Cretaceous climate modeling for the Caribbean region at Pennsylvania State University.

Felicity Wong also received a Zena Hunter Andrews Fellowship. She is sequestered in the Laboratory for Atmospheric and Space Physics, where she is pursuing an M.S. degree under the direction of Bruce Jakosky. Felicity is studying the most volcanically active body in the solar system, Io, Jupiter's satellite. She likens the covering of lava flows to a giant cheese-smothered pizza. Both the colors of the flows and their high, steep slopes raise the question of flow composition—silicate or sulphur based? She will numerically model the formation of the flows using both silicate and sulphur parameters under Io conditions. In this way she hopes to place some constraints on which flow composition is most likely. Sounds like a

good topic for a future Friends of the Pleistocene Field Conference.

Barbara Mieras, a Ph.D. candidate under the direction of Erle Kauffman, received the Runge Award of the Rocky Mountain Section of the AAPG-SEPM. The award was for the best student paper delivered at the September 1992 meeting in Casper. Her topic was sequence stratigraphy, Frontier Formation, South-Central Wyoming—eustatic and tectonic influences. In their letter to Barbara, the committee added that her presentation was among the best at the convention.

Peter Varnal, Hungarian Oil Plc, Budapest, was awarded \$500 for presenting the second best paper at the AAPG meeting in Calgary. The title was "Seismic Stratigraphy, Paleogeographic Reconstruction, and Petroleum Potential of Pannonian Strata (Upper Miocene-Lower Pliocene), Southeast Hungary." This impressive piece of work was his M.S. thesis in Hungary. Peter is here to study for the Ph.D. degree with Paul Weimer. His topic is the sequence stratigraphy of a patch of the Gulf of Mexico. Soon Paul and his students will have the Gulf all figured out.

AMOCO Fellowship

Barrett Dixon
Rob Noble

Association of Women Geoscientists

Maria Montour

Union Pacific Resources Fellowship

Ursula Hammes
Debra Krumm
Barbara Mieras
Natasha Vidic
Tomas Villamil

Wyoming Geological Association Steve Champlin Award

Gary Fager

Sigma Xi Grant-in-Aid of Research

Jared Morrow

Mucho Cactus, Mucho Agua

Judy Kreps Reports on a Bill Atkinson Field Trip

Two weeks in Baja California with Bill Atkinson, we thought, would be 14 long, hot days basking in the subtropical Mexican sun, foraging through tailings piles, and gawking at ophiolites. Right. As an unprecedented cold front moved through Baja, the formerly arid climate racked up record rainfall during our stay. Cacti sprouted Spanish moss from their limbs! Did we have a great time? You bet! We started off with a fabulous K/T boundary stop courtesy of Hernan Santos at Raton Pass, froze overnight outside of Albuquerque, then proceeded to scenic Meteor Crater, Arizona. New Year's Eve was spent fording raging torrents south of Flagstaff, then on to the Phelps-Dodge

Gold King mine at Jerome, a zoned massive sulfide deposit overlooking the beautiful Verde Valley. By the fifth day we were finally in Mexico, where we managed to persuade Bill to let us play tourist, then camped that night on the shores of the Pacific Ocean south of Ensenada.

If you've ever been to Baja, you know that the "road" is actually a cruel hoax brought to you by the guys who sell you sets of new tires. Amazingly, we had only two flats. Not bad for 1,500 miles of craters, washouts, and maniacal semi drivers. And that was the highway! One of the trip's highlights was the oh-so-memorable expedition to El Arco, a porphyry copper deposit the Mexican government is holding

in reserve, which is only reachable by 50 miles of what passed for a road.

Although we missed the whales, the Vizcaino Peninsula ophiolitic complex was mighty impressive, as was the road to get there. From the Pacific coast, we wandered back to the Gulf of California side of Baja, where we visited a gypsum mine on an island in the Gulf—one of those kinds of things that only happen on one of Bill's trips. As we ferried to the mainland, we learned that torrential rains had flooded the arroyos north of El Rosario, closing the only road out of Baja.

Faculty News

Honors

Carl Kisslinger (photo) has been awarded the John Wesley Powell Award of the USGS for 1992. The award is for achievement in an institution and is given to "individuals whose actions have made significant contributions to the advancement of the Geological Survey's principal mission." The award was presented to Kisslinger by Dallas L. Peck, USGS director, in a ceremony at USGS headquarters in Reston.

In his citation, Dr. Peck mentioned the following services that Carl has performed: officer of the Seismological Society of America, American Geophysical Union, and International Union of Geodesy and Geophysics; contributions to the Survey's programs since 1960 by being on a number of advisory committees and panels of the National Academy of Science, Office of Science and Technology Policy, and Department of Interior; and chair of the Advisory Panel on Earthquake Studies for a number



Carl Kisslinger, recipient of the Powell Award.

Faculty Appointments

Many times it is advantageous to the students' programs to have people from the outside (for example, consultants, USGS, etc.) on their committees for the purposes of exams or helping with theses and dissertations. Some will offer courses in their specialty. Many of these people are graduates from this Department and work in the area. There are various appointments that can be made, but the more formal ones are professor (at various ranks) adjunct, adjunct, or attendant, or research professor (again, various ranks).

In early 1993 we have 19 professors adjunct, adjunct, or attendant:

Geochemistry and analytical techniques: Andy Davis, John Drexler, Kirk Nordstrom, Robert Stallard, and Don Runnells

Mineralogy: David Sherman

Quaternary studies: Tad Pfeffer, Dugan Smith, Jon Overpeck, and Anne Jennings

Teaching

What ever happened to geomorphology in the wake of Bill Bradley's retirement? Although he was not replaced in kind in our Department, the Department of Geography replaced Jack Ives (now at Univ. California-Davis) with a mountain geomorphologist. The new person is John Pitlick, a fluvial geomorphologist and former student of Stan Schumm. John is on many committees in the Department, teaches successful geomorphology courses, and with Nel Caine forms the dynamic duo of degradation.

There is a new course in geomorphology. Students in geology and geography felt a need for more field work. As a result, Nel Caine,



Jane Selverstone at home in the Alps. Here she is in Italy, southeast of Brenner Pass.

of years in the 1980s. Carl and his graduate students are currently studying earthquake triggering processes and the temporal behavior of earthquake aftershock sequences.

Jane Selverstone (photo) was named as one of two Mineralogy Society of America Lecturers for 1992-1993 and will travel to ten colleges and universities in the western half of the United States to present "Petrologic Constraints on the Tectonics of the Eastern Alps" or "Fluid Migration in Subduction Zones: Inferences from High-Pressure Metamorphic Rocks." Before this happened she was invited to speak in Zurich, Basel, and Paris. During this spring she also will be a Weeks Distinguished Lecturer at the University of Wisconsin.

Jane is busy on other fronts as well. She started a tenure as North American co-editor of the *Journal of Metamorphic Geology*. She continues to study interactions between tectonic and metamorphic processes. This involves correlating depth, temperature, time, and deformation histories of different tectonic levels to test and construct models of orogenic processes. Although most of her research has been done in the Eastern Alps, she is ready to expand into other areas including the Western Alps, Ile de Groix (France), western Idaho, the Mojave Desert, and the Front Range.

Retirements

Don Eicher will retire (well, almost) this spring after 35 years of service to the Department. We will not write up his contributions yet because we have been fortunate to be able to hire him at a 50 percent level to teach essential courses and direct graduate students. This should give him more time to ski and bike (what else do our retirees do?).

Sabbatical Leaves

One of the nice perks of teaching is to be able to pursue one's research interests while on sabbatical leave from the University. Here are some of the recent projects:

Pete Birkeland was busy in the soils lab working on the origin and age relations of soils from exotic Pacific Ocean islands.

Lang Farmer will split his time between Boulder and the Los Alamos National Laboratory developing novel ion sources for isotope-ratio mass spectrometers.

Chuck Stern has returned to Chile to continue his work on Quaternary volcanism.

The following are in-depth reports from four others who have just completed their sabbatical leaves.

John Andrews

For the second part of 1992 John Andrews was on sabbatical. Martha had obtained a grant to work at the Scott Polar Research Institute (SPRI) at Cambridge University, England, so

News of Retirees

Bill Bradley continues to ski all over Colorado, and he and Weezie spent a week at Whistler-Blackcomb in southwestern Canada prior to Christmas. They prefer the drier snow here, however. Bill still teaches geology on canyon boat trips. Weezie is very busy with weaving activities, and when they go to her meeting, Bill gets the spouse badge!

Bruce and Ruth Curtis have a long vacation on Maui each year to escape from the Boulder cold. They are there as this article is being typed, and the streets of the town are rimmed with ice.

Ted Walker matches Bradley on the ski slopes turn for turn, especially as skiing is free for him now, and he commonly puts in greater than 50 days per year on the slopes. When the snow thins he switches to a bike. We asked him how he can be so active, and his answer is that he saved his body during all those years of physically inactive microscope work. Barbara usually accompanies him in all these endeavors but was on injured reserve for a short time this winter. They will take a boat to Alaska this summer.

We got in touch with **Ernie Wahlstrom**, who lives with his wife, Molly, in Redmond, Washington. He claims they have slowed down a bit but still travel north to Canada and south to Oregon. He bought a computer so he could write a series of short stories. Although he learned how to word process, he could not find a publisher. He thought the lack of love and sex in the stories could have contributed to the denial! Hey Ernie, take heart; we all have trouble getting our stuff published. Try to put love and sex in some of our rock articles! He still has a good sense of humor and encourages people to stop by.

New Hires

The Department is recruiting to fill positions in geohydrology (emphasis on groundwater) and geophysics. The latter position is a replacement for Max Wyss, who has moved permanently to Alaska. Successful candidates will be on campus this spring, and ideally both positions will be filled and the persons on campus by fall.

he tagged along! They left on October 31 and returned to Boulder January 12, just in time for John to start teaching on January 13 and to assume the duties of interim chair.

While in Cambridge, he started some research conversations with colleagues in SPRI and also in the Earth Science Department, especially with regard to the mechanisms and extent of "Heinrich events" in the North Atlantic (see article elsewhere in newsletter). For those interested, these are a current "hot topic," and John has papers in *Nature* (Nov. '92, Bond et al.; the et al. includes John and one of his graduate students) and *Geology* (Dec. '92, Andrews and Tedesco).

In late November, he was invited to attend a meeting of the Polar North Atlantic Margins (PONAM) European Science Foundation in Bremerhaven. This was an interesting 2-day meeting with about 80 researchers and graduates from all the Nordic countries and Germany. The focus of their research is a comparative land/sea study of climate change between East Greenland and the NW European Arctic (Svalbard).

Martha and he both submitted papers to the 3rd Circumarctic Universities Conference,

continued on next page

John Andrews, *cont.*

which was held in Rovaniemi on the Arctic Circle Dec. 1-4. Their trip included a visit to Santa Claus, and they even had their picture taken with him to prove it (photo). As part of this meeting they joined a small band of intrepid explorers, including a former McGill friend that John had not seen for about 20+ years, to visit Murmansk (lat. 69° N). The trip to Murmansk was enjoyable but long. Once they crossed the Russian border the condition of the road deteriorated rapidly and their speed was down to 30-40 km/hr. Thirteen hours later, they pulled up at the door of the hotel. A lot can be said about Russia, some good and some bad, but they were treated extremely well. As John's uncle had been a navigator of the attack planes on the British aircraft carrier *Ark Royal*, which was heavily involved in the protection of the Atlantic convoys, the visit had some emotional overtones (he was shot down just off the coast). The Atlantic convoys and the defense of Murmansk by the Red Army are still strong memories.

Martha had met one of the chiefs of the Kola Science Institute at the Polar Libraries Colloquy, and he invited the Andrews to visit the Kola Science Center in Appatite. They drove the 250 km or so south to this industrial/science city passing through some of the worst effects of industrial pollution one could imagine. The Kola Science Center is very impressive, and its mineral collection was superb. However, there is no doubt that the Center, like much of



John and Martha Andrews with friend at Rovaniemi, Finland.

Russia, is suffering under the present economic situation.

Their last major work-related trip in the UK was a visit to Edinburgh where John lectured to the "Hutton Club"—this was during the EEC Summit, so their visit was replete with police and maximum security measures. While at Edinburgh, they visited with friends from both the Departments of Geology and Geography who had spent their sabbaticals at the University of Colorado in the mid-1970s (the Boultons and Sugdens for those of you around at that time).

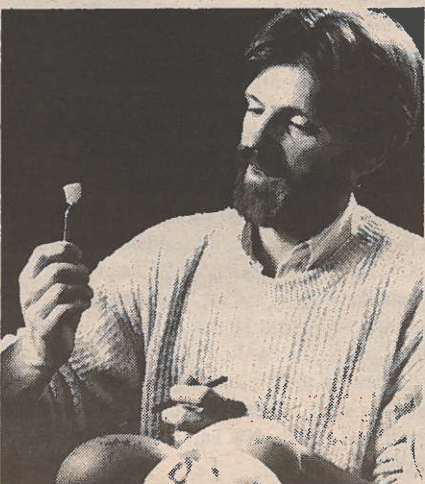
They were not ready to leave Cambridge, but 10 pounds heavier from eating too many suet puddings and too much custard (John, not Martha), they did make it back on January 12.

Gifford Miller

Gifford Miller reports that his sabbatical year was a delightful and productive experience. He spent the 1991/1992 academic year with the Environmental Geochemistry Group, Research School of Earth Sciences, at the Australian National University in Canberra, with support from a University of Colorado Faculty Fellowship and a modest grant from the International Program at NSF.

For the first 3 months of his tenure at ANU, he secluded himself with computer and a thick file of amino acid analyses of ostrich eggshells in an attempt to derive a set of simultaneous equations that would predict sample temperature independent of sample age using chemical reactions with very different activation energies. (One of the wonderful experiences of a sabbatical is to sit in one's office for an entire day and not have the phone ring once!) Such a solution has been the goal of the amino acid community for more than 20 years. Because of the superior integrity offered by the ostrich eggshell, he was able to develop the necessary equations. These results were presented to a meeting of the Royal Society in London ("The origin of modern humans and the impact of science-based dating") in February 1992 and subsequently appeared in the Society's proceedings volume.

He didn't, however, travel to Australia to be sequestered in an office with a computer for 10 months. On three occasions he journeyed, family in tow, to the Outback to test the potential of Australian ratite eggshell (emu and the now-extinct emu-like bird, *Genyornis*) for amino acid studies. Although his primary intention was to address the question of climate forcing of the Australian megalakes by improved dating of past high-lake levels, he also wanted to visit key sites within the range of radiocarbon to calibrate the racemization reaction and test its



New department chair Gifford Miller examines prized fossil egg specimens.

precision. This led to the discovery of early human occupation sites at Lake Victoria in western New South Wales. He obtained an AMS radiocarbon date of >45,100 years on emu eggshell associated with human artifacts, the oldest radiocarbon date on a human occupation site in Australia, and this led to a multiple-technique dating campaign (thermoluminescence, U-series mass spectrometry, as well as amino acids and radiocarbon dating).

An extended field trip into the Lake Eyre Basin during the Austral winter, in collaboration with John Magee and John Chappell (Biogeography and Geomorphology, ANU) and Rainer Grn (Radiocarbon Lab), yielded a wealth of eggshells from key stratigraphic settings. The new dating that resulted from this work and from the TL studies of colleagues in Australia and the UK on the timing of human immigration and lake level changes over the past 150,000 years in the interior of Australia led to the formulation of a new hypothesis that explains the climate forcing of these wet and dry episodes. Precipitation over the Lake Eyre Basin is largely derived from the Australian Summer Monsoon. The Asian Winter Monsoon is the primary controller of the Australian Monsoon, as Australia is too small and too low to generate its own significant monsoon. Lake-level events in Outback Australia are coincident with periods of minimum January insolation over the Tibetan Plateau (a proxy for the intensity of the Asian Winter Monsoon) and times of high sea level. This model of climate forcing explains the chronology of wet and dry episodes in the Lake Eyre Basin from 150,000 to 15,000 years ago, but a predicted lake-full event centered on 10,000 years ago failed to occur. The explanation for the failure of the monsoon 10,000 years ago is apparently tied to the immigration of the first humans (now securely dated at 55,000±5,000 years ago) and their habit of systematic burning of the landscape, which fundamentally altered the composition and density of the vegetation across northern Australia. The reduction in vegetation, and the accompanying loss of soil moisture-holding capacity, substantially decreased the wet-season transpiration of moisture into the atmosphere, resulting in a weakening of monsoon intensity and persistent aridity in the interior despite strong forcing by insolation and sea level. The Australian example is one of the rare instances where human activity can be inferred to alter climate on a continental scale.

Back in Boulder, he misses the smell of the eucalyptus, the daily sight of brilliant parrots flushed from the brush as he cycled to work, and the quiet, uninterrupted hours at the ANU. Giff reports that the Australians have great beer also!

Roger Bilham

In 1992, deformation studies using GPS space geodesy took Roger twice to Ethiopia, twice to India, to the Tien Shan Mountains and western Tibet, to the Mahabharat Ranges of Nepal, and to the SW Caribbean plate boundary in Venezuela.

Preliminary results from the GPS measurements (which form the doctoral dissertation of graduate student Mike Jackson) indicate slow rates of convergence in the Himalaya, similar to the 1 cm/year predicted from plate motion estimates, and uplift rates in the Himalayan foothills of 3 mm/year. Unexpectedly, the northern African rift appears to be opening at lower rates than hitherto believed applicable (11 mm/year), but the Red Sea arm of the Afar triple junction may be undergoing a northward propagating rifting episode driven by a 2 cm/year opening rate.

The Landers M7.4 earthquake (California) occurred in June a few hours after Roger returned from Delhi. A few hours later found Roger landing near the epicenter in a chartered Lear Jet where he installed 4 creepmeters to monitor developing surface slip through the homes of residents of Yucca Valley. This after-slip continues at a rate of 1 cm every few months—enough to discourage fixing cracks in foundations and plaster walls but not enough to encourage wholesale evacuation.

Also in June, Roger was invited to address attendees of the 10th World Earthquake Engineering Conference in Madrid on global seismic hazards, and during a stop-off in London, he investigated original sources documenting the 1737 Calcutta earthquake for which 300,000 fatalities were reported in global seismic catalogues. It appears likely that fatalities from the

event were 99 parts cyclone and 1 part earthquake, with most deaths caused by widespread flooding in East Bengal. This finding, if it can be confirmed by additional eighteenth century documents, radically reduces seismic risk estimates to this city of 14 million people.

Alex Goetz

Alex Goetz took his sabbatical in Boulder with two goals in mind: (a) to start writing a book entitled *Imaging Spectrometry* (contract with Cambridge University Press) and (b) to explore new applications for quantitative remote sensing with imaging spectrometry. The former goal was only partially completed but the latter goal resulted in Goetz's involvement with environmental assessment through a major oil company. With CSES (Center for the Study of Earth from Space) colleagues and NASA support the team is now developing techniques to determine vegetation biochemistry from imaging spectrometer observations from aircraft. Since vegetation covers the surface in many areas of interest, it is vital to get clues about the soil from observations of the plant canopy. It may seem far removed from geology, but environmental questions are playing an ever increasing role in the business decisions made by resource companies. Remote sensing is continuing to grow in sophistication and in the breadth of applications. CSES hopes to continue to play a leadership role in this field.

News of Professors

Bill Hay

Bill Hay reports that after teaching courses in oceanography and paleoclimatology at CU during the spring semester 1992, he attended the organizational meeting for the new Global Sedimentary Geology Program Project Pangaea in Lawrence, Kansas. There he presented a paper on the results of a new climate model, GENESIS, that has been developed by Starly Thompson and David Pollard at NCAR. Bill, Kevin Wilson, and Chris Wold provided paleogeographic boundary conditions for the initial paleoclimatic simulations for the early and late Triassic.

Bill returned to GEOMAR in Kiel, Germany, at the beginning of June. He began the second half of a year sponsored by the Alexander von Humboldt Foundation and participated in a number of professional meetings in Europe and Asia during the summer and fall.

From June 22-26 he attended the VIII Congreso Española de Geología y XII Congreso Latinoamericana de Geología in Salamanca, Spain, presenting a paper with C.N. Wold: "The fit of North America, Africa and South America about the site of the future Gulf of Mexico and Caribbean." In early July he attended the International Research Conference on Paleogeography, Paleoclimate and Source Rocks organized by the American Association of Petroleum Geologists and the Institut Français du Pétrole in Paris, France, and presented a major lecture entitled "Tectonic controls on paleogeography, paleoenvironment and sediment cycling: modeling interrelated processes." Later in July he presented an intensive 18-hour short course on paleoclimatology and paleoceanography at the University of Erlangen, Germany.

GEOMAR sponsored his attendance at two conferences in Japan in August. On the way to Japan, he stopped off in Singapore and Hong Kong for a few days to do some sightseeing and sample the local delicacies. At the 2nd International Conference on Asian Marine Geology in Tokyo, he presented a paper entitled "Barriers, passages and paleoceanography of the Indian Ocean." During the 29th International Geological Congress held in Kyoto, Japan, August 24-September 3, he presented three papers: "Why the bathymetry of the Indian Ocean is different from that of the Atlantic" (with C.N. Wold),

"Reversals of circulation in the Central North Atlantic during the Eocene," and "Reconstructing the age and lithology of eroded sediment" (with C.N. Wold).

September and October were especially busy, as Bill had been invited to give talks at several conferences. He attended the International Association of Sedimentologists' 13th Regional Meeting of Sedimentology, held in Jena, in former East Germany, September 15-17, and presented a paper with Starly Thompson, David Pollard, and Kevin M. Wilson as co-authors—"Results of a climate model for Triassic Pangaea"—which has since been submitted for publication. The Fourth International Conference on Paleoclimatology was held in Kiel September 21-25. Bill served as organizer of one session and presented a poster on the flow of currents in the Cretaceous Tethys and a lecture on Pangaea climate and paleoceanography. From September 29-October 1, he attended the 4th International Cretaceous Symposium in Hamburg and presented a poster entitled "How the dinosaurs walked from South America to India in the Late Cretaceous." In early October he attended the Aptcore-Albcore Meeting, a workshop held in Perugia, Italy, to develop plans for recovering and studying cores of Cretaceous sediments recording ocean anoxic events and Milankovitch climatic cycles. There he presented an invited lecture on modeling Cretaceous paleoclimate. October 12-15 he attended the First Congress of the Regional Committee on Atlantic Neogene Stratigraphy with the theme Atlantic general events during the Neogene, held in Lisbon, Portugal, presenting a paper entitled "Pliocene-Quaternary upwelling in the southeastern Atlantic may reflect changes in water mass production."

During the fall he taught a course in Mesozoic paleoclimatology at the University of Kiel for six students and also taught intensive 18-hour short courses in paleoclimatology and paleoceanography at the Bergakademie Freiberg, in Saxony in former East Germany, and at the University of Vienna, Austria, and a 3-hour mini short course on Triassic paleoclimatology at the University of Bonn, Germany.

During November, he attended the Latin America Colloquium in Münster, Germany,

Continued next page

Bill Hay, *cont.*

presenting a paper on the nature of the western end of the Tethys. He gave a lecture on past climatic change at the University in Essen, Germany, and one in Kiel on the fresh water balance of the Arctic Ocean during the last deglaciation.

Bill reports that the most exciting visits were in Freiberg, where the students at the Bergakademie are very enthusiastic, motivated, and well trained, and in Vienna, where short course participants had come from as far away as Budapest and Prague.

After the busy summer and fall, he relaxed at Christmas in his home in Estes Park.

Paul Weimer

Paul has been busy on many fronts. First, he and wife Laurie Lamar had their second son, Rudy Lamar Weimer, born January 7. Rudy was 19.25 inches long, 7.69 lbs.

During the fall of 1992, Paul taught Applied Sequence Stratigraphy and Basin Analysis, a course that is popular with our students as well as several students from the Colorado School of Mines and several from the petroleum industry. In addition, he teaches Introductory Geology and a petroleum geology seminar with Jack Edwards.

Paul received the Shell Junior Faculty Development Award for 1992-1994. It carries a stipend of \$60,000, which he can spend at his discretion. The award is designed to help junior faculty in science and engineering fields establish

a research program. For the first year, he purchased a second workstation (Sun Sparc10) for his research program. He also has negotiated about \$500,000 of additional interpretation software donated to CU-Boulder for workstations. CogniSeis Development is donating logging and interpretation software; Landmark is donating (via the DOE project) interpretation, logging, and mapping software; and HyperMedia Systems is donating interpretation and tutorial software.

On the research front, Paul is associated with the DOE-sponsored drilling program in the Eugene Island area in the Gulf of Mexico. Several oil companies with DOE support will drill several wells in the Eugene Island area to test concepts for active oil migration, with the hope of tapping into new reservoirs and increasing production. Mark Rowan and he are working with Roger Anderson (Lamont Doherty) and Peter Flemings (Penn State) on the regional and local stratigraphic and structural evolution in the study area.

Roy Kligfield and Paul have successfully launched their industry-sponsored integrated research program in sequence stratigraphy and structural geology. To date, they have thirteen companies that have subscribed to the consortium and four corporate sponsors. Their initial research efforts will focus on the sequence stratigraphy of the turbidite systems reservoirs and structural reconstructions of salt movement and deep-water foldbelts in the Gulf of Mexico. At their semi-annual consortium meetings, students and professors present the initial results from their research and companies give good input. Nine students are conducting graduate and post-graduate research using these data. The consortium will run for 3 years.

Paul remains busy in other areas. He co-edited an AAPG Memoir entitled "Siliciclastic Sequence Stratigraphy: Recent Developments and Applications" with Henry Posamentier (Arco Research). It will be published by mid-1993. He was keynote speaker at a research workshop at the SEG Annual Convention in Houston and presented a lecture entitled "Sequence Stratigraphy: An Overview." With Arnold Bouma (LSU) he is co-convenor of the 1994 SEPM—Gulf Coast Section Annual Research

Conference, "Submarine Fans and Turbidite Systems: Sequence Stratigraphy, Reservoir Architecture, and Production Characteristics, Gulf of Mexico and International." They have assembled an international group of scientists to emphasize the global distribution of these important reservoirs. They will showcase their Gulf of Mexico research. Finally, he is poster chairman for the 1994 National AAPG meeting that will be held in Denver and is organizing three symposia as well.

Smyth and Students Discover New Ocean

No, not Mare Smythii. That's on the Moon, and was discovered some time ago. Mineralogy professor Joe Smyth has been studying how hydrogen is incorporated into mineral crystal structures, particularly in minerals that are stable at temperatures and pressures of the upper mantle. Using infrared spectroscopy, neutron and X-ray diffraction methods, and working with scientists at the California Institute of Technology, Smyth has discovered that the normal anhydrous silicates known to exist in the upper mantle may incorporate large amounts of hydrogen. In a paper in the British scientific journal *Nature* in July 1991, he reported that mantle pyroxenes from South African Kimberlites may contain up to 5000 ppm by weight OH, or about one H atom per 100 oxygen atoms. More recent results on rutile (TiO₂) by graduate student Jeff Swope show incorporation of up to three H atoms per 100

oxygen atoms, suggesting that stishovite, the isostructural high pressure form of SiO₂, may also contain significant amounts of hydrogen. This was confirmed by workers at Arizona State University in results presented at the fall meeting of the AGU in December 1992.

Smyth predicted in a paper in 1987 that wadsleyite (β -Mg₂SiO₄), a high pressure phase of olivine, might be a major host for hydrogen in the transition zone of the mantle at depths of 400 to 525 km. Recent reports by experimentalists suggest that the mineral may contain up to 10,000 ppm by weight OH or 3 H atoms per 100 oxygen atoms. These results indicate that if the nominally anhydrous phases generally believed to constitute the upper mantle of the Earth are actually saturated with hydrogen, these minerals could contain more water than is currently in the Earth's oceans!

Alumni Notes

1947

Ralph L. Langenhelm, Jr. (B.S., Geological Engineering, Univ. Tulsa, '43; M.S., CU, '47; Ph.D., Univ. Minnesota, '51), is now Professor Emeritus and Curator of Paleontology Emeritus at the Univ. of Illinois. He has completed an interesting trip during which he analyzed the curriculum and faculty at the Faculty of Geology and Mining, Polytechnic University, Tirane, Albania. Ralph reports that they compare well with an average department in the United States and serve a first-rate mining industry. One way in which the faculty keep up to date is by publishing many textbooks in Albanian. Being that nobody publishes in that language, they cull the literature and publish their own! He had a great time there, found conditions quite good and a very friendly atmosphere. He encourages others to go there, especially if you like ophiolites.

1952

John Small (B.S., CU, '52; Ph.D., CU, '62) recently retired to the United Kingdom so that his youngest daughter could benefit from the school system there. He is consulting on exploration activities worldwide. He had been working in Kuwait and was at another daughter's wedding in Ecuador when Saddam Hussein moved in and grabbed up all their possessions. He even lost the alumni list of addresses. We will send him a new one as long as he keeps it in a safe place!

1959

John Harms (Ph.D., CU, '59) was featured in an article in the *Denver Post*. As many of you know, John is half of what the *Post* calls a "tiny Littleton Company." What makes the company newsworthy is that Harms & Brady Geological Consultants holds all the information on the size, exploration, and potential development of oil and gas reserves in Somalia. This information is kept at the company, and as soon as a government is formed and exploration begun, this information will be essential in helping that nation become self-sufficient. When looking for R and R this winter, Ted and Barbara Walker accompanied John and Bobbe on the slopes at Beaver Creek—pretty upscale!

1962

John Cys (B.A., CU, '62; M.S., CU, '65) reports an address change from Arlington to 3010 Westvista Circle, Fort Worth, TX 76133-5737.

1972

Raymundo Punongbayan (Ph.D., CU, '72) was featured on the NOVA show about the eruption of Mt. Pinatubo, in his backyard (see Rick Hoblitt, '78, story also). Ray (photo) is director of the Philippine Institute of Volcanology and Seismology. The Department can take pride in the fact that Ray's and Rick's groups did such an outstanding job in predicting the eruptive events there. TV coverage should help with recruiting our next class! We do not recall their Colorado background being mentioned, however.



Ray Punongbayan in front of the 1969 cone at Taal Volcano, Philippines.



Rick Hoblitt (right) in his student days on an Ed Larson field trip in the Wind River Mountains. Rich Reynolds (Ph.D., CU, '75) (left) is delivering a stimulating lecture on dikes.

1975

Robert K. Driver (B.A., CU, '75) is a senior analyst with the Foreign Systems Research Center in Denver. He has assisted in the establishment of the Central Eurasian Service Bureau, which provides a variety of services and products to clients who want to be involved in business ventures (including petroleum) in the former Soviet Union. He is married and has 2 children.

William L. Hiss (Ph.D., CU, '75) has shifted over to the investment business and has joined Hambrecht & Quist, Inc., investment bankers in San Francisco.

1978

Deborah Heston Schnelder (B.A., CU, '78; M.S., CSU, '82) is a self-employed geologic computer consultant in Reno. Look her up at the spring GSA meeting.

Many of you probably saw the NOVA show about Mt. Pinatubo, but did you realize that the bearded USGS geologist-on-the-spot was

our **Rick Hoblitt** (Ph.D., CU, '78) (photo)! Rick was part of the team that predicted the eruption in time for the massive evacuations of people, planes, PX supplies, etc. It was a superb show with excellent shots of all the main volcanic features. We will use these in our classes. Rick seemed to be under more stress than he was when sweating out the foreign language exam. He is stationed at the Cascade Volcano Observatory in Washington State, where he works with **Dan Miller** (Ph.D., CU, '71).

1980

Ola Magna Saether (B.A., Univ. of Bergen, '74; M.S., Univ. of Oklahoma '76; Ph.D., CU, '80) had not written for so long that we have a lot of data on him. He presently is a senior research geochemist with the Norwegian Geological Survey in Trondheim. Recently he has been on leave to work on the decomposition of organic compounds in groundwater with Prof. Don Macalady at the Colorado School of Mines. For the past 8 years he has

continued on next page

Alumni Notes, *cont.*

been editor of the *Norwegian Journal of Geology* and is proud of the improvements made to the journal. Recent interesting overseas trips have been to the Everest region of Nepal ('89), to Ecuador ('90), and to Japan ('91). He still skis the local mountains and reports that even the Norwegians have re-invented the telemark turn.

1981

Carrie Manfrino-Kievman (B.A., CU, '81; M.S., Colorado School of Mines, '84) is pursuing a Ph.D. degree at the Rosenstiel School of Marine and Atmospheric Sciences, Univ. of Miami, in addition to having married Carson Kievman recently. Her dissertation topic is on sea level and carbonate platform evolution of the Great Bahama Banks.

1982

Janet Bronken-Jakobsson (B.A., CU, '82; Master's equivalent, Norway, '91) is a senior geophysicist at Statoil Research Centre in Trondheim, Norway. She works on 3-D seismic imaging problems and alternative seismic acquisition methods. She and her family enjoy the quietness of Trondheim in comparison to their relatively busy (former) life in Oslo. She reports that Ingrid is 3 years old and that they are expecting no. 2 in February.

Vance Holliday (B.A., Univ. Texas Austin, '72; M.A., Texas Tech Univ., '77; Ph.D., CU, '82) has a position in the Dept. of Geography, Univ. of Wisconsin-Madison. His teaching responsibilities are in soils, geomorphology, and Quaternary studies. He continues with his research in the Southern High Plains of Texas and New Mexico, which involves the Quaternary history of the draws and dunes. Always interested in archaeology, Vance has edited a book entitled *Soils in Archaeology* (Smithsonian Institution Press). In 1986 he married Diane Young, who is completing her Ph.D. in anthropology at Madison. Diane has been director of the Burial Sites Program of the Wisconsin State Historical Society and soon will switch over to be director of the National Register Program. Vance and Diane were recently in China for the INQUA congress, where Vance had a bunch of the old CU crowd trying to determine the location where his father was photographed on the Great Wall in 1929 (Fig. 9-1 in *Putnam's Geology*, 1982 edition) (see photo). By the way, the CU-related people at the INQUA meeting

included Gerry Richmond, Dick Baker, Vic Baker, Peggy Guccione, Natasha Vidic, and Pete Birkeland.

1985

James G. Ritchie (B.A., Univ. California Santa Barbara, '80; M.S., CU, '85) is a principal geologist with SEACOR in San Francisco. He is working mainly on hazardous waste investigation and remediation. On other fronts, he is married, he and Debbie have two daughters, and he has discontinued serious rugby play with the exception of the alumni game at CU.

1986

Scott Minor (M.S., CU, '86) is a research geologist at the USGS, Denver. He is conducting studies of Neogene faulting in the Basin and



Which one is Vance Holliday and which one is his father? Did Vance occupy the same position on the wall over 60 years after his father did?

Range using digital techniques, as well as at Yucca Flat, NV. You may recall he met his wife, Cari, when he was a TA in an intro geology lab; they now have two sons.

1991

Ted Scambos (Ph.D., CU, '91) works at the Goddard Space Flight Center/NASA as a contractor with Hughes/STX Corp. He currently is using satellite imagery to study the geology of Antarctica. He recently spent three months in Antarctica obtaining ground truth information. He and Kari have two boys.

1993

Bruce Geller will receive his Ph.D. degree as this newsletter is being distributed. Some of you may have seen him at the Cincinnati GSA

meeting where he presented a poster. Active in local geological happenings, he is the 1993 secretary of the Denver Region Exploration Geologist's Society.

MEMORIAL

Ross V. Seeton, Jr., died March 12, 1992, in Gunnison. Born in 1920, he left college to serve in the Air Corps during World War II, then returned to CU and earned a B.A. degree in 1950. In the 1950s he was a project engineer for the Atomic Energy Commission and managed drilling sites across the Colorado Plateau. In 1960 he began work on a life-long dream of developing an environmentally conscious mountain community.

Helen L. Smith (B.A., '37) passed away April 22, 1992.

Alumni Awards

John W. Rold (B.A., CU, '48; M.S., CU, '50) received the Distinguished Service Award from Governor Roy Romer. As many readers know, John recently retired after 23 years as the state geologist of the Dept. of Natural Resources. His name became synonymous with the Colorado Geological Survey. While there, John initiated new programs in mineral resources and environmental geology and recommended to the legislature that geological factors be incorporated into land use legislation. John has served the department well as a past member of the advisory board. We saw him at the party following the last homecoming game and found out he now is consulting.

Scott Burns (Ph.D., '80) has been awarded a W.K. Kellogg Foundation National Fellowship (photo). The idea is to expand the national pool of capable leaders by increasing each individual's knowledge and experience base on topics of national and international concern outside his or her chosen discipline. The fellows periodically take part in educational seminars in the United States and Latin America that are designed to strengthen their leadership skills. Scott recently moved from Louisiana Tech Univ. to Portland State Univ.



Scott Burns in his pre-MacArthur days.

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) _____

before, during, and after CU-Boulder

Current Activity/Position/Employer/Location, etc. _____

Publications/Awards/Accomplishments _____

News About Family/Kids/Friends _____

Name/Address of Potential CU Geology Student We Should Contact: _____

Comments, Critiques, Accolades, as Appropriate, About Newsletter: _____

Alumni Support

The Department of Geological Sciences has several specific accounts to which contributions may be made. Checks should be made payable to the University of Colorado Foundation with a notation indicating which of the following funds the contribution should be used for.

Scholarship Accounts: (funds donated to these accounts are put in an interest-bearing account and the Department uses the yearly interest to provide scholarships to students).

Keith Marks Memorial Scholarship

(includes need)

Warren Longley Scholarship (Economic Geology)

Ernest Wahlstrom Scholarship (Economic Geology)

Larry Warner Scholarship (Economic Geology)

General Geology Scholarships

Contributions may also be made to the following accounts:

Geology General Gifts: (unrestricted funds for use at the discretion of the chairman).

Warren O. Thompson Graduate Research: (funds are used to assist graduate students with their research).

Geology Equipment: (funds specifically designated for the purchase of equipment).

Alumni Relations: (funds specifically designated for travel, etc. to promote alumni relations).

Geological Sciences Building Fund: (funds specifically designated for the new Geological Sciences Building).

Undergraduate Enrichment Fund: (funds specifically designated for undergraduates—see article, this newsletter).

W.J. Gardiner II Memorial Fund: (unrestricted).