GEOLOGY NEWS

Department of Geological Sciences ▲ University of Colorado at Boulder ▲ Summer 1996

MESSAGE FROM THE CHAIR

Every seven years each of the primary units within the University is given the opportunity to make its case for excellence to the campus through the Program Review process. This year Geological Sciences began its self evaluation, with the target of having a Self-Study Report completed by next fall. The Self-Study allows the Department to examine where we have come from and how we are currently performing, and to make the case that we have a coherent view of our future and the future of our discipline. In the rapidly changing post-Cold War era, the role of higher education is being re-evaluated nationally and locally. Although the urgency for continued investment in basic research is being questioned in some quarters, it is also recognized that the societal need for Earth resources remains high and will continue to increase, while the impact of human activities is rapidly becoming the dominant process effecting planet Earth. In this milieu the relevance of the Earth Sciences takes on a renewed importance.

As part of our Self-Study, we have tracked the changing demands for Geology courses over the past decade. The numbers of students enrolled in our courses have increased steadily since 1987 and are now more than double the 1987 figure and still rising. Although the number of Geology majors is not as high as in some of the other natural sciences, the trends in student interest, measured as the percentage increase in majors, places Geology as one of the fastest growing of the natural science disciplines. Predicting the future, much like predicting the weather, may be best left to fools and greenhorns, but the trends of the last ten years suggest that student interest in the Earth Sciences will continue to increase. We have an obligation to meet the needs of liberal arts majors seeking a better understanding of the earth system, and to the next generation of professional earth scientists who seek a career in the discipline. The relevance of the Earth Sciences—whether tied to the continuing need for additional natural resources, the hazards associated with plate boundaries, or the movement of groundwater—has gained increasing recognition and national attention. We welcome the challenge of articulating the central role the Earth Sciences will play as we ease into the third millennium.

By next fall, we will have completed our Self-Study, producing a document that both presents a consensus mission statement for the Department and reviews the activities of our undergraduate majors, our graduate program, and our collective efforts in original research. From these reviews, we will develop a revised strategic plan that presents our vision for the Department for the next seven years. Following completion of our Self-Study, a panel of experts from the discipline will be brought to campus to provide an external review of the Department's program. The combined internal and external reports will then be transmitted to the Vice Chancellor's Program Review Committee, which will make specific recommendations for the Department. Our essential challenge is to engage the Vice Chancellor's Committee in the central role that the Earth Sciences play in higher education through the next decade. The University has made it clear that it will invest in fields of established or potential strength; consequently, our goal is to demonstrate the disciplinary excellence within the Department.

Following the precedent set by the federal government, budget issues have tended to dominate campus conversations this year. Despite gloomy forecasts of reduced revenues and a reduction in the number of faculty at the Boulder campus, the Department was successful in obtaining permission to recruit a new tenure-track faculty line in Aqueous Geochemistry. Joe Smyth chaired the six-person Search Committee. With over 100 applicants, many with extensive experience and impressive credentials, it was difficult for the Committee to pare down the pool to a final short list. As of this writing, we are interviewing five candidates and hope to have the successful applicant on board by the Fall. We have strong interest from graduate and undergraduate students for water-related courses, and we expect the successful candidate will contribute to our growing strengths in low-temperature geochemistry and hydrology. The Department is pleased to have the support of the University administration that enabled us to recruit for this key faculty position despite limited recruitment on campus this year.

As you can imagine, planning for the new building for Geological Sciences and the Earth Science Library continued to occupy much of our efforts this year. The design phase has been completed and the construction documents are out to bid as of this writing. We are very pleased with the final design of the building. In appearance, the building is clearly of the CU "rural Italian" architectural style, while retaining a unique identity. The artist's rendering of the south-facing facade of the building, shown elsewhere in the *Newsletter,* gives a good impression of the overall appearance of the building. Inside, the design accommodates 25 faculty arranged in office "plexes", in which 3 or 4 faculty offices share a common dry lab space, with offices for graduate students interspersed between the faculty office plexes. The north side of the building is devoted to analytical laboratories and classrooms. We had a groundbreaking on April 30 and anticipate a move-in date of September 1997. Keep your fingers crossed!

If any of you are in Boulder, please stop by the Department and stroll by the Stadium to see how our new building is progressing as it emerges from the ground over the next 18 months.

—Gifford Miller

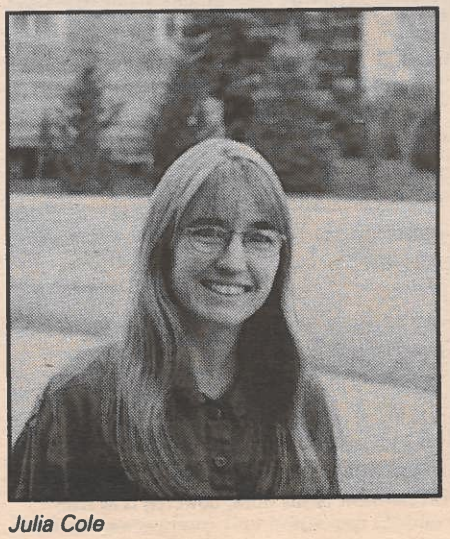
See page 2 for a preview of the new Geological Sciences building!

NEW FACULTY

In the past year we have been able to hire three new faculty. They will allow us to continue strong programs in structure, sedimentology, and global change.

Julia Cole

Julia will allow us to expand greatly our expertise in global change. Her undergraduate degree was a combination of geology and biology from Brown University. During that time she had her first taste of Rocky Mountain geology at an Albion College field camp. The rest of her degrees were from Columbia University: two Masters degrees and finally the Ph.D. degree in 1992. She came to Boulder in 1993 and since then has had affiliations with INSTAAR and the Program in Atmospheric and Ocean Sciences.



Julia Cole

Her research involves the development and climatic interpretation of high-resolution isotopic time series that span the past several centuries. The focus is on the few climatic systems that largely dominate low latitude climate, specifically the El Niño/Southern Oscillation (ENSO) phenomenon, the Asian monsoon, and the Atlantic trade-wind system. Sites are used that are sensitive to the important climatic/oceanographic features of the systems and that reflect large-scale variability. The record comes primarily from stable isotope data on tropical corals, a topic she began to pursue during her Ph.D. dissertation. We envy her for the exotic coral islands she includes in her research, with Tarawa Atoll common to a lot of her ENSO work. There she hopes to piece together a record that goes back to the Little Ice Age. For the interaction of ENSO with the Asian and Australian monsoons for up to millennial time scales, coral records from both Bali and northern Australia are being studied. In order to extrapolate her work more regionally, she is determining the climate isotopic signal on a centennial scale by study of an ice core from the Dundee ice cap of the Tibetan Plateau. For the Atlantic system, she is studying the upwelling

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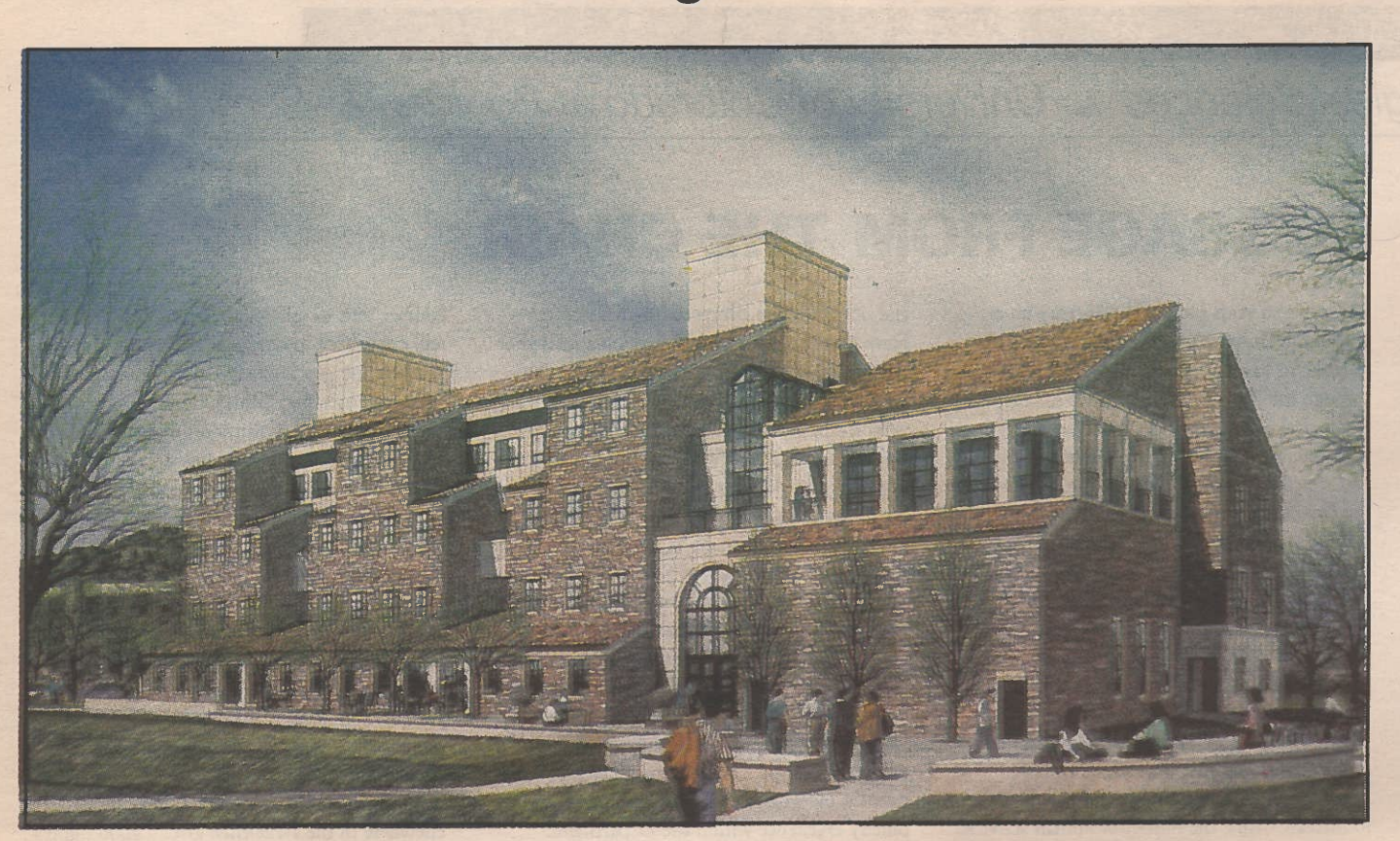
New Home for the Geological Sciences



Left: view of the south side of the new building. Below: the large glass door leads into the atrium.

New Faculty, cont.

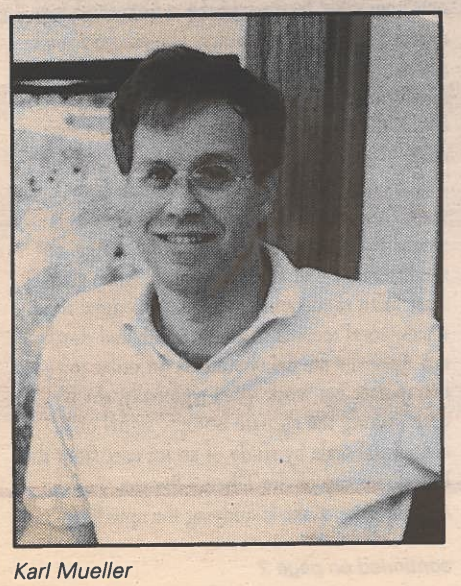
record as recorded in the Cariaco Basin, north of Venezuela.

Julia also provides much-needed teaching support for the department. The global change courses have been popular with the undergraduate students, and she already has taught one section of the introductory course. She is teaching a graduate seminar on Paleoclimate Dynamics and will add one on Climate Modeling. We look for her to do a lot with computer global climate modeling once we get into the facilities in the new building.

Karl Mueller

There has been a great structural void (pun intended) with the retirement of Bill Braddock. Karl Mueller was hired to take over the structure program. Both his undergraduate and M.S. degrees were from San Diego State University. His thesis for the latter involved structure, geomorphology, and soils to understand the Cucapa fault in Baja California; Ted Walker dragged many of us through the area back in the red-bed days. For his Ph.D., Karl worked on the Tertiary exhumational history of the Northern Ruby–East Humboldt metamorphic core complex of northeast Nevada. Interspersed with the more academic work he has done, he has worked on various structure problems for oil companies, including Amoco, Arco, Tenneco, and West and Associates of Denver. Prior to coming here, he worked as a postdoctoral associate at Princeton University. Focussing on the Los Angeles Basin and the Northwestern Transverse Ranges, he studied the paleoseismic history of blind faults by analysis of their related folds.

Karl's current research combines the fields of structural geology and active tectonics. He uses kinematic modeling of actively growing anticlines by studying their geomorphology, syntectonic alluvial histories, and incremental growth related to earthquakes on the underlying blind thrusts. The studies are aimed at defining and quantifying deformation mechanisms such as kink band migration, buckling, flexural slip faulting, plunge panel extension and fault slip during earthquakes, as all contribute to fault-related fold growth. Most current research is on tectonically active anticlines in the transverse ranges, San Joaquin Valley, and Los Angeles Basin, California. He also is investigating mechanisms of anticlinal fold growth in a restraining bend of the New Madrid Seismic Zone of Missouri and Tennessee.



Karl Mueller

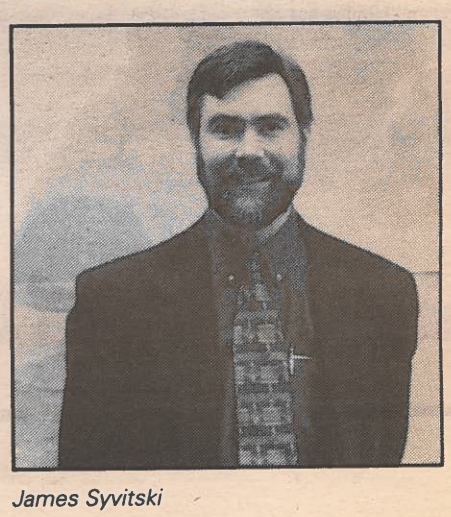
Karl came with previous experience, having taught a variety of introductory geology courses, as well as structure at both the undergraduate and graduate levels. So far he has taught the undergraduate structure course and historical geology. Soon he will add the undergraduate structure field course, a graduate course in Neotectonics, and the Advanced Structure Seminar. With the national interest in neotectonics, we look forward to this new addition to our offerings. Surely students interested in consulting can now combine neotectonics, geochemistry, and groundwater and be well prepared for a position in an industry that covers a wide variety of tasks.

James Syvitski

James Syvitski was chosen as the new director of INSTAAR following the retirement of Mark Meier. Although the director can have a background in biology, geography, or geology, because James is a geologist he was invited to join our faculty. James has had a fairly broad background, and it all started when he received two undergraduate degrees from Lakehead University, one in Geology and Mathematics and one in Geochemistry. Lakehead happens to be at the head of Lake Superior at Thunder Bay, Ontario. Not to be outdone, he went for two Ph.D. degrees at the University of British Colombia, one in Geological Sciences and the other in Oceanography (1978). During his undergraduate days he worked as a geologist/geochemist for Falconbridge Mines. Following the Ph.D., he taught for several years at the University of Calgary. In 1981, however, he moved on to the Bedford Institute of Oceanography of the Geological Survey of Canada.

James is well known for his work in sedimentology. On land, he has studied the geomorphic and tectonic controls of small mountain streams on sediment discharge to the ocean. Most of his work, however, is in sedimentology in the shallow marine environment, generally offshore of glaciated terrain. Data are obtained by extensive coring from marine vessels, and to this he has added seismic stratigraphy. Former students who worked on Baffin Island will recognize many of the fjords James has worked in, including Cambridge, Itirbilung, McBeth, Sunneshine, and Maktak. Offshore Greenland and Antarctica also have received his attention. Because he wants to model the entire sediment–facies package, he also has worked on deltas, submarine fans and turbidity currents. The overall goal is to model the land-to-sea environment, with a concentration on the Arctic.

James will offer several courses. He currently is teaching Quantitative Dynamic Stratigraphy, designed to demonstrate how numerical approaches to stratigraphic problems are developed. Students will also work on the development of simulation models. It is hoped students can use these approaches in such diverse applications as placer mining, pollution studies, military geology, hazards, and reservoir characterization. In the future, he will offer Coastal Processes. That course will cover the physical processes that shape the sediment deposits in a wide range of environments, such as estuaries, deltas, barrier islands/beaches/lagoons, fjords, glaciated coast settings, paraglacial coasts, tidal flats, and mangroves. James is a welcome addition to our already strong programs in sedimentation, stratigraphy, and paleontology.

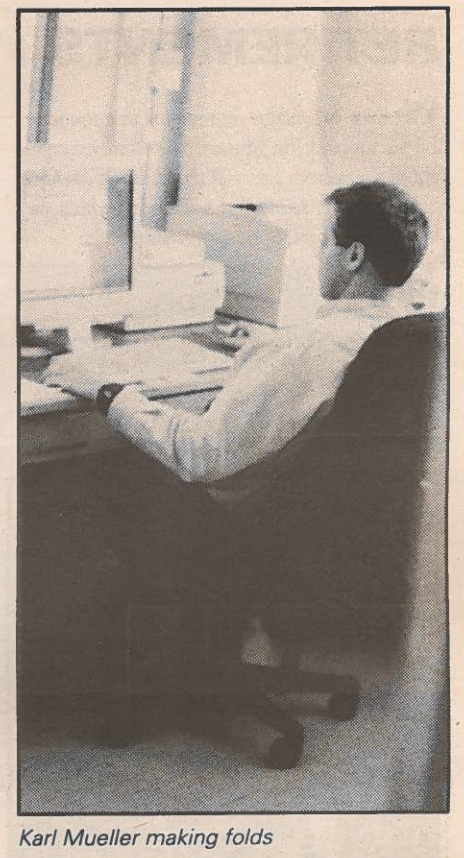


James Syvitski

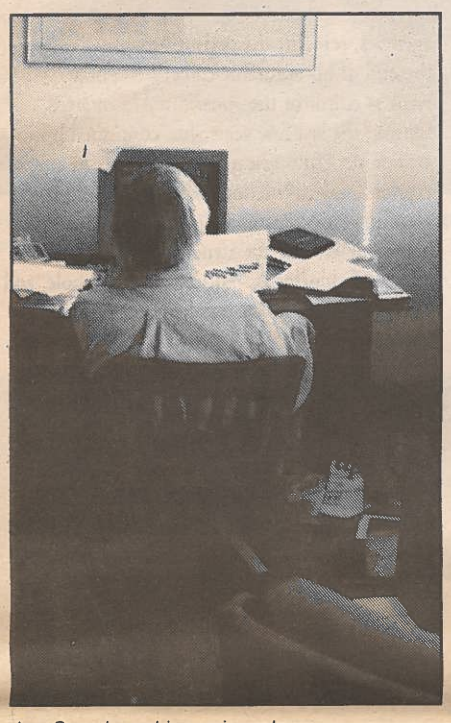
Shemin Ge water witching via ccmputer for the ground water table

Mark Rowen working on the salt tectonics in the Gulf

Somebody gets into the field! Anne Sheehan servicing a seismic station in Utah



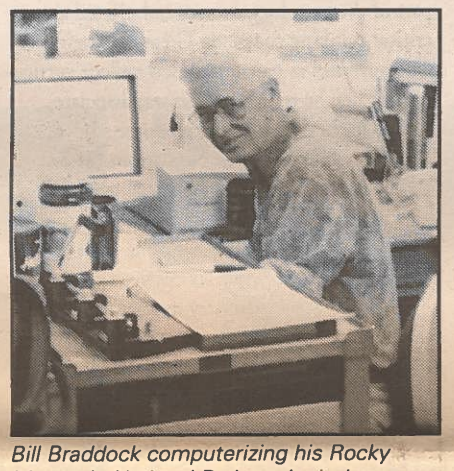
Karl Mueller making folds



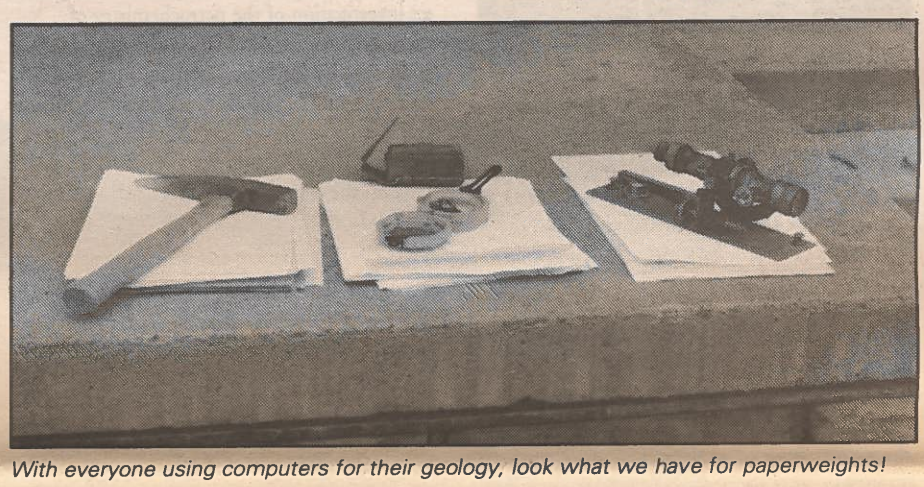
Joe Smyth making minerals

The New Geology

(computers reign)



Bill Braddock computerizing his Rocky Mountain National Park geological map

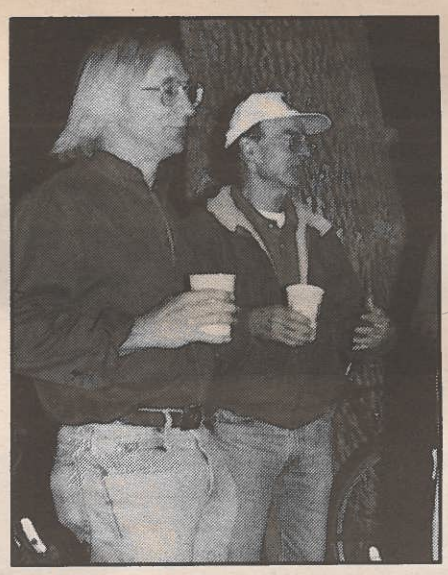


With everyone using computers for their geology, look what we have for paperweights!

Fall Picnic

The Fall picnic took place on a cold evening at Eben Fine Park on Boulder Creek. Here are some of the people there.

Becky Preston, Chuck (Platehead) Stern, and John Roesink



Joe Smyth and Ed Larson

Chuck Patterson and Tina Wells talking with Craig Jones

Alex Skewes and Jeff Swope

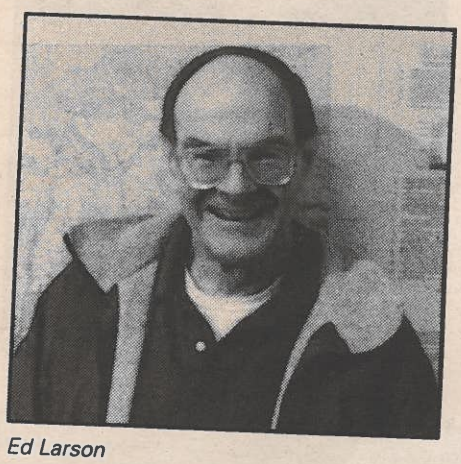
The next generation, Tina Kraus and Connie Ge

RETIREMENTS

We have two major retirements to announce, Ed Larson and Jim Munoz. Below are excerpts about them from Larry Warner's book *Profile of a Department: Geological Sciences*, to which we have added some of our own comments.

Edwin E. Larson

Ed earned his early degrees from UCLA (B.A., 1954, M.A., 1958) then, after a stint with Humble Oil Company looking for oil in the volcanic rocks of Oregon, came to this



Ed Larson

department for the Ph.D. degree. He worked with Prof. Dave Strangway and received the degree in 1965. He joined the faculty here in the fall of 1966, following post-doctoral work at Massachusetts Institute of Technology and the University of Tokyo. Ed's major training is in geology, but his background in physics and mathematics enables him to bridge the gap between geology and geophysics in ways that few of his contemporaries have achieved. This background was a major factor in his being selected. His courses in rock physics and paleomagnetism, built upon foundations laid by Strangway, were immediately popular. Because volcanic rocks trend to be important paleomagnetic markers, he acquired an interest in volcanology. Ed has been one of the best teachers in the Department in both undergraduate and graduate classes, and in the spring of 1986 he received the highest honor, a Teaching Award by the Boulder Faculty Assembly.

In the three decades that he has been affiliated with the Department, Larson's research activities have included improvements in application of paleomagnetic techniques to geologic problems, including studies of lunar and deep-sea samples, magnetism of meteorites, ages of paleomagnetic events ranging from the Precambrian to the Quaternary, development of chemical remanent magnetization during the formation of red beds (in collaboration with Ted Walker), and timing of continental breakup around the Atlantic. In more recent years he worked on the paleomagnetic signals in the sediments of Pleistocene Lake Tekopa in California, joined Emmett Evanoff for a study to locate the calderas responsible for the Tertiary ash beds of Wyoming, Nebraska, and Colorado and showed that they originated in the Great Basin, and now is doing rare-earth element analysis to figure out where Pete Birkeland's Pacific Island soils came from. He played a major role in the three editions of Putnam's *Geology* (coauthored with Pete), and it once (before the books were published in full color) was a widely used text for beginning students. In his undergraduate days Ed even took a course from Putnam himself! During the early seventies, Ed participated with Japanese colleagues in an investigation of the petrochemistry of extrusive rocks in the Mariana Islands, a project sponsored by the U.S.-Japan Scientific Cooperation Study Group. This led to more collaborative work on the volcanic rocks in the Aspen-Glenwood Springs area, which produced good data on the timing of the downcutting of the Colorado River.

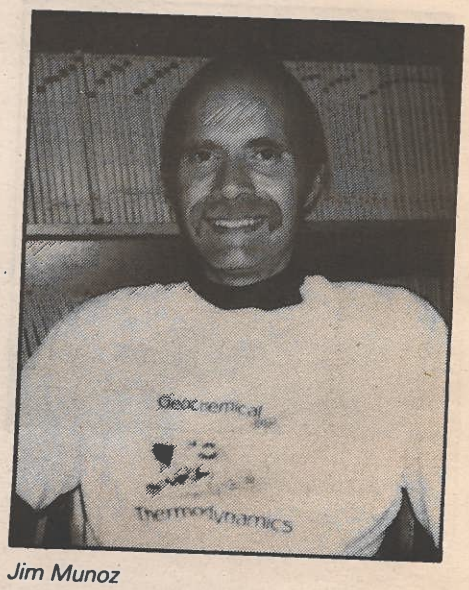
The Department has had many generalists in the faculty, and Ed could be the last of these to retire. His breadth in teaching and research will be missed by all. Right up to the end, he was teaching introductory geology (last class was in a tuxedo); in place of historical geology he and Jim Munoz taught a 2nd-semester course on the geology of Colorado; he helped develop the new 2nd-year field class; he continued to teach part of the petrology class, tectonic part of the senior geophysics and tectonics class; and his graduate classes in rock magnetism and volcanology. He also never lost his touch at careful (red ink) editing of theses and manuscripts. Any of us needing a dose of reality always had Ed to lean on.

Ed will continue to live in Boulder and keep his office. Actually, there is so much equipment and rocks in the office that he cannot leave it! He will continue with his research.

James L. Munoz

When the Department decided to strengthen its program in geochemistry to include studies of high temperature-pressure reactions related to igneous and metamorphic petrology and the formation of ore deposits, the person selected for the task was Jim Munoz. Jim earned a B.A. degree in chemistry from Princeton in 1957. He then moved on to Johns Hopkins, and received his Ph.D. in geology in 1966. At the time he was being considered for the job here, Jim was a postdoctoral fellow at the Geophysical Laboratory, Carnegie Institute, Washington. Arriving in Boulder in the fall of 1968, he began immediately to equip a laboratory for teaching and research in experimental mineralogy and petrology. Jim's major early teaching effort was in developing courses in thermodynamics, phase relationships, and hydrothermal geochemistry for advanced students. However, he also taught introductory geology, joined with Ed Larson in a popular course on the geology of Colorado, taught a part of the petrology course, and offered a critical thinking course on Great Geological Controversies as part of the new college curriculum. When he retired he also was associate chairman, in charge of the graduate students. With an alumnus, D. K. Nordstrom (M.S., 1971), he coauthored an advanced text *Geochemical Thermodynamics*. The second edition of this successful text came out in 1994.

Jim's research interests centered mainly upon halogen geochemistry in relationship to the stability fields of micas, garnets, and amphiboles, and the mineralogy of hydrothermal alteration assemblages. His efforts have led to the development of prospecting criteria that have potential application to a search for ore deposits. This work, supported by the National Science Foundation and other government



Jim Munoz

agencies, remains the definitive work. Toward the end of his academic career here, he served a term as editor of the *American Mineralogist*. During the last few years, Jim continued his atomic structure research on micas using single-crystal X-ray diffraction. With a crystallographic group that included undergraduates, he helped determine the structural location and effects of chlorine in biotite and amphibole, and cation ordering in the octahedral layers of biotites.

As many of Jim's students and colleagues know, he has a love for photography, and a great collection of photographs, especially of old mines and mining towns. He used many of these slides to illustrate his course (cotaught with Ed Larson) on the geology of Colorado. Jim still lives in Boulder and volunteers as a marketing person for E-Town (radio music and variety shows on NPR, with an environmental twist). He has contemplated moving to Helena, Montana and taking up photography full time.

Both Jim and Ed had a gift for helping students in many ways, in and outside of geology. We will miss having faculty as relaxed, enthusiastic, and helpful as they have been.

New Faces in the Front Office

The Departmental Front Office has always been perhaps the most important office in the Geology Building. As the central clearing house for all Departmental activities, it is the one place that impacts everyone on a daily basis. Most Alumni know that Edith Ellis, who oversaw the operation of the Front Office for 25 years, retired in 1994. Many of us in the Department wondered how we were ever going to keep the Department running on a day-to-day basis without Edith. And indeed, it hasn't been easy. But now we have new faces in the Front Office; the Department has survived the transition period and is running smoothly once again.

Not surprisingly, the administrative needs of our Department have changed over the years. Having many faculty affiliated with other units, and a new push to develop interdisciplinary course offerings, it is more important than ever that Geological Sciences interact on a regular basis with other primary units on campus. To facilitate this interaction at the administrative level, we reprogrammed Edith's position to a newly defined "Assistant to the Dean" title, a job that is designed to promote interaction between units. After a long search, we hired Beth Hanson to fill this position last June. Beth spent several years with the Institute of Behavioral Sciences at CU and had a brief stint in Athletics before joining the Department. She has focused her considerable talents toward streamlining the operation of the Front Office, networking across campus, and making sure that we are providing the services needed by our faculty and students. Beth was also able to persuade one of her former colleagues, Rebekah Tan, to transfer into the Department to take over as Accountant, a position recently vacated by the retirement of Mary Wikoff. Rebekah has made great inroads in developing an improved system to track the myriad Departmental accounts and to make the financial statements decipherable to the faculty. We all appreciate her efforts.

The needs of the students are looked after by Lynn Jackson and Kathe Kelley. Lynn handles all graduate admissions activities and the seemingly impossible job of scheduling courses in our various classrooms, as well as trying to match faculty requests for specific times with room availability. Inevitably, someone has to teach those 8 o'clocks though, and everyone's favorite, 4 to 5 pm on Friday. Through all the trials, Lynn somehow manages to keep a sense of humor. Kathe handles all the drop-add requests and a range of other student needs. Together, Kathe and Lynn answer the seemingly endless range of questions posed by students (and faculty for that matter). Collectively, they now know more about the University than most of the rest of us. Our thanks to all the staff for their efforts to keep the program on track.

Office line up (l to r): Rebekah Tan, Lynn Jackson, Kathe Kelley, and Beth Hanson

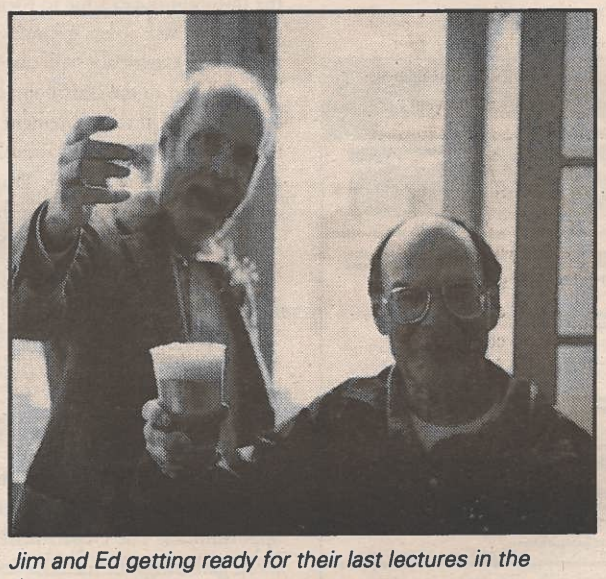
Emeritus Professors

The emeritus professors who remain close to the Department have had a busy year. Bill Braddock continues to teach the undergraduate computer course and, not to be outdone by the younger generation, is computerizing his local geological maps. Bill Bradley soon changes his skis for a raft as he leads float–geology trips through the canyons of Utah. Jack Edwards is polishing up a paper on world oil resources and consumption to be published in a future issue of the *AAPG Bulletin*. This is Don Eicher's big teaching semester, with both historical geology and introductory field being taught. They head for the United Kingdom for part of the summer. Carl Kisslinger was very busy helping to put on the 21st meeting of the International Union of Geodesy and Geophysics. This successful meeting was on the Boulder campus in the summer. Mark Meier is a common sight at INSTAAR with a few teaching responsibilities, but mostly research. Don Runnells continues to head a successful consulting firm in Ft. Collins (Shephard and Miller). They continue to add CU graduates to their staff, and his main job here is as dissertation advisor to Chuck Patterson. Ted Walker continues his bike trips through Germany and Austria, and will add Switzerland this coming summer. He and Barbara are taking a German course, and he is so overworked by homework that they have curtailed their downhill skiing.

RETIREMENT PARTY

The retirement party for Ed Larson and Jim Munoz was a great success, with many alums in attendance. We combined it with students awards. Here are photos of some who came. Unfortunately the department photographer, Pete Birkeland, again shot a lot of photographs that came out too dark. He is being sent to a photo class!

John Rold, now a consulting geologist, and Steve Colman, advisory board.

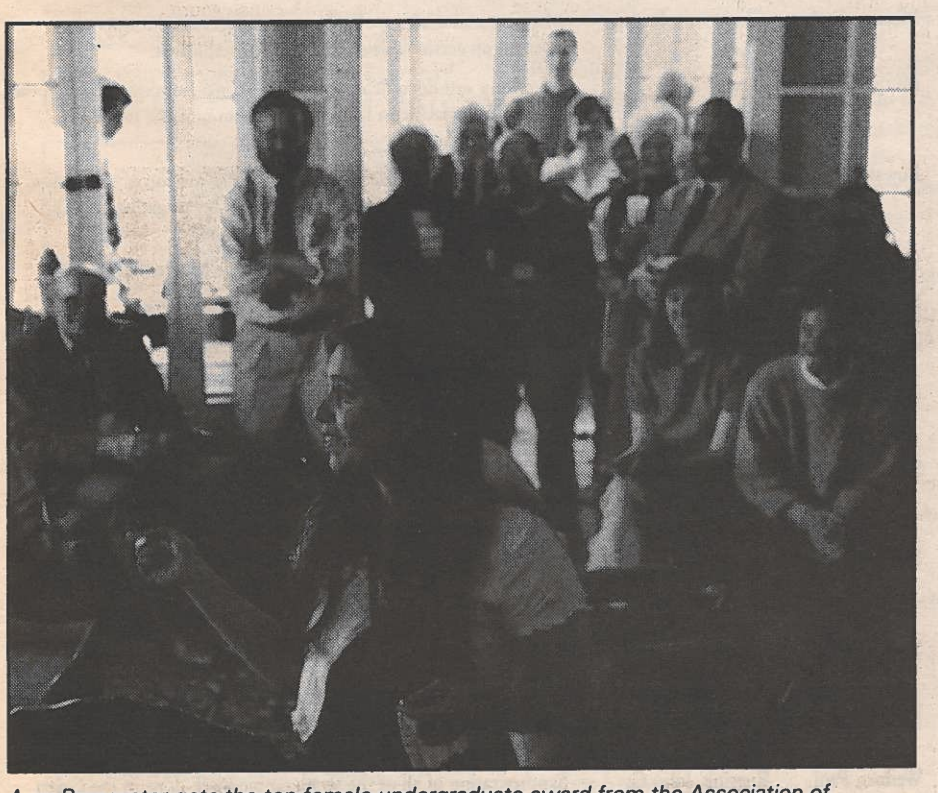


Jim and Ed getting ready for their last lectures in the department.

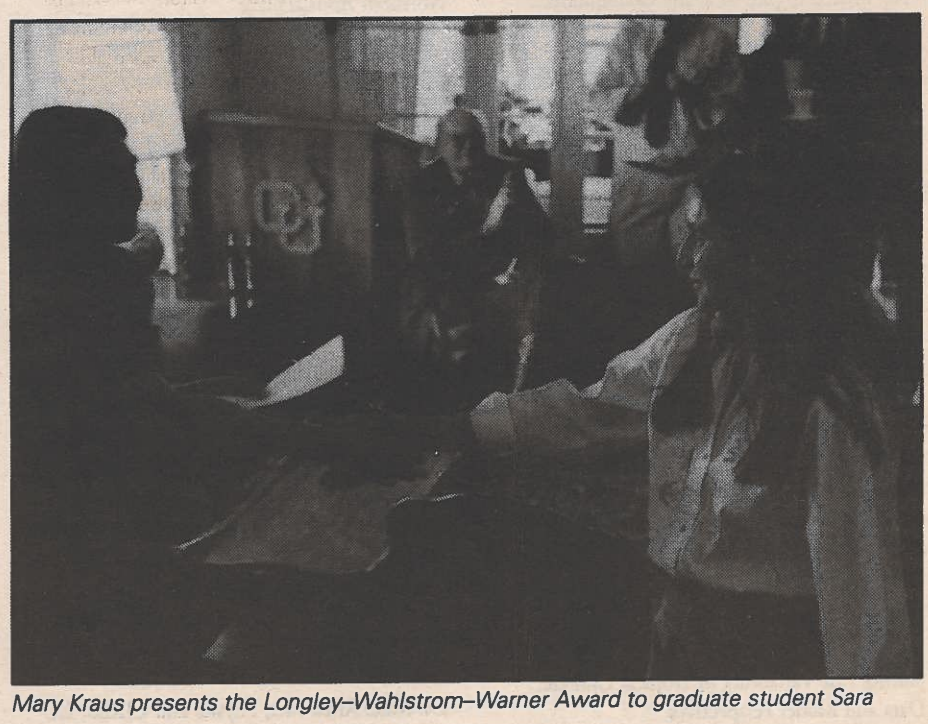
Edith Ellis, Red Bed Ted, and Paulina Franz.

Dave Elwood, a friend of the department for years, Fred Luiszer, the caver and Ed's last student, and advisory board member Bill Meyers.

It was a full house.



Amy Rosewater gets the top female undergraduate award from the Association of Women Geologists.



Mary Kraus presents the Longley–Wahlstrom–Warner Award to graduate student Sara

Geology Goes On-line

The Department is now on the information highway. Our web page is at:

http://www.colorado.edu/GeolSci/

Check it out for the latest news. You can also contact us at

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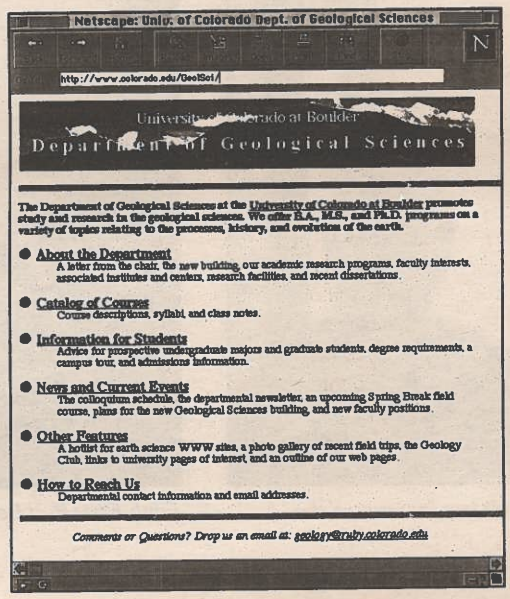

Here's a look at the new Department web page. For a better view, go to http://www.colorado.edu/GeolSci/

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Colloquium

The departmental Colloquium during 1995 covered a variety of subjects. Following are the speakers and their topics. Local alums are especially invited to join us at the Colloquium.

Dr. Scott Lehman, Woods Hole Oceanographic Institute, "Was the Ocean a Tropical Heat Drain During the Last Glacial Maximum?"

Dr. Roger Bilham, Geological Sciences and CIRES, CU-Boulder, "A Massive Earthquake in the Himalaya—Never or Now?"

Dr. Ken Dueker, University of Oregon, "Origins of Upper Mantle Heterogeneity in the Western U.S."

Dr. Paul Hsieh, USGS, "A Multidiciplinary, Multiscale Investigation of Fluid Flow and Solute Transport in Fractured Crystalline Rocks: Findings from the Mirror Lake Site, New Hampshire"

Dr. John Wahr, CIRES and Physics, CU-Boulder, "The Use of Geodetic Techniques to Learn About Changes in Polar Ice"

Dr. Ned Field, USC/SCEC, "Influence of Surface Geology on Earthquake Motion"

Dr. Julia Cole, INSTAAR, CU Boulder, "Exploring Past Variability in Tropical Climate: Data and Model Perspectives"

Dr. Vicki Hansen, Southern Methodist University, "Late Paleozoic to Mesozoic Evolution of Terrane Boundaries, Northern North America Cordillera: Implications for Terrane Accretion and Continental Growth"

Dr. Mary Hubbard, University of Maine, "Orogen-parallel Strike-slip Deformation: Examples from the Western Alps and the Northern Appalachians"

Dr. Gary Axen, "Patterns of Cenozoic Extension and Magmatism, Western North America, and Some Possible Lithospheric Controls on Their Evolution"

Dr. Karl Mueller, "Growth and Propagation of Active Fault-Related Folds: Implications for Blind Thrust Earthquakes in Southern California"

Dr. Karen Carter, "Fractal Nature, Kinematics and Geometry of Normal Faults in the Central Rio Grande Rift, NM: Implications for Fault Growth and Brittle Strain"

Dr. Tad Pfeffer, INSTAAR, CU-Boulder, "Physical Insight: Direct Measurement of Internal Velocity Field in a Glacier"

Dr. Don Turcotte, Cornell University, "Applications of Complexity to Natural Hazards, from Earthquakes to Floods"

Dr. Ed Brook, "Exposure Dates and Erosion Rates: Using In-situ Cosmogenic Nuclides for Geochronometry"

Dr. Mike Ritzwoller, Physics and CIRES, CU-Boulder, "Seismic Tomography of the Earth"

Dr. Mark Rowan, Geological Sciences, CU-Boulder, "Extension—Is It Always a Dominant Process in Gulf of Mexico Salt Tectonics?"

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Engaging Undergraduates in the Research Enterprise: The Department's Mentoring Program for Geology Majors

Many undergraduates remain uncertain about the possibilities available to them as Geology majors and lack access to professional information. Their experience with our profession is too often limited to the classroom; rarely have they been engaged in the excitement of geological discovery. To remedy this situation, the Department sponsors a Mentoring Program. The goal of the program is simultaneously to enhance the educational environment for undergraduate majors and to facilitate research in the Department. Funds are available to 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 an 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.

The Department is able to offer the Mentoring Program through the generous gifts of our friends and alumni and contributions from the private sector. We feel that mentoring is one of the most effective investments we can make in our program. The undergraduate majors benefit by being exposured at an early point in their careers to the research environment and by developing personal ties to graduate students and faculty. Faculty and 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 recently recognized our Mentoring Program as one of the best examples on the Boulder campus of personalizing the educational experience for undergraduates.

For the 1995–1996 fiscal year, the first year of the program, the Department awarded 29 Mentoring grants, averaging $1000 each. Response from the students and their mentors has been uniformly favorable. A list of mentor projects and individuals involved is tabulated below.

Mentor	Mentoree	Project
Birkeland, P.	Russell, John	Revision of the book *Soils and Geomorphology*. Student to assist with layout and graphics.
Budd, David	Harrington, Elizabeth	Studies of the Cenozoic carbonates of Florida, focusing on the nature, origin, and evolution of permeability in the carbonate rocks that constitute the Upper Floridan aquifer.
Hiatt, Eric	Harrington, Elizabeth	Geochemical and petrographic analysis of sedimentary rocks from the Permian Phosphoria Rock Complex of eastern Idaho and western Wyoming.
Drexler, John	Triplett, Laura	Bioavailability of lead phosphates.
Evanoff, Emmett	Corkem, Miles	Migrations, extinctions, and evolution of the fossil groups in the upper 500 m of the middle Eocene Bridger Formation in Uinta County, southwest Wyoming.
Jakosky, Bruce	Grant, Karen	Field trips in Planetary Geology to Yellowstone and associated volcanic fields and rock glaciers in Wyoming.
Kaplan, Michael	Stephenson, C.	Late Quatenary Ice-sheet Dynamics in Frobisher Bay, Eastern Canadian Arctic: A Paleoclimatic Signal?
Kauffman, Erle	Sosulski, John	Paleontological study of Cretaceous reef ecosystems in the Caribbean Province.
Kraus, Mary	McHugh, Maureen	The study of Eocene fluvial rocks and associated paleosols in the Bighorn Basin, Wyoming.
Lester, Alan	Gariote, Mick	The study of pegmatite origin in the Front Range through the application of X-ray-fluorescence trace-element analysis.
Licht, Kathy	Manzo, Rosemarie	The glacial history of the Ross Sea, Antarctica, during and since the last glacial maximum.
Lubinski, David	Krebs, Birget	Holocene marine conditions and glacier extent on Franz Josef Land, high arctic Russia.
Martinez, Sara	Gilmore, A.	Field measurement and lab processing of electromagnetic spectrum of hydrothermal alteration areas corresponding to an epithermal system in Sonora, Mexico.
Mueller, Karl	Champion, Jocasta	Mapping and drafting of geologic cross sections in support of research on active fault-related folds in California.
Murphey, Paul	Burger, Benja	The study and documentation of the faunal transition between the Bridgerian and Uintan land mammal ages near the top of the Bridger Formation.
Rowan, Mark	Cosby, Jim	Ongoing research into the geometry and evolution of salt bodies in the Gulf of Mexico, and a new project investigating the four-dimensional growth of contractional folds.
Sauer, Peter	Quinlivan, Megan	Records of environmental change in arctic lake sediments.
Sheehan, Anne	Bartsch, Julie	Colorado Plateau–Great Basin Seismic Experiment.
Sloan, Valerie	Bulicki, Katarzyna	Modeling Glacier Response to Climate Change in the Yukon Using a Geographic Information System
Smith, Henrietta	Preston, Rebecca	Research involving X-ray diffraction studies of garnet crystal structure.
Smyth, Joe	Jacobsen, Stephen	The crystal structure of thaumasite and the effect of temperature on these unusual chemical bonds which may be of significance for high-pressure phases.
Stern, Chuck	Larner, Michael	Fingerprinting the petrochemistry of obsidian artifacts from southern Patagonia and determing the source and distribution of specific obsidian types.
Swope, Jeffrey	Cykoski, Michael	Research in studies of a single-crystal X-ray diffraction study of mid-range biotite.
Trudgill, Bruce	Crow, Ryan	Remapping of the Perdido Foldbelt in terms of its structure and stratigraphy.
Weimer, Paul	Ruesink, John G.	Synthesization of all of the stratigraphic work done in the Green Canyon in the northern Gulf of Mexico.
Yuhas, Roberta	Sickels, Heather	Landscape Response to Holocene Climate Change: Evidence from Remotely Sensed Data and Ground-Based Studies in Northeastern Colorado

Faculty News

John Andrews

Last year John had a full year, with teaching four courses. Although there is a lot of press about the dedication, or lack thereof, of the lecturers, he thinks we might equally take a hard look at the dedication and interest of many of the undergraduates! Enough of the gripes.

In many respects the highlight of the year for Martha and John was a work/vacation trip in June to Canada. They first went to Montreal for a McGill reunion and then on to St. Johns, Newfoundland, for the meeting of the Canadian Quaternary Association (CANQUA). He had been asked to give the keynote speech on Heinrich events and the Laurentide Ice Sheet. There were several old CU-ers at the meeting, including such luminaries as Tom Davis, Peter Clark, Art Dyke, David Sharp, and John England; and Valerie Sloan (present graduate student from Canada) also made the trip to the northeast. You all may not know that Newfoundland time is 3.5 hrs ahead of us—not 3, not 4, but 3.5 hrs!

John and Martha had a great post-conference field trip along the western side of the northern Newfoundland Peninsula as far north as St. Antonys. Icebergs were plentiful in the northern waters and this, combined with great weather, made the views spectacular. The field trip was partly led by Ian Brooks who spent some time on sabbatical at Boulder. In many ways the highlight of the trip was a visit to the only authenticated Viking site in North America, L'Anse aux Meadows. The site is a Canadian National Park and they have reconstructed several of the very large sod houses that were erected on the site ca. 1000 A.D.—well worth a visit. After the field trip they flew to Halifax and then vacationed in the Gaspe and Maine.

The marine high-latitude paleo group, housed at INSTAAR, consists of John and Anne Jennings (Assistant Professor attendant rank), and Nancy Weiner, Micropaleo Technician (B.A., Geological Sciences CU; M.S., Illinois). Together they have about 6 graduate students, both Ph.D. and M.S., working on a variety of projects from Iceland (Jorunn Hardardottir) to east Greenland (Tom Cooper, Mickey Smith, Andrew Stein), to the Labrador Sea and Hudson Strait (Donnie Barber and Matt Kirby), and finally the Ross Sea, Antarctica (Kathy Licht and Wendy Cunningham). In addition, Valerie Sloan and Patti Best kept a terrestrial component in the group with their work in the Yukon and on the magnetics of lake sediments from northern California and southern Oregon, respectively. Kathy Licht, Nancy Weiner, and Jiang Xiao ventured south and had a 6-week cruise in the Ross Sea, Antarctica, ending up in New Zealand. In the next year or so they hope that the group will have additional cruises off east Greenland, northwest Iceland, and the Canadian offshore area.

John was honored to be elected a member of the Norwegian Academy of Sciences and Letters in May 1995.

Bill Atkinson

The mineral deposits program was alive and well in 1995! Graduate students included 5 who are active, taking courses, and working on theses, and 3 working full-time, writing their theses in their spare time. One, Craig Bruno, graduated in May, having done a thesis on a red-bed copper deposit just south of Ciudad Juárez, Mexico. He was sponsored by Tenneco, through EMARC. The active ones include Armando Zaragoza, from Mexico, doing a study of an area in the Sierra Madre Occidental in Chihuahua that includes a giant caldera and many gold and silver deposits. He is sponsored by Peñoles, Mexico's largest mining company. Lupe Espinoza, also from Mexico, started a thesis near Rayón, Sonora, Mexico, on a deposit located in a probable caldera. His objectives are to study relations between mineral deposits and calderas, in part using remote sensing. Sara Martínez, of Barcelona, Spain, is also working in Sonora, studying the use of remote sensing methods to evaluate the zonation of mineral deposits. She completed her second field season in Mexico. Alex Iriondo, also from Spain, is working on a thesis in the far northwest of Sonora, just south of Phoenix, Arizona, studying the structural setting of gold mines in an area of mylonites and flat faults—quite challenging. He spent the summer in Australia with his family studying remote sensing. Abbas Sharaky, from Egypt, is working on a model of zonation of deposits, using Jamestown, Colorado, as a model. He went to Egypt in September, sponsored by one of our mineral deposits alumni, Avrom Howard, to look at a possible thesis on a prospect being examined by Avrom. Those working on theses part time include Paul Boni, John Gray, and Michele Murray. We wish them success in finishing!

Bill was on sabbatical during the spring semester. He spent two months mapping near Moctezuma, Sonora, Mexico, in an area of many small gold deposits in volcanic rocks. He gave slide shows of other countries where he has traveled (Chile, Spain, Iran, Perú, etc.) to the local ranchers. They greatly enjoyed them, but asked if he couldn't bring slides of Mexico next time. He led a Department field trip to Winnemucca, Nevada, to visit a mining exploration project of one of our successful alumni, Gary Grauberger. The group was impressed by the huge, gold-bearing fossil hot spring system being drilled, shivered in the snowy weather, and enjoyed being taken out to dinner at a Basque restaurant by Gary. During the fall semester, Bill taught Introductory Geology, a seminar in mineral deposits, and ore petrography, a lab course to teach the thin section, polished section, and X-ray study of ore deposits. Trying to get connected with e-mail occupied the rest of his time since October!

Roger Bilham and Himalayan Studies

In 1774 King Prithwi Narayan likened his country, Nepal, to a gourd between two rocks. He was referring to the delicate political and economic position of Nepal between China and India. He could not have known that his nation was actually contracting as the two rocks, the Indian plate and the Tibetan Plateau, approached each other. The 0.5 inch/year convergence between India and Tibet, which is responsible for the vertical growth of the Himalaya, results in a north-south reduction in area corresponding to roughly one baseball park per year. Hitherto this rate has been determined from indirect evidence, but now Roger's group is calculating the very first direct measurement of this convergence.

In 1995 they remeasured, many for the first time, the Himalayan points that they first measured with GPS geodesy in 1991. The accuracy of the 1991 and 1995 measurements is thought to be on the order of 6 mm, providing a rate uncertainty of less than 3 mm/year, adequate to constrain the Himalayan convergence rate to an accuracy of approximately 10%. In addition to the 22 points in Nepal that they measured together with two geodetic groups from France, led by Patrick LeFort and Jean-Paul Avouac, points in southern Tibet were measured by a team from the University of Alaska led by Jeff Freymuller, and points in the central Himalaya and northern India were measured by a team from the University of Bangalore led by Vinod Gaur. Altogether 25 teams of GPS operators worked across the 1000–km–wide collision zone between the Eurasian and Indian plates. A prodigious data editing and GPS orbit calculation is being undertaken by Prof. Kristine Larson of CU Aerospace Engineering and will be complete in early 1996.

While these remeasurements and the establishment of 30 new points were being undertaken, CU graduate student Frederick Blume and Lin Denham, a surveyor from Colorado, were undertaking a remeasurement project of a different kind. Fred's thesis is aimed at understanding the rupture zones of great earthquakes in the Himalaya, one of which ruptured beneath eastern Nepal in 1934. It so happens that in 1950, a few years after the earthquake, the Survey of India decided to measure the height and position of Everest, and in so doing established a network of height and position marks on peaks in a north-south line to the borders of India. Fred carried CU's gravimeter (given to us many years ago by Lucien LaCoste) to the summits of these peaks where he also measured their GPS positions. The measurements required a 200-mile hike and the ascent and descent of 26 miles vertically over a period of 7 weeks! He will use the data to search for viscous adjustments following the 1934 earthquake and to estimate an accurate geoid/ellipsoid separation for the Everest region.

While Fred was completing these measurements, Rebecca Bendick was initiating a search for buckling of the Indian continent resulting from the Himalayan collision. The 1994 GPS measurements in southern India showed that, as expected, the Indian continent is deforming very slowly, if at all (less than 10 nanostrain per year since the early days of the British Raj). Yet earthquakes continue to occur and some of them, though small (Richter M=6), are devastating. The Indian plate south of India is clearly buckling under the pressures of the Himalayan collision. Could the older part of the oceanic plate and part of the subcontinent also be buckling, thereby concentrating stresses locally? Their search concentrated on the magical Malabar coast of India, bristling with Portuguese forts from the days of the spice wars. They examined reports of sunken cities and coastal upheavals described in 18th century manuscripts, and recent reports of dead oyster beds, all indicators of localized vertical motions, but found no historical markers that unequivocally told of vertical motions. Erosional-accretional processes were evidently the reason for changes in coastal features. However, evidence for localized Quaternary motion was evident in the form of gently deformed coastal cliffs and subsurface basins. The rate of deformation of these features is consistent with the slow rate of deformation of southern India measured by GPS, suggesting that buckling may indeed concentrate stresses locally. Further work is necessary on other parts of the Indian coast to reconcile gravity, geological, and offshore marine data to establish a coherent interpretation of continental buckling and seismicity.

Meanwhile, in order to improve the accuracy with which they are able to measure the Himalayan collision, they have initiated the installation of a network of continuous GPS observations in the Himalaya. These are GPS instruments operating autonomously on solar power whose data are transmitted via radio and internet links to Boulder for daily processing. In theory they should be able to obtain 1 mm accuracy from these units, thus opening up a whole new field of real-time Himalayan tectonics. The first of these installations was initiated in December 1995 near Kathmandu and data are being transferred to CU regularly. The installation of the second fixed GPS installation near Mount Everest will be filmed by an IMAX camera crew in April 1996. Several more are planned next year, both in Nepal and in the Indian Himalaya. The Everest installation calls for a weather station/microwave repeater link to be installed on the south summit! Any volunteers

Shemin Ge

Shemin has devoted much of her time to teaching and several research projects. One project, started in 1995, involves studying the coupled effects among subsurface fluid flow, heat transfer, and mass transport in geologic media. The research is intended to gain a better understanding of geothermal and geochemical anomalies associated with groundwater movement. The research application is of interest in two geological environments. One is in sedimentary basins where ore deposits and petroleum distributions have been considered partially as a result of large–scale fluid migration. The other is in accretionary prisms where numerous heat and chemical (chloride and methane) anomalies have been observed in the past decade from the Ocean Drilling Programs. Preliminary results suggest that the heat anomalies in accretionary prisms could be caused by several factors, such as convection caused by channelized fluid flow, and by frictional heating along faults or décollements.

Another study initiated in early 1995 is to investigate the hydrological properties of rock fractures. In collaboration with Professor Hartmut Spetzler, both theoretical and experi-

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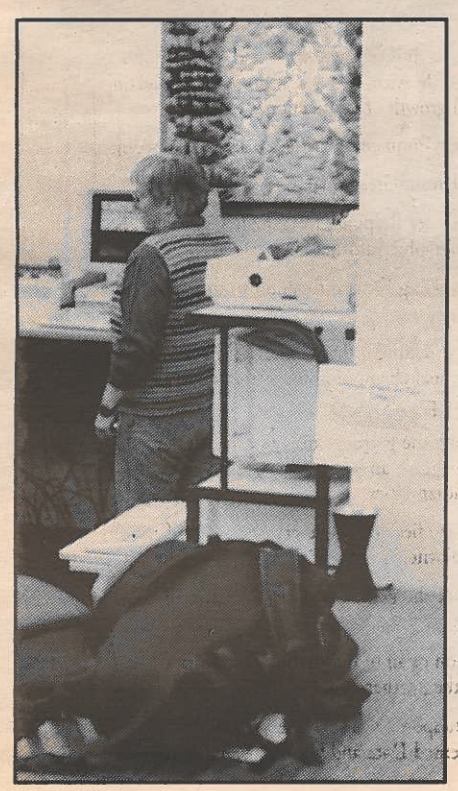
What's New in the Earth Sciences Library?

Planning for the new Jerry Crail Johnson Earth Sciences Library has continued since last Summer's *Geology News*. Unfortunately, however, the building suffered a setback in the original construction timetable and a completion date of fall 1997 is now planned. The Earth Sciences Library will be moved out of the old building following the end of that semester. Let's hope the snow holds off until mid-January!



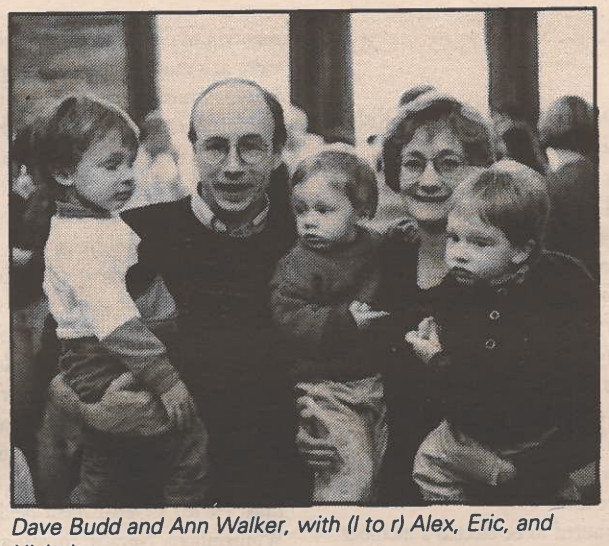
Suzanne Larson seeking references via computer

The new Library is split between the Building's first floor and basement, with circulation, reference, and current periodicals on the first floor and the map collection and stacks on the lower lever. Seating for those using the Library exists on both floors. One primary issue in the planning process has been providing room for the map collection that currently resides in the basement of Norlin Library. Maps are very space intensive. While our new facility will be over 10,000 square feet, lack of space is already a concern with this part of the collection. The maps currently reside in an area of about 2,400 square feet. About that same amount of space has been allotted to the collection in the new area. Currently one staff member works with the collection in Norlin and we hope to augment this with a map librarian in the future. The collection will have a much higher profile in the new Library and we expect the usage to increase dramatically.

If you are interested in looking through the CU Libraries online catalog, we are located at: libraries.colorado.edu on the Internet. When you log in just type the word, Colorado. Suzanne Larsen can be reached at: Suzanne.Larsen@colorado.edu.

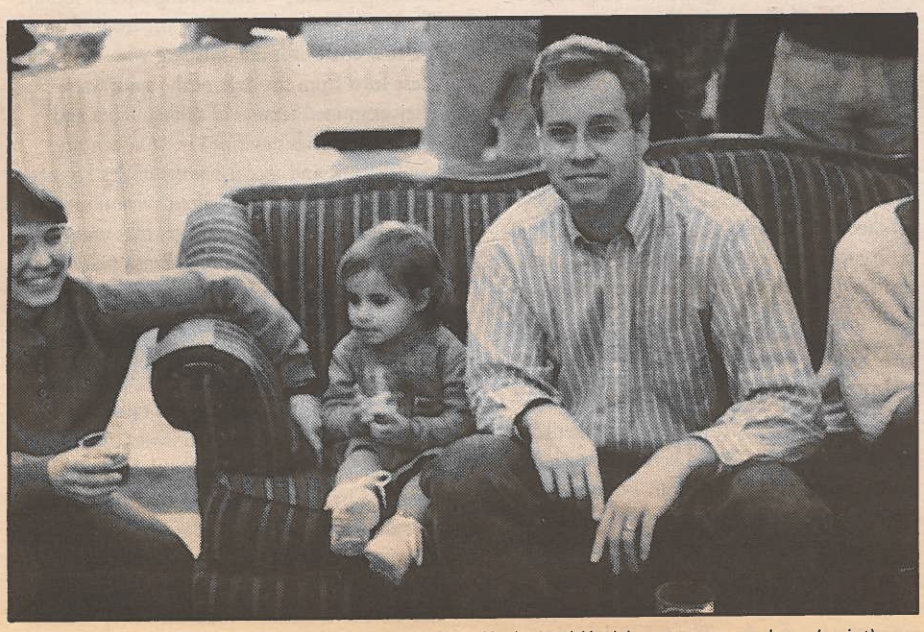
GEOLOGY NEWS

Look who showed up!



Dave Budd and Ann Walker, with (l to r) Alex, Eric, and Nicholas

Paul Weimer with (l to r) Lou (the "Big Hurt" and Rudy (the "Big Cat"). Obviously, they are baseball fans.



Family Mueller, Chris (former undergrad here), Katie and Karl (new structural geologist)

EMARC people (l to r): Tomas Villamil and Claudia Arango (former students and now research associates), and sequence stratigraphy students Gerard Soto, Mario Suarez, and Claudia Malagon

Former student Alan Lester with students (l to r) Mellisa Burke (paleontology), Andy Horn (groundwater), Sara Jones (ultimate frisbee and applied geochemistry), and Elizabeth Sopher (applied geochemistry)

INSTAAR students heading for the food line (l to r): Katie Keller, Kathy Licht, Mikie Smith, and Patti Best

Mary Kraus with her youngest child, Katherine, Beth Hanson (new main office manager), and Colleen Velie (assistant to the EMARC director)

Hooray, it's Christmas!

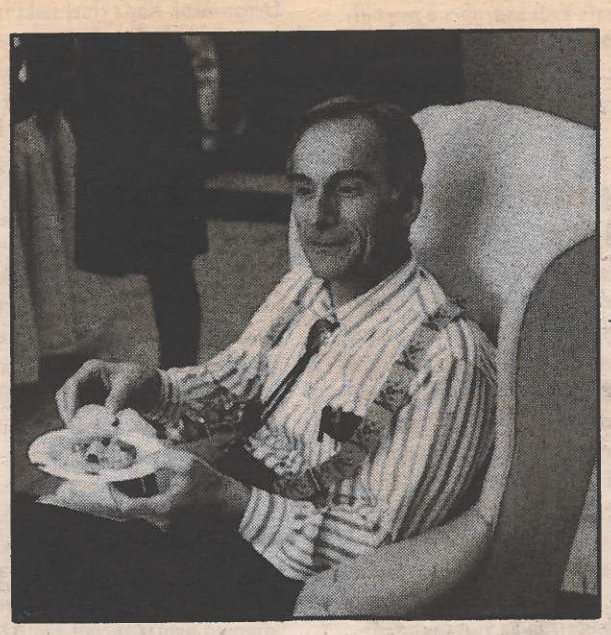
We celebrated with a party at the UMC.

Anne Sheehan and Craig Jones, with Kathryn Sheehan Jones

Shemin Ge and students (r to l) Mike Kaplan (Quaternary), Diane Fritz (geochemistry), and two groundwater students, Miles Waite and Andy Horn.

Giff and Midra Miller

James Syvitski (l) (new head of INSTAAR) and John Rundle

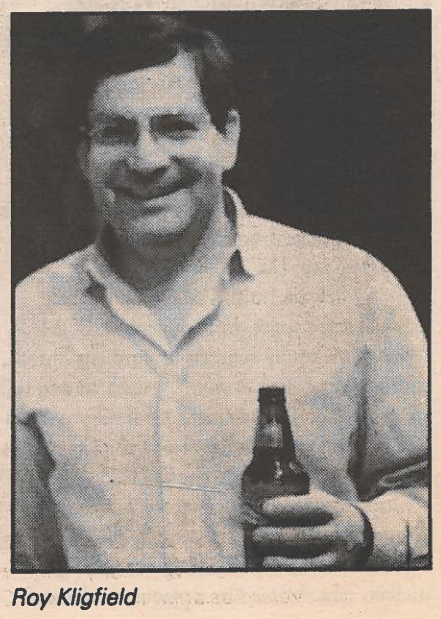


Hartmut Spetzler, relaxing following return from sabbatical

Louise Bradley and Midra Miller.

Chuck Stern and Alex Skewes

John and Martha Andrews and student Ernie Joynt



Roy Kligfield

Faculty News, cont.

mental approaches are employed in the research. Shemin has completed a theoretical derivation of a new governing equation describing flow in rough fractures. The new ingredients incorporated in the equation are the concepts of true aperture and tortuosity, which are not reflected in the well-known Reynolds equation. Graduate student Miles Waite has set up a apparatus to measure the permeability in a smooth fracture. The experiment design for more complex fracture conditions is more challenging and is under way.

Other ongoing research includes perched water formation and capillary flow in unsaturated heterogeneous porous media, which forms the thesis topic for graduate student Jennifer Hinds. Jennifer has performed numerical experiments to look at various controlling factors such as heterogeneity and scale effects. She and Shemin presented the first–phase results at the 1995 Fall AGU meeting.

Graduate student Gordon McCurry continues research on surface water-ground water interaction. The study aims at a better understanding of how water rights transfers could potentially impact baseflow conditions and riparian ecosystems. With some assistance from the city of Boulder, Gordon has obtained useful data on stream flow and groundwater level in the city of Boulder's portion of the Boulder Creek watershed. He and Shemin also presented their latest progress at the 1995 Fall AGU meeting.

On the teaching front, Shemin continues to teach Introduction to Hydrogeology with great enthusiasm. She took the class to a well field in Cottonwood Grove on Boulder Creek just outside the city limits. The students appreciated the real-world experience, had fun "egg-hunting" the 15 wells hidden under many fallen trees (due to a heavy early-winter snowstorm), and mapped the water table in that area. She plans to add a laboratory section to this course as soon as we move into the new building. She also purchased a groundwater simulator and used it in the class to demonstrate how groundwater and contaminants move in porous media. Because the simulator is a portable device, it can be conveniently brought to classrooms. (She encourages anyone interested in using the device to contact her.) In the spring, she taught a graduate–level hydrogeology and modeling class that attracted students from geology, civil engineering, and local environmental firms.

A final note is that two of Shemin's publications have been cited in the 1995 GSA Meinzer Award as papers of distinction in advancing the sciences of hydrology. The award has been made to her former supervisor, Professor Grant Garven of Johns Hopkins University. Three papers were cited in this year's award.

Bill Hay

Bill was in residence at CU during the spring semester. He again taught the Introductory Oceanography course. It has become quite popular and now has long waiting lists each semester. He also taught a more advanced course in Oceanography for seniors and graduate students, Paleoclimatology/Paleoceanography for graduate students, and team-taught Plate Tectonics with Roger Bilham. During early March he hosted the JOIDES Sedimentary Geochemistry and Processes Panel (SGPP) for a three-day meeting held in CIRES. After the end of the semester, he and John Herzog, who had just completed his Ph.D., attended the NASA Graduate Student Researchers Meeting in Washington, D.C.

Bill flew on from Washington to Kiel, Germany, and spent the summer at GEOMAR. It was a fine sunny summer in northern Europe, with plenty of time to work on research and still enjoy the high-latitude sunshine until 9 p.m. In July he attended a conference on the Cretaceous in Berlin, which has become the world's largest construction site. Walking down a street in former East Berlin he accidentally found the high school where Alfred Wegener had been a student, now denoted by a plaque on the wall.

September was a very busy month, starting off with the International Nannoplankton Conference in Copenhagen, Denmark, then right on to a meeting in Brussels, Belgium on Cretaceous stages. Graduate student Rob DeConto flew over and met Bill in Brussels, and they then attended the Annual Meeting of the IGCP Project 362 "Tethyan and Boreal Cretaceous" in Maastricht, the Netherlands. They then made a visit to the Dutch Museum of Natural History in Leiden to discuss plans for paleoclimate exhibits for the new museum building. Bill then returned to Copenhagen for the fall meeting of the JOIDES SGPP while Rob stayed at GEOMAR.

Bill spent the fall semester as *Gastprofessor* in the new Paleontological Institute of the University of Vienna. The new *Geozentrum* of the University of Vienna houses all of the Geological Institutes. It was completed last summer and is part of a huge university complex over the railway yards of on the stations in the northwestern part of the city. The new geology building is very modern, with a five-story atrium about 200 yards long and three glassed-in elevators, and very well equipped. He taught a course in Paleoclimatology and Paleoceanography, and managed to attend concerts and, of course, the premier Viennese institution, the Opera.

In October, Bill attended the annual meeting of the Advisory Board of the Netherlands Research School of Sedimentary Geology. Early in November he taught a weeklong intensive course in Paleoclimatology at the Hungarian Geological Institute in Budapest, sponsored by the Hungarian Academy of Sciences. At the end of October he attended the 5th Zonenshain Conference on Plate Tectonics in Moscow, Russia, where he had a chance to meet many old friends. Early in December, he attended the meeting of the JOIDES Planning Committee in La Jolla, and then, after a few days in Vienna, went to Bremen, Germany, for a workshop on setting up a network for stratigraphic formation about the oceans on the Internet.

Christmas and New Year's in Vienna were wonderful. Friends had come from Kiel for *Sylvester* (New Year's Eve) and, after a magnificent concert of Beethoven's 9th Symphony, they danced the night away, waltzing in the gently falling snow in a party throughout the streets of the old city.

Jakosky and Students Go to Mars

Actually, Professor Bruce Jakosky took the students in his graduate course on the geology and geophysics of Mars to the closest terrestrial analog—Hawaii. Over spring break '95, he and a group of nine students spent a week on the Big Island, looking at volcanic and erosional features that are similar to those seen on Mars. The highlights of the trip included a guided tour of the active front of lava flows associated with an ongoing eruption (led by Carl Thornber, a CU alumnus), a hike up the sides of Mauna Ulu (a twenty-year-old parasitic vent on the side of Kilauea), and a visit to the erosional channels on the volcano's flanks (caused in part by sapping and possibly similar to water-carved valleys on the Martian surface).

Several graduate students are doing research on the Martian surface and atmosphere, and Jakosky is involved in the upcoming spacecraft missions to Mars. The Mars Global Surveyor spacecraft will be launched in late 1996; it is a replacement for the Mars Observer spacecraft that was lost just before it got to Mars in 1993. Jakosky is an Interdisciplinary Scientist on the mission, charged with analyzing the data from all of the instruments that pertain to surface-atmosphere interactions and the seasonal cycles that determine the planet's climate.

In addition, Bruce's critical thinking course in the fall semester, Controversies in Planetary Geology, focused on the possibilities of finding life on Mars, elsewhere in our solar system, or on planets around other stars. This involved detailed discussions of the conditions required for the formation of life on Earth, the geologic conditions that obtain on Mars and the other planets in our solar system, and the possibilities of planets existing around other stars and having a habitat suitable for the existence of life

Edwin Larson

In view of Ed's upcoming retirement it seems appropriate that his present research efforts have increased the previously accepted age estimates for certain local rocks (thereby establishing an antiquity far greater than his own!). Working with Alan Lester, Larson has obtained both paleomagnetic and radiometric data indicating that two Front Range "kimberlite diatremes," previously thought to be Devonian in age, were emplaced during the late Proterozoic. Kimberlites are mantle-derived CO_2-rich igneous rocks that sometimes contain diamonds. One of these kimberlite bodies is located near Boulder on Green Mountain, and has been a popular destination for petrology classes over the years. Ed is now quite safe from any accusations of being "nearly as old as the Green Mountain Kimberlite"!

Karl Mueller

As a new assistant professor in the Geology Department, Karl's chief tasks in the fall semester were teaching undergraduate structural geology and setting up a new computer graphics lab on the third floor where the geochemistry students once ran AA analyses. He's been busy trying to keep his research going, including a trip to California that involved flying 1500 feet above the ground in a NASA Lear jet to map active folds with a laser altimeter. His next problem will be finding a computer that can handle the 10 Gb of data collected in only about 5 hours of data acquisition. A big achievement during the mission was not barfing all over the instruments inside the plane, much to the relief of the pilots and technicians; he did, however, turn an attractive shade of green. Meanwhile, back on terra firma, he enjoyed a close look at some amazing technology at NASA's Dryden Flight Research Center in the Mojave Desert where the plane was based. Rocks sure have a hard time competing with advanced fighter aircraft and B2 bombers for the interest of a technology-addled geologist used to wandering around alone in the sagebrush for months at a time.

Lava flowed over road, causing Bruce's class to detour.

Karl is continuing to work in southern and central California where he is studying how active folds grow and whether they can be used to determine when past earthquakes occurred on underlying blind faults. Depending on the whims of funding agencies, he will probably be involved in mapping and modeling active folds that extend under the skyscrapers of Los Angeles with co-workers at Cal Tech. He also hopes to continue a multiyear project in the southern Los Angeles Basin to document recent folding above a potentially active and lethal blind thrust. So if any alumni out there working for geotechnical firms in California know of anyone interested in combining active tectonics and structural geology in CU's grad program, tell them to apply—he's looking for eager students.

In the spring semester, Karl is teaching freshman-level historical geology. We hear he's been practicing his standup comic routines in the hope of not boring the non-majors senseless. One of his structure lectures last semester about frictional constraints on thrust faults involved drinking beer and then watching the cans slide down a piece of plate glass—the old King Hubbard trick! That ought to increase enrollments!

A little closer to home, Karl, his wife Chris, and daughter Katie moved into a house in Broomfield, probably starting a trend where new hires at CU are unable to afford living in Boulder. It's gotten pretty pricey around town lately, with 30-year-old tract homes starting at $200K. All in all, however, it's been a good start; we just hope he figures out there is some great local geology around Boulder, rather than flying off to California all the time.

Anne Sheehan

Assistant Professor Anne Sheehan has received a National Science Foundation Faculty Early Career Development (CAREER) Award. This is a new program that replaces the NSF Young Investigator Award program. This award grants a minimum of $50,000 per year for four years. The intent is to provide stable support at a sufficient level and duration to enable awardees to achieve their education and research career development objectives. The research funded by her award is entitled "Crust and Mantle Discontinuity Structure beneath Oceanic Regions." The results of this project will lend insight into the role of the Earth's mantle in the formation of hotspots and mid-ocean ridges.

Anne was also the recipient of an NSF Undergraduate Education Instrumentation and Laboratory Improvement award. The $45,000 award is matched by a combination of funds from the Department of Geological Sciences, the Cooperative Institute for Research in the Environmental Sciences (CIRES), the College of Arts and Sciences, and the Graduate School of the University of Colorado. The funds will be used to purchase geophysical equipment (seismometers and GPS gear) to enhance the teaching program in geology and geophysics. The equipment will be used in three different undergraduate geophysics courses: Field Geophysics, where emphasis will be on planning and executing a seismic experiment; Applied Geophysics, where emphasis will be on geotechnical applications of earthquake seismology; and Geophysics and Tectonics, where the major application will be seismotectonics.

Anne is receiving assistance in the purchase of her GPS equipment from an Aerospace Engineering GPS senior design class at the University of Colorado. A team of three students has chosen this task as their senior design project. The students will select the most appropriate equipment given her budget and scientific criteria, will test and evaluate the equipment, and will work with her on integrating the equipment into undergraduate geophysics labs

Harmut Spetzler

Harmut spent his 1995-96 sabbatical year in Germany and Japan with support from the Alexander von Humboldt Foundation and the Japan Society.

GEOLOGY NEWS

Shortly after arriving at the Bavarian Geoinstitute in Bayreuth, where he spent a total of 10 months, he attended several conferences in Europe. At the European Mineralogical meeting in Pisa, Italy, he joined several scientists to collaborate on gaining a better understanding of aspects of the deep Earth interior. The basis of their collaboration is a technology developed at the University of Colorado that allows them to make physical property measurements of unprecedented accuracy on very small samples. The small sample size vastly increases the possible sample inventory and allows us to extend the technology to high pressure and temperature environments. The high accuracy will enable them to more fully extract from seismic data the composition and environment in Earth's mantle. Understanding Earth's evolution and its dynamics, manifested in such phenomena as volcanism and earthquakes, is the long range goal of the research.

Back in Bayreuth, he afforded himself the pleasure of pursuing goals in a very supportive environment with very few interruptions. Specifically, he made it a goal to adapt the GHz (gigahertz) interferometry from Colorado to work in the diamond anvil cell (DAC). The DAC is a device within which very high pressures, corresponding to hundreds of kilometers depth inside Earth, can be generated. Two diamonds are being pushed toward each other and in the process compress a hard metal disk with a small hole. The volume formed by the two diamonds and the hole is the pressure chamber. The pressure medium, usually a fluid in the chamber provides the environment in which the measurements are made. In this case an external heater assures the simultaneous application of pressure and temperature to simulate deep Earth interior conditions. Because of the relatively small sample size (~one to atmost several hundred microns) measurements are restricted to technologies using very short wavelengths. In the past these were optical and X-ray techniques. Now that the wavelength of usable ultrasound waves has been reduced by nearly two orders of magnitude to within a factor of 2 of that of visible light, this new technology can be added to the experimental probes available. This newest addition is perhaps especially significant since it allows one to measure directly those properties which we know best within Earth, i.e. the sound velocities from seismology. The ultimate contribution to the science of material properties under extreme conditions will come when the GHz measurements in the DAC are made simultaneously with X-ray measurements. These two technologies complement each other to yield a complete equation of state without reliance on independent pressure measurements.

The Geoinstitute is undoubtedly the best place in the world to do this research. Not only is the infrastructure inviting to do innovative research and are the experimental facilities first rate, but the right people were and are there at the right time. Expertise and the prerequisite enthusiasm in diamond anvil cell and X-ray technology with outstanding technician support will lead to the ultimate success of the combined experiment. To date they have succeeded in making sound velocity measurements in liquids and solids in the DAC. Of special interest was the unanticipated success in observing the dynamics of a phase change observed as ice melted and froze.

During the fall of 1995 Harmut attended a workshop near Leipzig in which applied rock-mechanics research was being discussed. Part of the research in his group concerns the loss of energy as seismic waves traverse rock formations which are partially filled with fluid. During discussions at this meeting he decided to do some very simple experiments to gain a better understanding of the forces involved when a fluid advances across a surface. It appears that much of the loss of energy is associated with this wetting process. Back in Bayreuth, he discussed the lack of understanding of the fluid solid interaction at the advancing or retreating fluid front with Prof. K. Hoffmann and members of his research team, Dr. W. Ulbricht and Mr. S. Haas, in the Institute for Physical Chemistry. His inquiry and their hospitality resulted in a set of measurements where the forces of moving fluid fronts were carefully measured. It was not until he was in Japan, that he took the time to carefully evaluate the data gathered. The results are very interesting and are essential for the development of models that will enable them to determine if contaminants are entering ground water.

In Japan his host was Prof. S. Takemoto, whose research group is involved in the measurement and modeling of Earth's strains resulting from natural and man-made causes. It was strain measurement technology that first brought them together. This has quite unexpectedly now broadened to include water rock interaction. Prof. Takemoto's group is concerned about the influence of changes in groundwater movements and levels on their gravity measurements. Hartmut's laboratory measurements yield data suggesting that changes in gravitational forces should result not only from the changes due to the mass changes of the water, but also from elevation changes that result from modulus changes associated with the exposure of rock to water.

Being free of administrative and teaching duties for an extended period of time and, not less importantly, having a very understanding and tolerant wife, Harmut was able to spend many hours at the Geoinstitute in Bayreuth and at the Department of Geophysics at Kyoto University in Kyoto, often returning in the evenings and on weekends. He had previously spent extended periods in both countries and this time restricted travel to a minimum, allowing him more time to concentrate on research and writing. Several papers have been written, lectures presented, and papers given at scientific meetings.

What will not show up in publication records or in the annals of science are the preparations he made during the last year for the teaching of mainly undergraduate students. He has studied multimedia technology and written several programs that should make it possible for him and his colleagues to better explain difficult concepts, especially to the non-science majors. He is presently acquiring the necessary equipment to use these tools in a large classroom.

James Syvitski

Since James arrived, he has been on a steep learning curve meeting faculty and students, and settling in to life in the U.S. James's first class will be Quantitative Dynamic Stratigraphy and he is working on another course called Coastal Processes.

James attended the Circum-Arctic Paleo Environment (CAPE) workshop in Copenhagen in September. CAPE is designed to develop an understanding of climate change in the arctic during the Quaternary. James helped write the scientific agenda for linking global climate models with ice sheet models and with sediment hydrology models.

In October, James convened the 2nd Seismic Facies of Marine Glacigenic Deposits Working Group workshop in Halifax, Canada. The meeting was highly successful, outlining the application of very high resolution 2– and 3-D seismic techniques, modeling, and other geophysical approaches to developing coherent seismic-stratigraphic tools for the interpretation of glacigenic sedimentary facies. A special issue of *Marine Geology* will contain papers from the meeting.

As a member of the Board of Directors of the Arctic Research Consortium of the United States, James has worked with other members to increase the educational outreach of arctic research, particularly in Alaska. In December, James attended the International Arctic Science Committee meeting in Hanover, NH. That meeting, attended by users and planners of arctic science from 20 countries, worked on a coherent science plan for arctic research over the next 7 to 10 years.

As co-leader of the Office of Naval Research's multimillion dollar STRATAFORM project, James convened a workshop in San Francisco just prior to the AGU fall meeting. James outlined his advances in numerical approaches to the problem of understanding continental slope stratigraphic sequences in time and space and their three-dimensional geometry. Long-term goals of his project are to develop or improve upon existing numerical models useful for the simulation of sediment delivery and accumulation on continental margins over time scales of tens to thousands of years.

James has published and prepared many papers this year. They are mainly in sedimentology (Greenland and Baffin fjords) and the interactions between river sediment loads and offshore sedimentation.

Postdoctoral Fellow Dr. H.J. Lee has recently arrived to work with James on seismic interpretation in Lake Melville, Alaska. Mark Moorehead has signed on as James's first graduate student here and will be involved in the STRATAFORM project.

Paul Weimer

During the fall, Paul taught Applied Sequence Stratigraphy and Basin Analysis to the largest graduate course of the semester. They took a four-day field trip to the Book Cliffs, with John Van Wagoner of Exxon Production Research. It was a great success. During spring, he taught historical geology and Petroleum Geology of Turbidite Systems, co-taught with Roger Slatt (CSM). Over spring break, they went to Arkansas for a week of field work.

On the committee front, Paul was elected President of the SEPM (Gulf Coast Section) and also serves on the technical program for the 1996, 1997, and 1998 annual research conferences. He chaired technical sessions at the October GCAGS meeting, the December GCS–SEPM Salt Conference, and the AAPG national meeting in San Diego. He serves on the Scientific Steering Committee for the IMAX movie *The Making of America*, sponsored by the Smithsonian National Museum. He also is on the National Academy of Sciences/ National Research Council Committee, Geodynamics of Sedimentary Basins Panel. Paul also works on three AAPG committees, as well as chairing nine graduate student theses/dissertations.

Paul finished editing a special publication for the AAPG and SEG entitled *3D Seismic Interpretation Atlas*. It includes 30 papers and will be published in late 1996. With that, he is retiring from the book editing business.

Paul is the Director of EMARC, highlights of which are in another part of the *Newsletter*.

STUDENT NEWS

Michael Kaplan

This Department has a long legacy of students that have been awarded the J. Hoover Mackin Award of the Geological Society of America. The award honors the best research proposal for the Ph.D. degree in Quaternary studies/geomorphology and is contested nationally. This year Mike Kaplan won the award for his proposal entitled "Late Quaternary Ice-Sheet Dynamics, Southeast Baffin Island." Basically, Mike will be doing field work on the glacial geology in a remote cape southeast of Pangnirtung.

Hasiotis on the Birds and the Bees

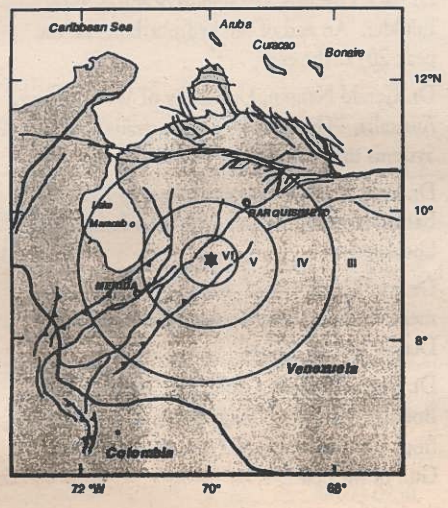
Last year we reported on paleontologist Steve's work on crayfish. Here we report on some of his work on fossilized bee nests, as reported in the winter issue of *Summit Magazine*, a CU publication.

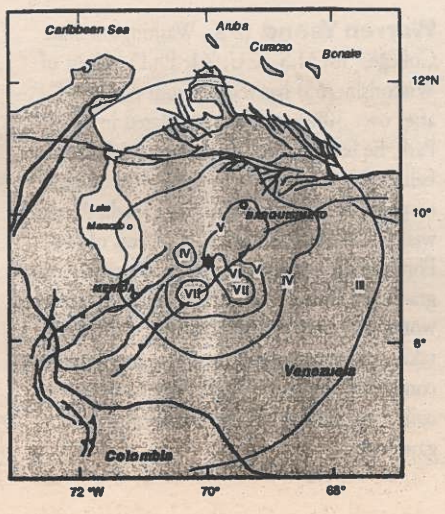
Steve has come across bee and wasp nests in petrified tree trunks in Petrified Forest National Park, as well as wasp nests in paleosols. Unfortunately, no fossil bees or wasps have yet been found. The ages are about 220 million years old.

A controversy that has raged in paleontology is which came first, the bees or the flowering plants (angiosperms). Conventional wisdom has held that the flowering plants preceded the bees. However, this find indicates that although these bees probably were pollinating cone-bearing woody plants (gymnosperms), this happened some 100 million years before the first flowering plants.

Michael Kozuch

Mike was written up in the June issue of *Geotimes* for his work on iso-intensity contours about earthquake epicenters (see figures below). The standard approach to estimating intensities is to draw radially symmetrical contours, as shown in the left figure. Wanting to obtain more accurate data, Mike spent a lot of time in Venezuela gathering more information on geological conditions, historical reports, and even people's recollections of earthquake impacts. The result is a more accurate predictive map of potential intensities, shown in the right figure. He can make similar predictions for earthquakes located anyplace in the country.





Samson Tesfaye

Samson comes here from Ethiopia and is doing his Ph.D. research on structures in the Afar Triangle. He spent 2 months working in the area in the Fall of 1995. Being hot and arid, the area offers superb exposures.

The work focused on a 60 X 60-km area, encompassing the Dobi and Guma grabens, in central Afar. Faults were mapped and throw measured in order to better understand the tectonic evolution of the grabens.

For his last two weeks there, he made GPS measurements across the Main Ethiopian Rift. GPS stations first established by Roger Bilham in 1992 were reoccupied. This work will hopefully shed light on the relative motion between the African (Nubian) and Somali Plates.

Geology Club News

As of this fall Geology once again has an active undergraduate Geology Club. Thanks in large part to Oliver Boyd and Kim Langston, several activities were planned for the fall and deemed a success due to the high numbers of participants and the enthusiasm they showed. Joe Smyth bravely agreed to be the club's faculty advisor. A special thank you should also go to Jeff Swope, who not only attended most of our events but helped plan them as well.

In an attempt at raising funds, the club auctioned a geode. Topaz Gem and Mineral generously donated the geode, which, without much ado, was christened George. In all, the club made two hundred dollars in ticket sales. Thank you to all of the faculty, staff, and students who bought tickets! Jeff Swope and fellow graduate student Kathy Licht deserve special thanks for teaming up to sell the most tickets. Congratulations go out to Beth Kuperman, the winner of George.

This semester the club hopes to be even more active. Plans are underway to raft the San Juan River over spring break. This trip is being led by Joe Smyth, and several students have already committed to going. Matt Jones will be coming to speak about GIS system. Other ideas in the works are a trip to the Mountain Research Station in Nederland and a white-water rafting trip late in the spring.

A Club fund-raiser is also in the works. A contest, possibly in conjunction with the Graduate Geology Club, will be held for a tee-shirt logo. The winning logo will be printed and the shirts sold. We think this would be a good way to make some money for the club, while at the same time give us some good publicity. Any alums interested in a shirt should contact the Club (email is Geolclub@ucsu.colorado.edu).

1996 Awardees

Juniors

Alex Krolick—Marks Scholarship (Outstanding Undergraduate)
Ben Berger—Estwing Pick (Top Junior)

Seniors

Laura Triplett—Johnston Scholarship (Top Senior)
Becky Preston—RMAG pick (Top Senior)
Amy Rosewater—Top Female Undergraduate

Graduate Students

Péter Varnai—W.O. Thompson
Alexander Iriondo—Longley Warner Wahlstrom
Jennifer Hinds, Claudia Malagon—Curtis Scholarship
Sara Martinez—Geary Award
Kathy Licht—Bass Award

Degrees Conferred in 1995

Ph.D.

John Michael Herzog, Hydrology and Thermocline Doming: Their Relationship to Primary Productivity in the Eastern Tropical Atlantic Ocean.

Beverly Jane Johnson, The Stable Isotope Biogeochemistry of Ostrich Eggshell and Its Application to Late Quaternary Paleoenvironmental Reconstructions in South Africa.

William Woodruff Little, Tectonic and Eustatic Controls on Fluvial Architecture, Middle Coniacian through Maastrichtian Strata of the Kaiparowits Plateau, South–Central Utah.

William Frederick Manley, Late–Glacial Record of Ice–Sheet/Ocean Interactions, Hudson Strait and Southern Baffin Island, Eastern Canadian Arctic.

Master of Sciences

Claudia Arango, William Matthew Baugh, Craig Benjamin Bruno, Fadjar Marsono Budhijanto, Brian Michael Gwinn, Kathy J. Licht, Douglas Byron Yager, Hedwig Angelica Bump, Logan Patrick Dent, Xiaoming Li, Nicholas T. Loizeaux, Bruce Hamilton Raup, Qin Wang.

Bachelor of Arts

May Graduation

Jennifer R. Crews
Jeffrey S. Deems
Douglas B. Dellinger
Kevin C. Flaherty
Wendy J. Freeman
Randall W. Kneebone
Elizabeth A. Medlin
Gregory S. Mitchell
Jon W. Slotta
Justin E. Stockwell
Mitchell J. Weimer

August Graduation

Nathan F. Blomgren
Ryan P. Doherty
David J. Holton
Robert C. Morris
Christopher A. Surmonte

December Graduation

Oliver S. Boyd
Emily P. Hunt
Stephen D. Jacobsen (with Honors: Magna Cum Laude)
Victor K. Lam
Casey O. Reagan

ALUMNI NEWS

Cary Black (B.A., CU; B.S. in chemistry, Central Missouri University) is a chemist for Dow Chemical in Midland, Missouri. He is an electron microscopist for the X-ray microanalysis group of analytical services.

Roland Burgmann (M.S., CU; Ph.D., Stanford) is now an assistant professor in the Department of Geology, University of California, Davis.

Don Deininger (B.A., CU, '70; M.S., Florida State Univ., '73) has been working for 22 years in petroleum exploration and development with Texas Eastern Exploration, Superior Oil, and Mobil Oil. Besides working throughout the Rockies, he has worked in North Dakota, Texas, Louisiana, Mississippi, Arkansas, Florida, and California. In addition to property acquisition and hydrologic studies, his current work with Mobil in Bakersfield involves thermal recovery of heavy oil in California's Midway-Sunset Field. This is the largest field in the lower 48 states, and is just now reaching the productive apex in its 101st year! Don has published on the isotopic tracing of groundwater in the Floridan Aquifer (the topic of his M.S. thesis) and on Mississippian Waulsortian mounds in North Dakota and Montana. In addition, he has lectured on drillstem testing of oil and gas wells and on nuclear stimulation of low permeability clastic reservoirs. He married Sue Thomas in 1976.

Bruce Geller (B.S., Dickinson College, '77; M.A., SUNY-Binghamton, '81; A.M., Harvard, '81; Ph.D., CU, '93) writes that his consulting work takes him to Africa and South America. He also has started a gemstone business importing foreign materials for American Faceting and Mineralsmithing. Wife Judy enjoys work as a pharmacist at King Soopers.

Timothy Gubbels (B.A., CU; M.S., Univ. of Wyoming; Ph.D., Cornell, '93) shows up in Boulder periodically as an advisor to remote sensing programs. His dissertation had to do with high-level erosion surfaces in the Andes of Argentina and Chile. After graduating from Cornell, he worked at Earth Satellite Corporation performing regional geological studies of such diverse areas as the northern Andes, Central America, Yemen, and Zambia. Beside available geological information, the main tools of the trade were satellite imagery, digital photogrammetry, computer cartography, and GIS. Recently, however, he reoriented his career more toward computers and scientific and technical information systems, and joined Hughes Information Technology corporation.

Eric Miller (M.S., CU, '68) was featured recently in the Boulder newspaper, the *Daily Camera*. Eric is a science teacher at Centennial Middle School and is always scrounging around for materials. Well, he wrote Hubbard Scientific for surplus equipment and soon four semi–truckloads showed up, worth some $0.5 million. He claimed he felt like Santa Claus distributing the equipment throughout the district.

George Newmarch (B.A., CU, '52; Master's degree in Public Administration, California State Univ., Sacramento, '78) retired at the end of last year after working 32 years as an engineering geologist for the California State Department of Natural Resources. He reports that he spent an additional 11 years consulting and working for the federal government and private industry. He and his wife, Cindy, live in Lodi, California, where he agitates politicians at all levels of government. They intend to do a lot of traveling.

Michael M. Relf (B.A., CU, '80; M.S., Univ. of Wisconsin–Madison in water resources management, '83) is a hydrogeologist for Barr Engineering Company in Minneapolis. One of his listed main accomplishments is surviving seven Minnesota winters in a row. He is married to Carol, and children are Jack (6) and Grace (3).

Anne Southwick Ringman (B.A., CU, '93) reports that she married Michael Ringman (B.A., CU, '93) last year.

Warren Yeend (B.S., Washington State College, '58; M.S., CU, '61; Ph.D., Univ. of Wisconsin, '65) has retired from the USGS after over 30 years of service. Based in Menlo Park, he has emeritus status and is a Pecora Fellow. He is kept busy finishing the surficial mapping of the Mt. McKinley Quad., Alaska, as well as a Bulletin on the gold placers of the Fortymile River region, Alaska. Daughter Erica graduated from CU in '94 in Business and now works for United Airlines. Warren, therefore, is taking advantage of all the flight privileges that come with the latter. Spare time is spent book collecting, book binding, bee keeping, and gardening.

In Memoriam—Sidney Craford

Sidney D. Craford, (B.S., CU, '41) passed away February 10, 1996, at the age of 77. He came to Boulder from the flatlands of western Iowa because he wanted to see some mountains. He learned to climb mountains and ski down them in his years at Boulder.

Because of Sid's training in geology, during World War II he was released from the Army to mine strategic minerals under Army jurisdiction, working at Leadville and Climax, as well as at Howe Sound Copper in Holden, Washington. Fifty thousand GIs with technical or practical mining experience were taken from active duty and put into the mines by the Army during this time of extreme need for strategic minerals for the war effort.

In 1950, Sid and his wife Ruth settled in the Northwest at Vancouver, Washington, where he continued climbing and skiing (but not mining) in the mountains of the Cascade Range. He always recalled his years at CU and Boulder with pleasure and nostalgia.

Although Sid did not continue a career in geology, his studies in that field had a bearing on his life and always added interest to his and Ruth's outdoor experiences together. They met in 1944 at Holden, when her family was on a hiking trip.

Share your news . . .

We prepare our annual newsletter during December, and would like to include any significant professional or personal information you may wish to share with us. Your response should be sent to:

Professor Peter Birkeland, Newsletter Editor
Department of Geological Sciences
C.B. 250
University of Colorado
Boulder, CO 80309–250

Colloquium, cont.

Dr. Jack Edwards, Geological Sciences, CU-Boulder, "An end of the hydrocarbon era: the peak 2012? the end . . . ?"

Dr. Gerald Nansen, University of Woolongong, Australia, "The Response of Australia's River Systems to Quaternary Climate Change"

Dr. Egill Hauksson, Caltech Seismo Lab., " Earthquakes, Stress and Structural Images from Los Angeles"

Dr. Jim Smith, USGS, Boulder, "Flow, Sediment Transport and Geomorphic Processes in Deeply Incised Rivers"

Dr. Bruce Trudgill, Geological Sciences, CU-Boulder, "Gravity Sliding above salt—Examples from the Canyonlands, Utah, and the Deep Gulf of Mexico"

Dr. Jeff Unruh, William Lettis & Assoc., "Reconnaissance Assessment of Quaternary Deformation in Central Colorado"

Dr. Stephen Brown, Sandia National Lab., "Fluid Flows in Fractures Rock: Does Toxic Waste Travel in the Fast Lane?"

Dr. Hartmut Spetzler, Geological Sciences and CIRES, CU-Boulder, "Fluid Flow and Seismic Attenuation: A Simple View"

Dr. Jim Ellis, Chevron Overseas Petroleum Inc., "Geological and Environmental Remote Sensing in International Petroleum Applications"

Alumni Support

We gratefully acknowledge the gifts and donations made to the Department in support of our research and graduate students by the following individual and business donors:

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Contributions Enhance Opportunities

Alumni contributions allow the department to greatly enhance the educational and research opportunities for our undergraduate and graduate students. Funding cutbacks from state and federal sources require us to rely on our alumni and friends to maintain our high quality education and enhance it with new innovations. The Department of Geological Sciences has several special 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 contributions should be used for. A self–addressed envelope is enclosed for your convenience.

Endowed 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.

Bruce F. Curtis Endowment: Scholarships to graduate students in energy resources, environmental geology, and engineering geology.

Jeffrey A. Deen Memorial Fellowship Fund: Support of graduate students in environmental geology, geochemistry, and exploration or economic geology.

Longley–Warner–Wahlstrom Scholarship: For graduate students in economic geology.

Keith Marks Memorial Scholarship: Scholarships, which may be based on need, to outstanding undergraduate geology majors.

Elaine Bass Parkison Memorial Scholarship: Recognizes outstanding women at any level.

Warren O. Thompson Graduate Research: Funds are put in interest–bearing account and annual interest is used to assist graduate students with their research.

Undergraduate Enrichment Fund: Funds are put in interest–bearing account and annual interest is used for projects and activities that enhance the undergraduate student experience outside of the classroom.

Henry Waldrop Scholarship: Recognizes high academic performance, along with personality, character, and contributions to the Department.

Annual Support Accounts

Funds donated to these accounts are either spent in their entirety on an annual basis, or put into interest bearing account and saved until need arises.

Geology General Gifts: unrestricted funds for use annually at the discretion of the Chairman with the intent of enhancing all aspects of the department's programs, including alumni relations.

Geology Equipment: funds specially designated for purchase of equipment.

Geological Sciences Building Fund: funds specially designated for the new Geological Sciences Building.

Runnells' New Building

If you ever are travelling through Fort Collins and see this building, Don Runnells will be inside, as well as the many alumni he has hired. It is the office of Shepherd Miller, Inc., at 3801 Automation Way. Quite a change from his corner office and tiny laboratory on the third floor. Also, this building beat our building by over one year.

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 _____

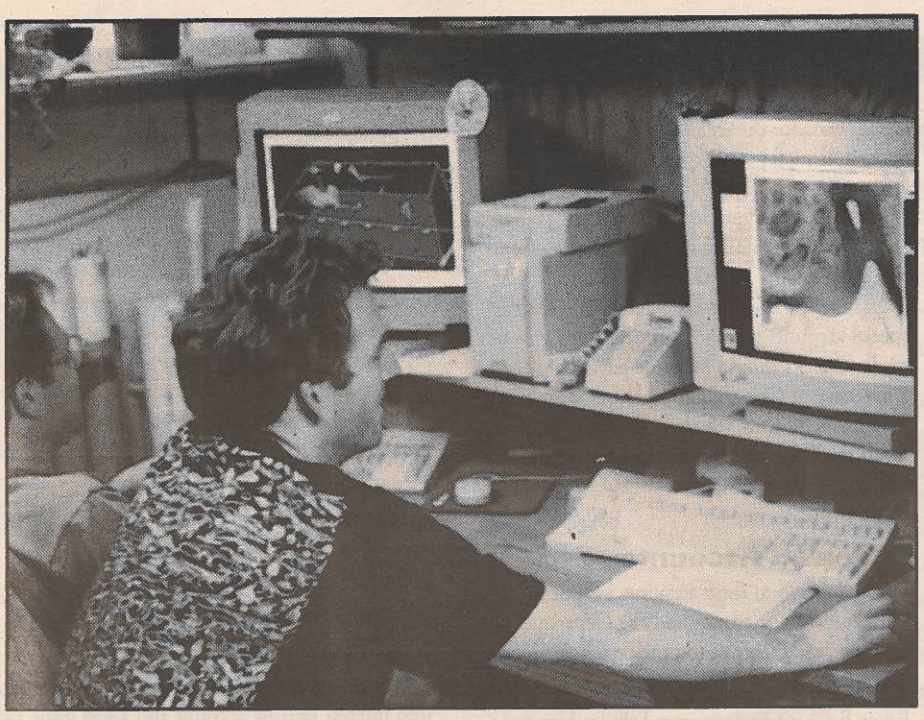
Degree(s) (year and institution) _____

Current Position/Employer _____

News About Yourself/Family/Kids/Friends _____

Comments _____

Mail to: Newsletter, Department of Geological Sciences, University of Colorado, Boulder, CO 80309-0250.



Bruce Trudgill studying salt–cored fold belts in the Gulf

Energy And Minerals Applied Research Center (EMARC)—1996

EMARC Advisory Board Members

David Lawrence (Shell), Stuart Strife (Union Pacific), Mike Padgett (Pennzoil), Karen Christensen (Conoco), Keith Shanley (Amoco), David Sieh, Thom Fisher (Zycor– Landmark), Robert Ratliff (CogniSeis), Robert Graebner (consultant), Davis Ratcliff (Diamond Geophysical), and Walt Ritchie (Western Atlas).

Corporate Sponsors

Landmark Graphics:	Interpretation system,4 seats
CogniSeis:	Geosec 2-D, 2 seats; Geosec 3-D, 1 seat; Geostrat, 2 seats; DLPS, 2 seats; VoxelGeo, 1 seat
GeoQuest:	IES interpretation system, 1 seat
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Platte River:	Basin analysis, thermal maturation, 1 seat
Western Geophysical:	2-D, 3-D seismic data
Diamond Geophysical:	3–D seismic data
PaleoData, Inc.:	Biostratigraphy data

Hardware

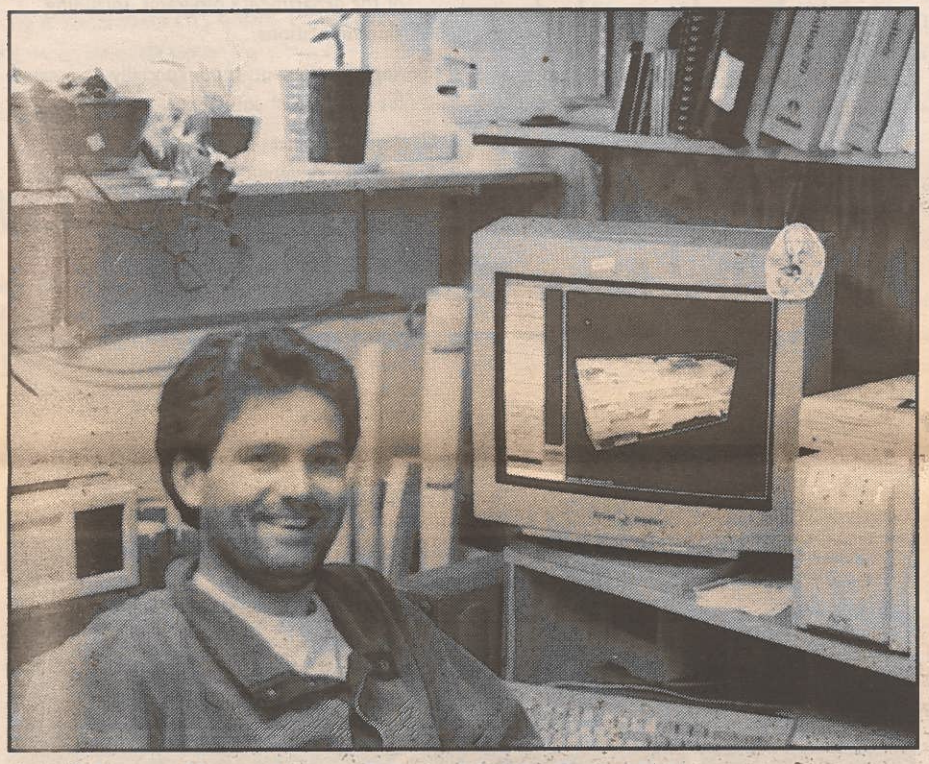
5 Sun Sparc workstations; 1 Silicon Graphics Indigo 2

Companies Supporting Research

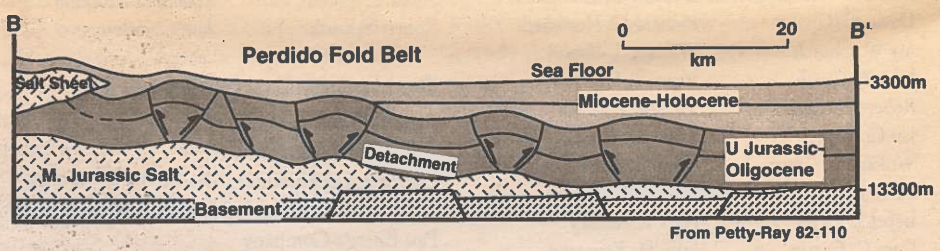
AGIP, Amoco, Anadarko, BHP, BP, Chevron, CNG, Conoco, Exxon, Marathon, Mobil, Pennzoil, Petrobras, Phillips, Shell, Texaco, Total, Union Pacific, and Unocal.

Staff

EMARC has six research scientists: Mark Rowan (structural geologist), Bruce Trudgill (structural geologist), Andrew Pulham (sedimentologist), Carl Fiduk (stratigrapher), Tomas Villamil (stratigrapher), and Claudia Arango (biostratigrapher), a 3/4 time drafting person (Jonathan Irick), one full-time systems administrator (David Knapp), and several part-time students. Paul Weimer is the Director of EMARC



Andy Pulham working on the geocellular model of the Cusiana Field, Colombia, South America



Schematic depth cross section across Perdido Foldbelf, northwestern deep Gulf of Mexico. Foldbelt consists of northeast trending, slightly asymmetric box folds cut by high-angle reverse faults. The exploration well is drilling the structurally highest fold in water depths of 7625 feet.

The EMARC group produces an amazing amount of work from their work stations housed in that small room at the north end of the basement. From left to right, they are John Roesink, Mark Rowen, Paul Weimer (the leader), David Knapp, Peter Varnai, Barry McBride, Bruce Trudgill, and Carl Fiduk

Paul Weimer proudly prints out some of the colorful graphics that the group produces. The group allows the Director to do the printing, as long as he doesn't mess up!

Research Programs

Green Canyon:

This project is a large industry-sponsored consortium in the northern Gulf of Mexico, which focuses on an active exploration area sitting in water depths between 200 and 1500 meters. The focus of the research is to (a) study how salt tectonics have extensively deformed the area and how they impact potential structures to be drilled, (b) study the origin and distribution of the strata that hold the oil, and (c) study how salt deforms and how the strata are deposited at the same time. The strata represent complex reservoirs deposited in the continental slope.

There are 25 members in the consortium. Total funding is $750,000, with $2.0 million in data donations. Nineteen members are oil companies and six are software/data companies. Our last meeting will be held in May in Boulder, with 60 company representatives expected to attend. This work has been presented extensively at recent meetings, including eight presentations at 1994 AAPG, ten at 1995 AAPG, eight at 1996 AAPG, and six at the 1995 GCS–SEPM Research Conference. Project personnel include Paul Weimer, Mark Rowan, Tomas Villamil, Claudia Arango, Barry McBride, Peter Varnai, Alfonso Garcia, and Gerard Soto. Five M.S. degrees and two Ph.D. degrees were awarded for research on this project.

Perdido Foldbelt:

The Perdido Foldbelt, in the northwestern deep Gulf of Mexico, is a major foldbelt resting in water depths of greater than 7500 feet. This project comprises a four-company industry consortium (Shell, Texaco, Amoco, Mobil), which leased the mineral rights to the foldbelt during the mid-1980s. The Perdido Foldbelt has an extremely high potential to hold large volumes of oil (several billion barrels). These four companies have pooled their proprietary seismic databases and donated them to CU-Boulder and paid $220,000 for EMARC to evaluate the data over two years. With the combined seismic databases of the four companies, EMARC can now remap the structure in far greater detail, thus producing much more accurate maps for the companies. The combined database contains 8000 miles of 2-D seismic data worth $5 million. A seismic data set of this size and quality is extremely rare in academia. A well was begun in mid-April 1996 in 7612 feet of water. The well is expected to be completed during August 1996. The project is unprecedented because the selection of the well site location was based on the research results of an academic group. Project personnel include Bruce Trudgill, Carl Fiduk, Mark Rowan, and Paul Weimer.

Reservoir studies of the Cusiana and Cupiagua *Fields, Colombia:*

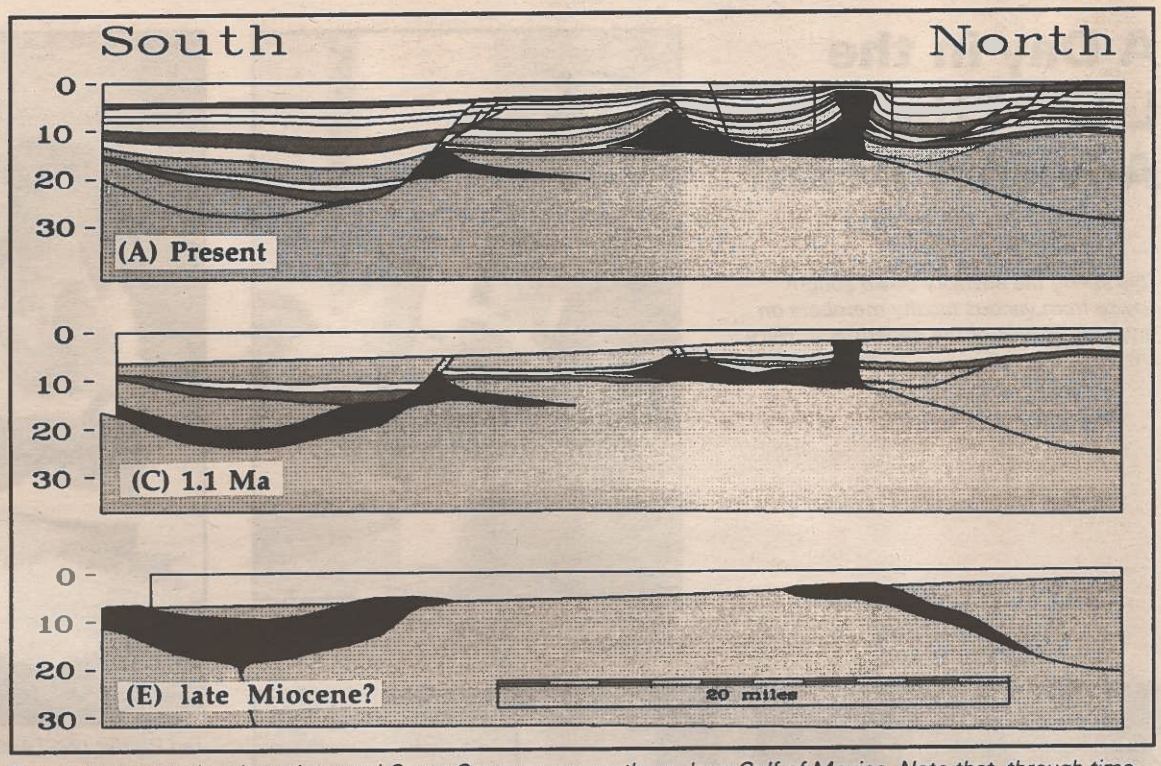
Andrew Pulham is conducting a reservoir study of the Cusiana and Cupiagua Fields in Colombia. These are two of the giant discoveries made in the past few years. The project will focus on which reservoir parameters are most sensitive to production performance. Andy is developing a new reservoir consortium to analyze key stratigraphic surfaces in reservoirs and how they compartmentalize the reservoir and affect performance. This program will start in fall 1996.

Salt –Sediment research, northern Gulf of Mexico:

EMARC will begin a new salt industrial research consortium this June. "Sub-salt" is currently the hottest play in the northern Gulf of Mexico. The work is the natural evolution of the detailed structural restorations that EMARC does in the Green Canyon and Eugene Island 330 areas. They will use 3-D seismic data to interpret the salt geometries and distribution strata, and then do sequential restorations using Geosec 3-D to study salt evolution and better understand sub-salt structure and stratigraphy.

Awards

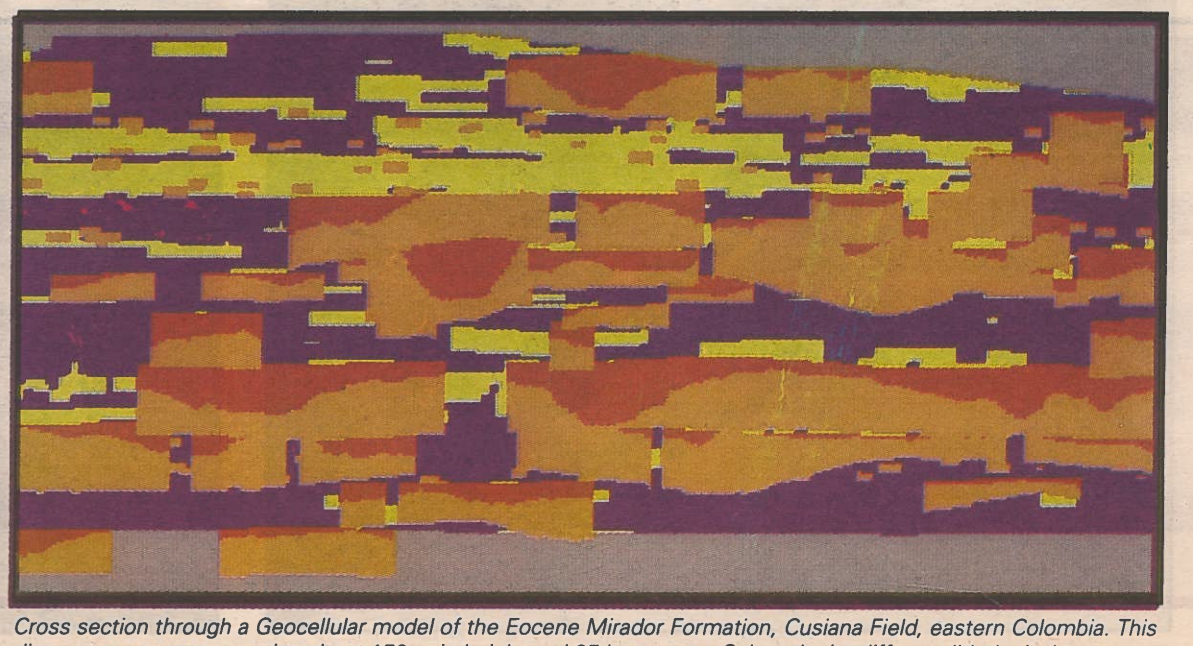
Andy Pulham won best paper for the SEPM at the Houston convention. Mark Rowan won second prize for best talk at the RMAG for 1995. Paul Weimer won second prize for presentation at the Landmark Worldwide Technology Conference.



Sequential restoration through central Green Canyon area, northern deep Gulf of Mexico. Note that, through time, the nature of the shallow tongues of salt changed geometries and depth as they became loaded with sediments, and the sedimentary basin changed shape. The current sub-salt exploration play consists of drilling large structures imaged on seismic below the salt.

Present day 3-D image of central Green Canyon (view is to the west) showing distribution of salt and sediments. Two major oil fields overlie the salt. Pea green is sea floor, dark green is 0.5 Ma, yellow surface 3.0 Ma, pink surface is top of allochthonous salt, and brown surface is base of the salt.

Visit the EMARC web site at:
http://lolita.colorado.edu/emarc.html

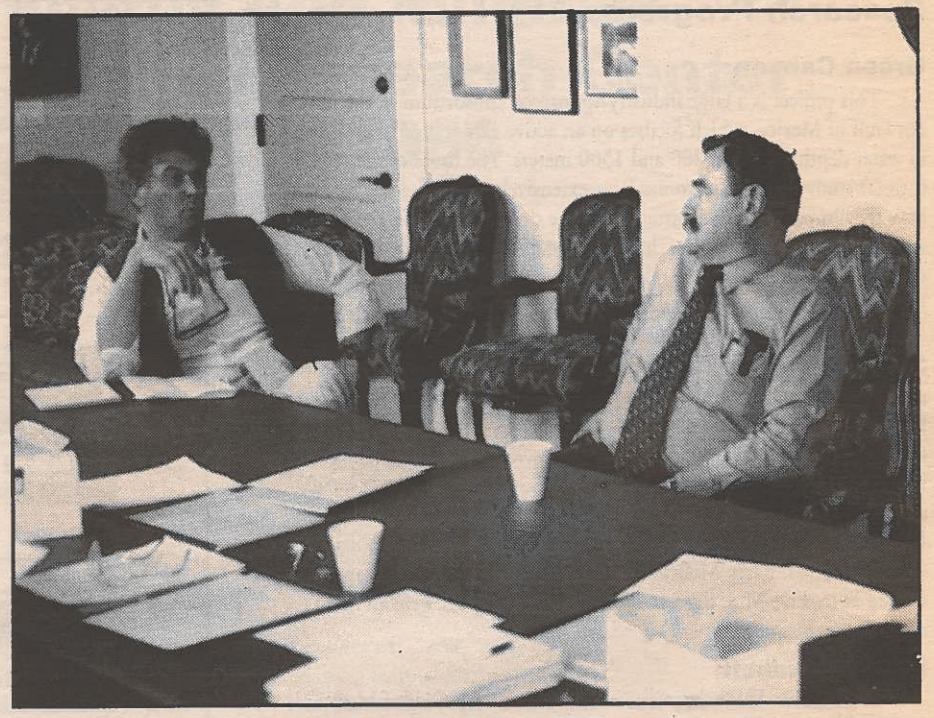


Cross section through a Geocellular model of the Eocene Mirador Formation, Cusiana Field, eastern Colombia. This diagram represents a section about 150 m in height and 25 km across. Colors depict different lithological types: orange and brown are valley fills; small orange "bricks" are distributary channels and tidal inlets; yellow is coastal plain and various shoreface sandstones; and purple is shale.

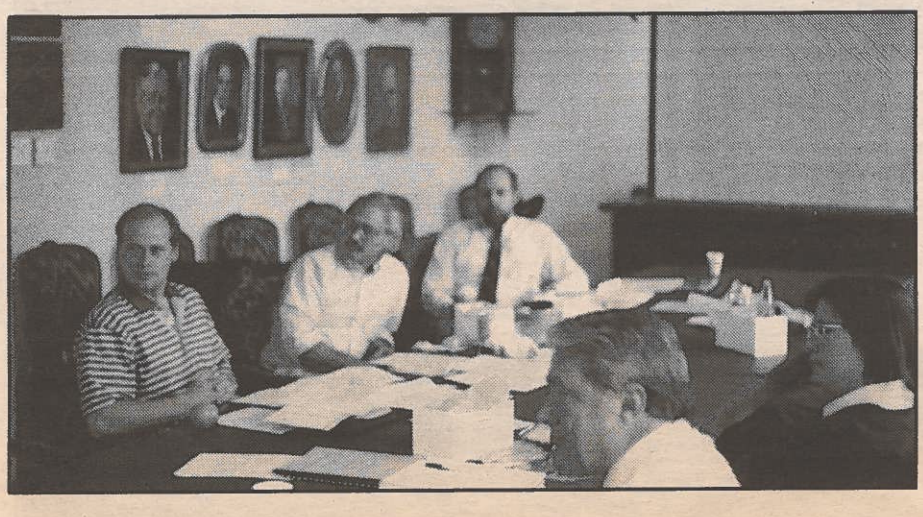
A Day in the Life of the Advisory Board

This spring the advisory board sought advice from various faculty members on future directions of the department. Here are some scenes.

Gene Shearer, chair of the board, lays out the agenda.



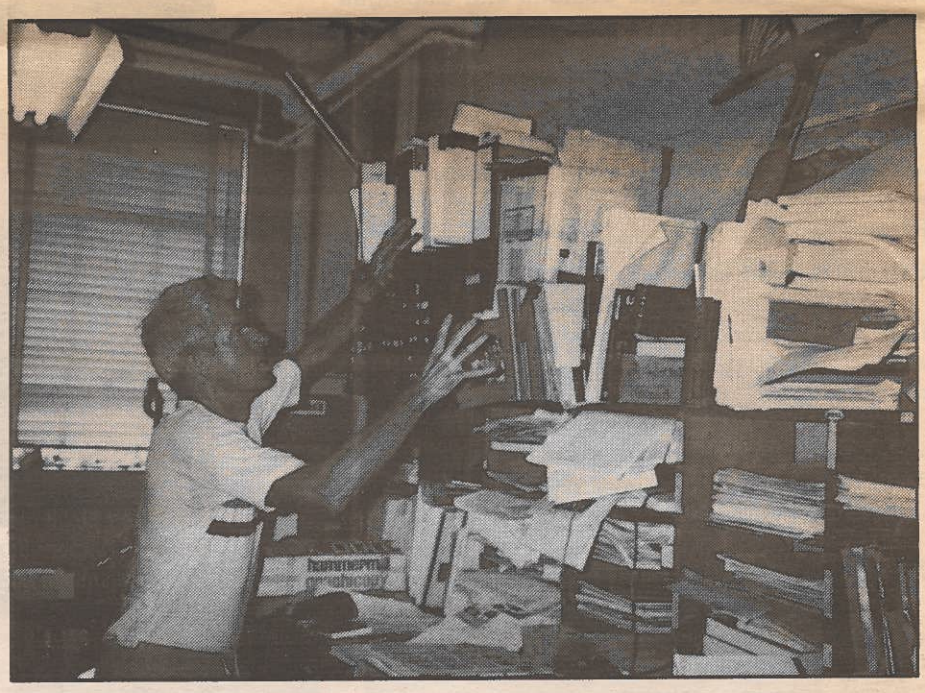
Tad Pfeffer (INSTAAR) speaks up for geophysics with Bill Downs.

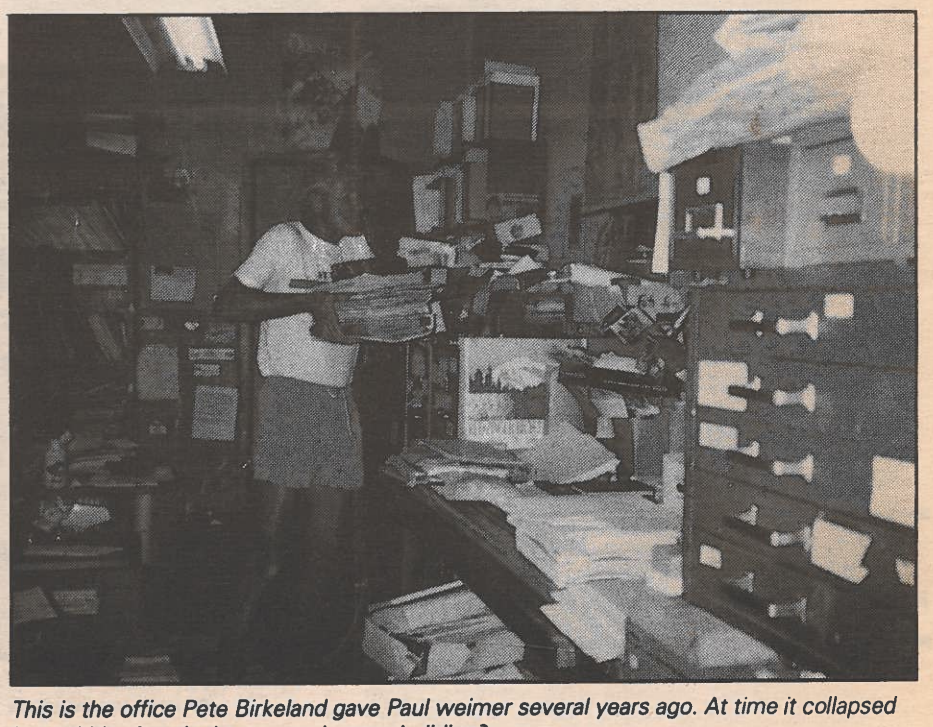


Left: Dave Muller, Rich Reynolds, and Steve Colman.

Tailings . . .

Ever seen one of these in the Rocky Mountains? It's a rock glacier flowing slowly eastward on Mt. Sopris, near Glenwood Springs. (Photo courtesy of Bob Beehler)





This is the office Pete Birkeland gave Paul weimer several years ago. At time it collapsed into rubble. Any doubt we need a new building?