Geology News

Department of Geological Sciences ▲ University of Colorado at Boulder ▲ Summer 1990

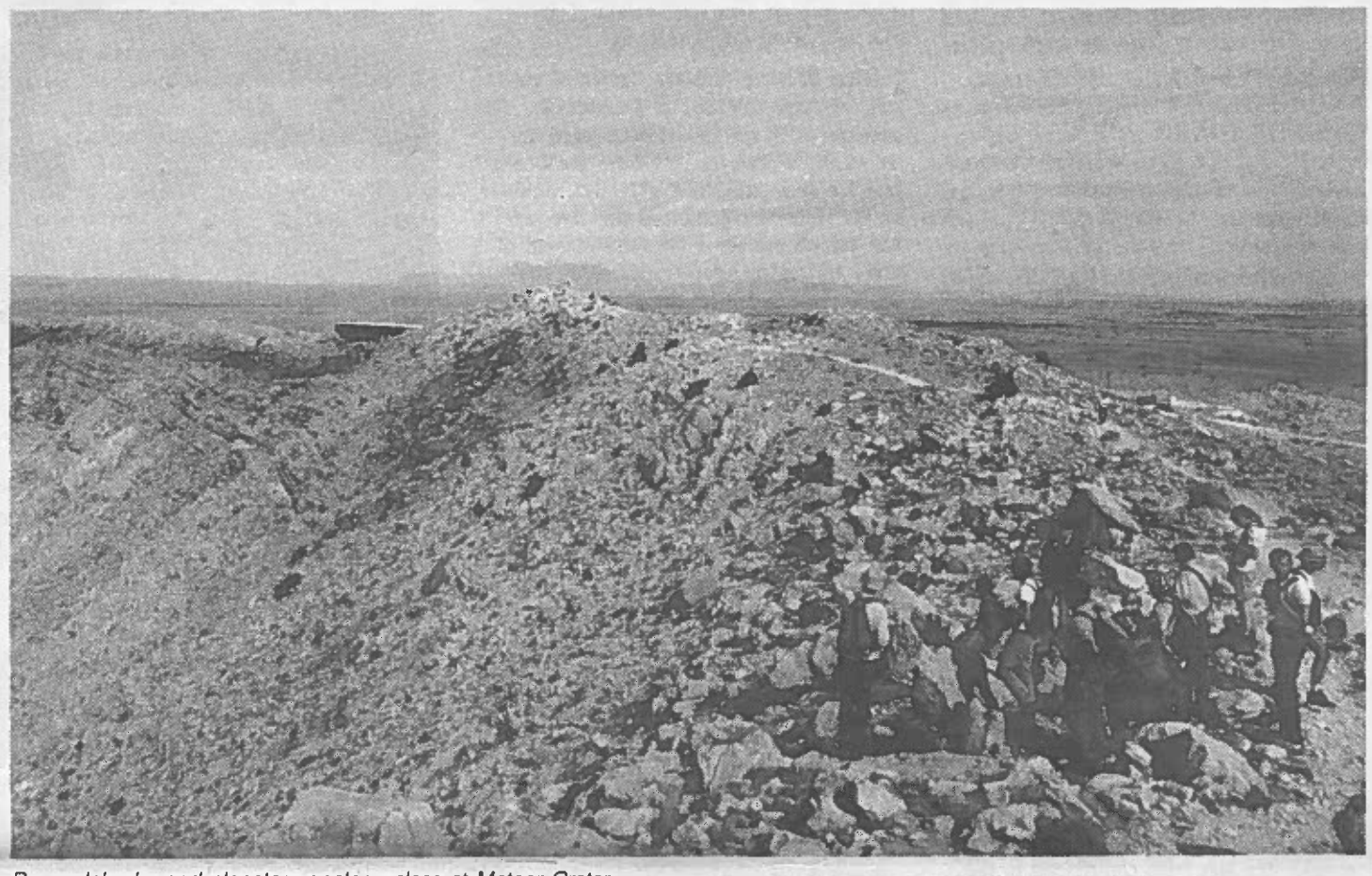
Department Emphasizes Field Trips in '89–'90

Stillwater to Sonora: 1989–90 Economic Geology Field Trips

Led by Professor Bill Atkinson, two minerals-oriented geologic excursions were offered by the Department during the 1989-90 year. The first was to the Stillwater layered-mafic complex in southern Montana during September 1989. A few hardy souls added a side-trip to tour the nearby Yellowstone geothermal district on the return.

During the January break, Bill again led a group from the Department into Mexico, where they joined up with a team from the University of Sonora to view the very rugged and interesting gold province just 'south of the border.' Of interest on this field trip, in addition to the economic geology features, was the Mojave-Sonora Megashear, a zone believed to be the boundary between suspect-terrane microplates and the North American craton. The trip provided a solid week of mine and prospect visits in low-angle shear zones and intrusions, and Tertiary volcanic sequences, where invisible gold in limestone as well as gold telluride occurrences were noted. Of particular interest was the Moctezuma district, where Bill has been working.

Both of these economic geology field trips were made possible through the generosity of alumnus Gary Grauberger. Thanks, Gary!



Bruce Jakosky and planetary geology class at Meteor Crater.

West Texas Carbonate Field Trip

(where else in the West can you go to see better exposures?)

David Budd (see photo, p. 3) led a group of seven on a six-day spring break field trip in 1989 to examine the classic Permian carbonates of the Guadalupe Mountains in west Texas. Most of the students were enrolled in Dave's class on carbonate sedimentology and depositional systems, and included individuals originally from Germany and Puerto Rico as well as a visiting professor from Spain. The diverse cultures resulted in some truly glorious meals, all cooked over open fires on cool star-covered nights and washed down with some of the best-tasting, yet cheap, wine that David had enjoyed in some years.

The group traveled by van to Carlsbad on the first day, then spent two days examining outcrops along a basin-to-shelf-to-shoreline transect in the upper Guadalupian age rocks. The long climb up the geological trail in McKittrick Canyon was particularly interesting, not only for its geology, which covers the depositional slope from shore to reef facies, but also for the thunderstorms that struck all around, but never actually rained on the group!

The next two days were spent climbing outcrops of slightly older Permian strata exposed along the Algerita Escarpment and in Last Chance Canyon. These wonderfully long and continuous outcrops allowed the group to examine the rocks from a sequence stratigraphy viewpoint, and to envision what the rocks would look like on seismic sections. A great learning experience for all!

The all-day van ride back to Boulder was uneventful, however the fast food was a severe departure from the earlier geoculinary delights. The van, now loaded down with samples of pisolites, stromatolites, fusilinid grainstones, and lots of sponges, was probably the most relieved member of the entourage as it gasped over the last hill on U.S. 36 before entering Boulder.

New Planetary Geology Class Capped by Field Trip

Bruce Jakosky led a multi-site field trip during the Spring 1989 semester that included the Great Sand Dunes in southern Colorado, the Sunset Crater volcanic field northeast of Flagstaff, Arizona, and the Meteor Crater east of Flagstaff (see photo above).

The sand dunes were chosen as a stop due to the importance of aeolian processes in modifying the surface of several of the planets, most especially Mars, where there is abundant evidence for wind erosion and transport of material. Sand dunes play an important role in the geology of polar regions and also appear to concentrate in some topographic depressions such as impact craters. Also present on Mars are 'yardangs', erosionally carved bedrock forms, located in the lee of topographic obstacles, and, as seen at the Viking spacecraft landing sites, possible ventifacts. Global dust storms also attest to the importance of wind as a geological agent.

Sunset Crater is a recent (about 1064 A.D.) cinder cone that lies at the eastern end of a linear vent system in the San Francisco volcanic field in northern Arizona. The visit included stops at the cone itself and at two lava flows emanating from the vicinity of the cone. These flows show the entire range of lava types, from blocky to aa to pahoehoe, and include small-scale features such as squeeze-ups and pressure ridges. The cone itself is dark grey, but is covered at the very top with a bright red layer of ash representative of the changing oxidation state during the final stages of the eruption.

Similar volcanic features are seen on Mars (abundant lava flows, large-scale constructs, and a number of features which appear to be cinder cones), and features indicative of different styles of volcanic eruption are seen on the Moon.

The highlight of this trip was Meteor Crater, a 1-km diameter crater formed by the impact of an asteroid tens of meters across between 25,000 and 50,000 years ago. Because of its relative youth, this crater shows all of the important characteristics indicative of an impact rather than a volcanic origin; these include a raised rim and ejecta blanket, overturned stratigraphy near the rim, upturned strata on the sides, and the presence of the highly shocked quartz minerals stishovite and coesite. In fact, it was the study of these features at Meteor Crater that allowed the description of the basic physical processes that occur during a high-velocity impact.

Using a guidebook written by Gene Shoemaker and Sue Kieffer, they examined most of these features on the rim, along the walls, and at the bottom of the crater. Fortunately, we saw all of them while hiking into the crater, because the hike out (600 vertical feet) was exhausting! Examining these features was very illuminating, given the importance of impact cratering in the history of the solar system. Not only do we use the occurrence of craters on other planets to aid in defining geologic time scales, but the details of their occurrence provide important clues as to the nature of surface materials.

Although the field trip was spread out over four days because of the long drives, we are indeed fortunate that so many geologic features relevant to the planets can be found within a reasonable distance from Boulder. In Spring 1990, we went on a field trip to Hawaii to see active volcanism on the Big Island, which is very reminiscent of volcanic eruption styles on some of the big constructs on Mars.

Field Trip Planning for Next Year

The department has restored an old tradition: having official field trips, one per semester. All faculty and students are being encouraged to participate, to expand their field geology understanding and to get better acquainted. Alumni are also encouraged

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Geology News

FLASH...

Paul Weimer Appointed Assistant Professor

The Department is pleased to announce the addition of a petroleum geologist to the faculty, effective this summer. Paul Weimer, who earned his B.A. from Pomona College, an M.S. from CU, and the Ph.D. from the University of Texas-Austin, worked for Sohio in Alaska and Mobil R & D in Dallas for about six years. His specialty is seismic and sequence stratigraphy, particularly in the Gulf of Mexico.

Paul will be joining EMARC to participate in the development of CU's petroleum geology teaching and research capabilities. Welcome aboard, Paul!

Center for Geochronological Research

The Geochronology Center recently completed its fourth year and annual funding for research totals nearly $1 million. These funds allow support of graduate student research projects, hiring of permanent technical support staff to oversee day-to-day operations of each facility, and involvement of undergraduates in the research program. At present, the Center includes six analytical facilities on campus:

Amino Acid (Giff Miller, Geology)
Thermoluminescence (Steve Forman)
Light Isotopes (Jim White, Geology)
Heavy Isotopes (Lang Farmer, Geology)
Dendrochronology (David Yamaguchi)
Radiocarbon Extraction (Tom Stafford)

In addition, Center researchers enjoy access to equipment through affiliates such as:

Uranium-series Dating (Muhs: USGS Lakewood)
Potassium/Argon, 40/39 Argon, and Fission Track Dating
(Walter: Berkeley Geochronology Center)
Accelerator Mass Spectrometry C-14 Dating
(Jull: University of Arizona)

Highlights of individual research activities are outlined below:

Giff Miller, Director, is investigating two contrasting extremes—Quaternary history of Arctic regions, and the dating of hominid evolution and climate change in Africa and Australia. He spent summer 1989 on Baffin Island with PhD student Darrell Kaufman studying the direction and timing of ice movement at the mouth of Hudson Strait. Their results, presented at the December AGU meeting, provide unanticipated evidence of a dramatic flux of ice off the Labrador highlands during the last deglaciation. The resulting icebergs in the Labrador Sea may have contributed to the onset of global cooling in the midst of the last deglaciation (the Younger/Dryas event).

Giff and Peter Beaumont of the McGregor Museum in South Africa have dated layers at Border Cave showing that the first appearance of anatomically modern man was about 100,000 years ago. This dating was done by amino acid dating methods applied to eggshells of the African ostrich. Because ostrich eggshells are common in archaeological sites across Africa, including Olduvai Gorge and stratified South African cave sites with *Homo erectus* that are beyond the age range of radiocarbon dating, amino acid geochronology offers the potential of dating these sites.

Preliminary experiments on emu and cassowary eggshells indicate a similar behavior to ostrich eggshells. A pilot study on these Australian materials indicate that the C-14 based chronology is too young in some areas, particularly for the timing of past high lake level events in the arid interior of Australia. AMS C-14 dating of purified amino acids extracted from eggshells, a collaborative project with A.J.T. Jull of the University of Arizona, is in progress to confirm these conclusions.

Steve Forman works in the Thermoluminescence (TL) Dating Research Laboratory. TL dating is emerging as an important tool for deciphering climate, tectonic and archaeological records from the late to middle Pleistocene. The TL "clock" in a mineral grain is reset by exposure of the grain to sunlight during sediment transport and/or deposition. The time-dependent TL signal accumulates in the grain through its exposure to ionizing radiation produced during the decay of radioactive elements of uranium, thorium, and potassium in the surrounding sediments.

The TL method has been successful in dating Late Quaternary tectonic events. Deposits such as loess, buried A horizons, sag-pond muds, and fault-scarp colluvium yield TL ages that agree with radiocarbon ages. TL studies have concentrated on dating paleoearthquake events on the Wasatch fault zone, Utah, the Sierra Nevada Range, California, and the Rio Grande rift, New Mexico.

In collaboration with CU's Center for the Study of Earth from Space, CSES, Steve has initiated a research program to study the geomorphology and chronology of eolian sediments on the High Plains. Dunes, loess, and coversands are ubiquitous but little is known about the temporal and spatial distribution of these deposits. Initial results indicate that stabilization of dunes was only about 2,000 years ago.

Jim White runs the Center's Light Stable Isotope Lab, one of a group of laboratories in the U.S. now engaged in recovering a deep ice core from the Greenland Ice Sheet, the GISP II Project, funded by NSF. Our contribution to this five-year $20 million project is the measurement of stable hydrogen isotope ratios (D/H) and deuterium excess (the combination of stable hydrogen and stable oxygen isotope ratios) in surface snow and down the 3,000 meter length of this core. The first field season was 1989; White and a graduate student, Lisa Barlow, spent six weeks on the ice sheet. The scientific goals of this project are broad, including climate reconstructions, studies of particulates and greenhouse gas concentrations from air trapped in the ice.

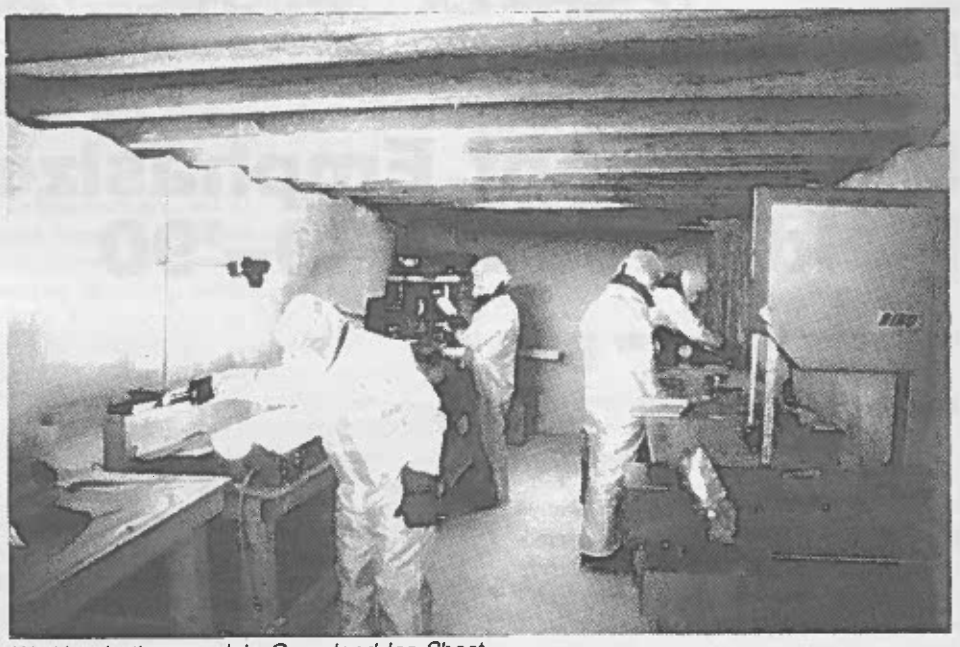
Lisa Barlow going to work.

The Center's contribution will be reconstructions of past atmospheric temperatures from delta-D values, and the determination of moisture sources and evaporation conditions, past and present, from the deuterium excess values.

Tom Stafford is in charge of the Radiocarbon Extraction Laboratory, a facility that isolates carbon-bearing compounds for AMS radiocarbon dating. Materials to be studied include buried soils, lake sediments, calcified tissues and bone. The facility will permit the isolation of extremely small samples of carbon (10 to 100 micrograms) and enable us to obtain finite dates for samples as old as 45,000 to 50,000 years BP.

Tom will first concentrate on chemical techniques for the isolation of specific molecular fractions such as individual amino acids from fossil material. By isolating purified organic molecules from modern and fossil plant and animal remains, we anticipate significant improvements in radiocarbon dating, molecular-level ecology and human paleo-diet research. Other anticipated projects include dating Late Quaternary animal extinctions in the New World and Pacific Islands, C-14 dating of human migration into North America, and the use of fossil vertebrate and plant remains for paleoecological reconstructions of the past 20,000 years from the Arctic to arid mid-latitude sites.

David Yamaguchi is head of the Dendrochronology Laboratory. While several recent papers in *Science* have pointed out the potential earthquake hazards posed to the Pacific Northwest by the adjacent



Working in the core lab, Greenland Ice Sheet.

Cascadia Subduction Zone (CSZ), geophysical and stratigraphic studies of the Washington and Oregon coasts have been unable to unequivocally prove that the CSZ can produce great earthquakes. One of the reasons for this is the lack of precision in radiocarbon dating of sediment deposited during the last 500 years. Radiocarbon dating is incapable of proving or denying, for example, whether a series of buried soils present in marshes along the coast were created by synchronous coastal subsidence events induced by earthquakes emanating from the CSZ.

Enter David and his expertise in dating trees. He uses dendrochronology to determine the death dates of long-dead trees rooted in the buried soils. Research in different estuaries along the Washington coast should yield a calendar date for the most recent coastal-submergence event, and constrain the magnitude of inferred causal paleoearthquakes.

Lang Farmer's solid source mass spectrometer facility has been developed as a cooperative Center/CIRES/Geological Sciences effort. Lang's interest in strontium isotopes and the capability of his multi-collector instrument has led to research on Sr isotopes in marine bivalves. It is hoped that this method will be useful in providing an independent geochronology for marine deposits and associated glacial sediments of late Pliocene to Pleistocene age across the Arctic. ▲

News From CIRES

The Cooperative Institute for Research in Environmental Sciences includes workers in geophysics and geochemistry:

Max Wyss and Carl Kisslinger
earthquake source physics and earthquake prediction
Roger Bilham and the UNAVCO group
crustal deformation, fault mechanics, and neotectonics
Lang Farmer
radiogenic isotope geochemistry
Hartmut Spetzler
laboratory rock physics

Some of the new areas of earthquake research include the inversion of large numbers of focal mechanism solutions for the regional stress tensor. This is a tricky and important problem, because current earthquakes occur on preexisting faults which may have a different orientation with respect to the tectonic stress fields than they did when they first formed.

Much effort is going into aftershock studies and the temporal behavior of earthquake swarms triggered by dike injections in Hawaii. The goals of this work are to gain better understanding of fault-zone properties and the earthquake nucleation process.

Workers are also analyzing earthquake doublets (pairs of almost identical events in the same place, but at different times) as a means of detecting changes in rock properties that might be caused by the stress buildup and release associated with a strong earthquake.

The Global Positioning Satellite (GPS) program run by CIRES is world-wide in scope. Successful campaigns have been completed in a number of geologically important regions, including recent observations along the eastern part of the North Anatolian Fault in Turkey. Roger Bilham's creep and tilt observations in California are giving new insight into post-seismic fault movements and may lead to new methods for predicting strong aftershocks. Roger was interviewed on network television following the Loma Prieta earthquake.

Farmer's isotope research has led to the fingerprinting of probable source locations of igneous rocks and new insights into the mechanism of crustal thinning in regions of extensional tectonics.

Spetzler's lab is carrying out some exciting experiments on the measurement of inelastic attentuation in minerals. New methods developed by the group are setting new standards for this kind of investigation.

1989 was a good year for CIRES research in the geological sciences. The struggle for funding is a continuous battle, but we have hopes that events like the Loma Prieta earthquake and the start of the Decade of Natural Disaster Reduction will help to raise the budgets in the Federal agencies that support our work. ▲

Department Part of New Water Resources Program

A multi-disciplinary 'water resources studies' program is being formed through the cooperation of the Departments of Civil Engineering, Economics, Environmental/Population/Organismic Biology, Geography, and Geological Sciences.

Participating from our Department are Don Runnells, Alex Goetz, Vijay Gupta, and Mark Meier, who have prepared a 'white paper' describing existing courses that are logical aspects of the water studies program. Campus-wide, there are over forty classes and other activities focusing on water resources, and many grants fund water-related research. And, as mentioned elsewhere, we hope to add a groundwater hydrologist to the faculty in the near future. ▲

STUDENT NEWS

CU's Remote Sensing Research Center Active in EOS

The Center for the Study of Earth from Space (CSES), a branch of CU's Cooperative Institute for Research in Environmental Sciences, is entering its fifth year of existence and is going strong.

Professor Alexander Goetz, its founder and director, came to the Department and CIRES in late 1985 from Cal Tech and JPL. The Center is the focal point for research in earth sciences campus-wide that utilizes the tools of remote sensing.

Since its founding in 1985 CSES has grown in size and stature and is recognized internationally as the leading university center for imaging spectrometry development and applications. Thirty staff and students are involved in research as diverse as gold exploration technique development, grasslands ecology, non-destructive jade characterization, and theoretical hydrology. The latter research is being conducted by the newest member of the Department faculty, Dr. Vijay Gupta, who recently relocated from the University of Mississippi.

NASA, in a world-wide competition last year, selected three CSES fellows for two projects that form part of the Earth Observing System (EOS), a polar orbiting platform to be launched in 1997 to study global change. This multi-billion-dollar project is by far the most ambitious earth-*looking mission ever undertaken by NASA*, and the Department and CSES will be right in the middle of the action. ▲

Four CU Geology Students Receive AAPG Grants

Four CU graduate students were among the seventy students from 42 universities who were selected from among 160 applicants for educational grants during 1989. AAPG grants last year totalled more than $61,000.

No other university had more than three students receiving these $800 to $1000 awards.

Dan Taranik's MS thesis develops remote sensing identification of iron minerals and alteration changes in the Cripple Creek, Colorado, mining district. Supervised by Alex Goetz, Bill Atkinson and Fred Kruse, Dan's field work included traditional field mapping of the distribution and intensity of iron minerals on a district-wide scale, and the use of a computerized geographic information systems method for comparison with previously compiled geophysical and geochemical spatial data. A genetic model for the iron minerals was developed, based on field mapping observations and published literature on iron mineral stabilities, identification of the most useful exploration indicator, jarosite after pyrite, and determination of its surficial distribution.

Dan's bachelor's degree was earned at the University of Nevada–Reno and he had several years of exploration work as both a geophysicist and a geologist with Chevron Oilfield Research, ARCO Exploration and Production Research, Echo Bay, United Mining, and Noranda. His plans include pursuit of the PhD in Geology, then employment in geological remote sensing research in industry or academia.

Paula Maat's MS thesis topic is the history of eolian deposition and climate change in the sand dune region of northeastern Colorado. This work is being supervised by Pete Birkeland and Steve Forman. The objective of her study is to understand the nature and timing of stratigraphic sequences within stabilized dunes which show alternating soils and cross-stratified soils. The sands were deposited during periods of relative aridity, while the soils represent wetter climates similar to the present. Radiocarbon and thermoluminescence age estimates on soil horizons buried by eolian sand indicate dunes were active 7 to 9 ka ago. Based on the morphology of surface soils, the dunes were most recently stabilized less than 3 ka ago.

Paula, whose home is in East Bridgewater, Massachusetts, graduated magna cum laude in Geology and earned a second BA in Chinese in 1987 after spending the 1984-85 school year at Nankai University, Tianjin, PRC, for language study.

Reed Johnson's MS thesis topic is the depositional and diagenetic control of reservoir characteristics in Lower Meramecian rocks (Mississippian), Bindley Field, Hodgeman County, Kansas. Reed's thesis advisors are Dave Budd and Phil Choquette. His objectives are to interpret the depositional environment and diagenetic history of the reservoir interval based on high-density core control, establishing a three-dimensional model of the reservoir, and to relate the petrophysical reservoir characteristics to the geologic model. Methods employed in the project will include conventional and cathodoluminescence petrography, porosity image analysis, and mercury porosimetry. Research to date indicates that significant revision of a prior published work pertaining to the Bindley Field reservoir is required. The principal areas of revision relate to the deposition environment and the origin of high-quality reservoir rock.

From his hometown of Fishkill, New York, Reed has earned his BS from SUNY-Stony Brook, worked eight years as a petroleum geologist, and currently works as a consultant with Bartshe Exploration, Inc., and Energy Foundation, Inc. both in Lakewood, Colorado.

John Brock's PhD research centers on topographic controls on ocean bioproductivity and organic carbon deposition in the Oman Arabian Sea coastal upwelling region. His work is being supervised by Bill Hay. This is an attempt to document the geological significance of surface divergence driven by conservation of potential vorticity of a boundary current impinging on shallow shelves and coastal capes. This results in local upwelling, enhanced primary productivity, and increased organic richness in sediments. Combined with reconstructions of past coastline configurations and models of paleo-ocean circulation, the recognition of this process should enable the 'hind-casting' of more specific sites of organic carbon enrichment than has previously been possible.

John earned a BS in Geology and a BA in Psychology from the University of Deleware, then his MS in Geology from the University of Georgia, where his thesis was on the geochemistry, petrology, structural geology, and economic mineral deposits of the Mobley Mountain Granite, Amherst County, Virginia. He worked four years for Texaco as an exploration and wellsite geologist in the Los Angeles region, where he worked extensively with satellite data on structural features and taught in-house classes on exploration applications of CAD and VMS systems. ▲

... Stillwater to Sonora

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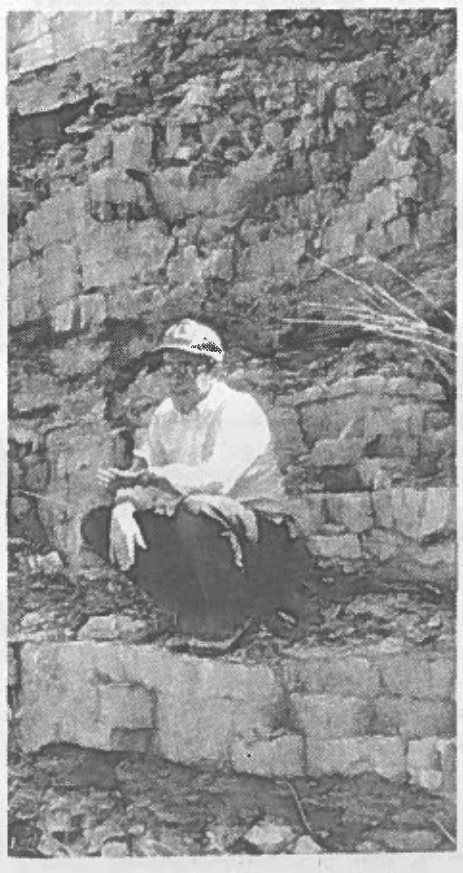
to attend to get reacquainted with the old alma mater and to refresh or, who knows, learn something new.

Cost-sharing and economizing are still the game on geology field trips, so students, faculty, and alumni alike would be expected to pay their own way—of course, a tax-deductible contribution directed toward the field trip will always be appreciated. A $30 deposit check forwarded to the Department will hold a spot in the official vehicle, or you can join us near or at the actual site with your own transportation.

If you're interested in joining us for a future trip, call Hartmut Spetzler at 303/492-6715 to make arrangements.

Utah Valley and Sudbury—Destinations in 1990

The Spring 1990 field trip enabled Bill Atkinson and Hartmut Spetzler to share the incredible geologic wealth of the Salt Lake valley with students, alumni, and friends: the Wasatch Fault Zone, Mesozoic-Laramide thrusts and folding north of Ogden and on the west side of the Oquirrh Mountains, upper Paleozoic thin shelf sequences contrasting with the thick Oquirrh Mountains sequence, Jurassic marine and continental rocks as well as lower Tertiary sediments shed off the Laramide uplift near downtown Salt Lake City, the Oligocene intrusive complex at Park City and Little Cottonwood Canyon, outstanding glacial geomorphology in Little Cottonwood and tributaries, the exposed delta entering Lake Bonneville, many well-exposed wave-cut terraces, evidence of recent fault movement where a lateral moraine is cut by a Wasatch zone fault, the regional tectonic setting, and the igneous complex and mineralization of the Park City and Bingham mining districts. Whew! What an ambitious itinerary for just five days!



David Budd lecturing from a limestone outcrop in Texas.

The likely itinerary for the Fall 1990 field trip would focus on the Sudbury Basin, Ontario, where tectonic, structural, economic, meteorite-impact geologic features, peculiar deformation history and origin/genesis controversies abound. Trip leaders will be Bill Atkinson, Roy Kligfield, and Bruce Jakowsky, and the schedule is not firm. Due to the relatively large travel cost, the Department is seeking financial support from alumni for this multi-faceted field trip. ▲

Student Acknowledges Generosity of Alumnus

This letter was shared with the Alumni Advisory Board at its April 1990 meeting:

Dear Mr. _____:

I am a first-year geology graduate student working with Professor W. W. Atkinson, Jr., at the University of Colorado at Boulder. I feel that this letter is long overdue because your generosity in supporting the economic geology program at CU has tremendously enriched my learning experience.

I received my undergraduate degree in Geology from CU in December 1988, and as an undergrad was able to take part in many field trips that your gifts helped make possible. One such trip was to the Black Canyon of the Gunnison River and the nearby carbonatite locality.

I also took Bill Atkinson's "Introduction to Ore Deposits" course in my last semester of undergraduate studies. Before taking this course, I felt that geology was perhaps more of a hobby to me than a career because of my father's hobby of collecting minerals and an uncle who was a hard-rock geologist who was unemployed half the time.

Bill's course and his enthusiasm for the subject were very inspirational. Nearly every weekend, several members of our class studied in the field what we had been exposed to in the classroom. In my opinion, being able to see the examples in the field was the only way one could truly learn. Your gifts helped to pay for the gas for these weekend field trips.

Well, it turned out that I must have outperformed some of the graduate students so Bill suggested that I apply to grad school. I was excited about that prospect, but was disheartened knowing my financial situation with outstanding student loans. After graduating, I spent eight months working at NOAA and desperately looking for support to go to school. By that point, I gave up hope and notified the school that I would not be able to attend. A few weeks later, Bill called me and mentioned that an alumnus had donated some money which could be used to provide for a Research Assistant in Economic Geology and that he wanted me to take the position.

I am now in school, thanks to you. During this first semester of grad school I have been able to participate in mineral deposit-oriented field trips to Stillwater, Montana and Sonora, Mexico along with many other grad and undergrad students. These educational trips were made possible, at least in part, by your generosity.

I am overwhelmingly thankful to you and thought I should share my feelings with you.

Sincerely,
Scott Bennett

An Adventurous Year in Peru

by Don Rodbell, PhD Candidate

In the summer of 1986, I travelled to the northern Andes of Peru with Pete and Sue Birkeland as part of CU's Rio Abiseo National Park (RANP) Research Project, a study of the archaeology of the Gran Pajetan site and of late Holocene environmental change in the upper Amazon Basin. After preliminary work in the spectacular glaciated terrain, it was clear that the region contained a detailed record of late Quaternary climatic fluctuations, and would be an ideal field area for my doctoral dissertation.

I returned to Peru in May 1988 as a Fulbright scholar to spend six months mapping moraines, coring lakes and collecting samples for radiocarbon dating. This was to be followed by six months of lab work in Lima. I arrived in Lima on May 22 to find that the customs office had seized my coring equipment. After a frustrating two weeks in Lima, my equipment was retreived and I boarded the next plane to the sunny coastal city of Trujillo on Peru's north coast. Alas, while taxiing down the runway, the plane collided with a fork-lift truck! From my carefully selected window seat, from which I had hoped to gain a spectacular view of the snow-capped Andes, I saw instead a fountain of jet fuel! Eventually, I did arrive in Trujillo, but on my way from the airport to a restaurant, I found myself in the middle of a riot which pitted the University of Trujillo faculty against the police. The latter, using tear gas, quickly dispersed the crowd. Unknowingly, I had joined the wrong crowd! Welcome to Peru, Don! In Trujillo I met Dan Miller, who is doing his MS thesis on soils in RANP. After a day on the beautiful beaches (and an epic night of Pisco sours), Dan and I were sufficiently numb to embark on the infamous 24-hour, 200-km, twisting drive across the spine of the Andes into the upper Amazon Basin. Twenty-five-year-old Ford sedans took us as far as they could go, and then we began a 3-day hike with a 15-mule train. On our way, we passed through the small mining town of Pataz, where Jose Abrahm works as a silver miner. Jose took a leave and worked for me for the next six months and proved to be an extraordinary worker and a good friend. My field work in RANP involved mapping and coring numerous lakes and bogs. Meanwhile, Dan was investigating the effect of a steep climatic gradient on soil development. Jose split his time between digging holes for Dan and helping me core lakes.

Jose is proud of his Indian heritage and took great pleasure in leading us "gringos" around his home turf. One afternoon, Jose and I were scrambling through thick brush and high grass on our way back to camp when I discovered that I had lost my Geology Department altimeter. While I was dreaming up numerous "last accounts" for Bill Braddock's queries, Jose managed to retrace our steps in the fading light for nearly an hour and find the altimeter! It was truly a remarkable feat, for I couldn't even see the trace of the path we had followed.

In late July 1988, Dan, Jose, and I returned to Trujillo and travelled from there to Huaraz, high in the Cordillera Blanca, only 100 km from RANP, yet a two- to three-day drive! Here we met Pete and Sue Birkeland, who had just spent several weeks with Jay Noller along Peru's hyper-arid coast (Jay's dissertation involves the use of soils and geomorphology to determine the timing and extent of Quaternary El-Nino events). The Cordillera Blanca is a spectacular range whose glacier-clad peaks stand in excess of 18,000 to 20,000 feet. It contains some of the best-preserved and easily accessible records of glaciation anywhere in the tropics.

Here I hoped to gain a record of glaciation on the dry western side of the Andes.

Dan, Don and Jose on Cerro Obispo, 4525 m.

After the five of us spent three weeks scouting out the area, Pete, Sue and Dan bid Jose and I farewell and made their way back to Boulder. Jose and I then spent the next four months mapping moraines, coring lakes, and describing and sampling soils. We hired a local, Honoratto Caldua, to guard camp and cook, and he proved invaluable as a friend and hard worker. Given the present political situation in Peru and the very real danger from terrorists and thieves, I was glad to always have at least one Quechua-speaking local with me!

In hindsight, timing for all aspects of the project could not have been better. Only a week after I came down with hepatitis and was forced to end my field season and return to Lima, the Sendero Luminoso, or Shining Path guerilla movement, began to move into the Huaraz area. For the next six months I hoped to return, but the U.S. Embassy's travel restrictions made that impossible.

In January 1989 I began working at La Molina University in Lima. It has the only reasonably well-equipped and staffed soils lab in all of Peru. Two students, Ernesto and Alberto Lopez, helped me enormously in analyzing several hundred sediment and soil samples. During January-June 1989, political unrest and terrorism increased dramatically and there were several times when the Sendero Luminoso blew up the power lines serving Lima. This made lab work impossible, and at one point, the University staff went on strike, demanding an increase in their $75 to $100 per month wages. The Lopez brothers continued to go to work, however, even going so far as to jump the University fence to do so!

If, as John McPhee wrote: "Geology is legitimatized travel," my year in Peru was a geological success. It provided me with an exciting year of geology, adventure, hard work and learning. And on a personal note, my year in Peru provided me with a fiancee, Cecilia Maria Oballe of Lima. Pete and his students warned me this would happen, and even had a lottery going! They were right, and I am glad they were so keen on looking out for my best interests! The wedding was on Flagstaff Mountain in May. ▲

Ursula's Summer Job at ARCO Lab

Ursula Hammes, a graduate student from West Germany, had the opportunity to work summer 1989 at the ARCO Oil and Gas Research Laboratory in Plano, Texas. She filed this report:

The ARCO research lab includes such disciplines as geochemistry, mathematics, computer sciences, geophysics, and geology. ARCO employs about thirty summer students every year to work in the different disciplines. Students are required to complete a field-related project, an oral presentation, and a written report during their stay at the lab.

Benefits from this program are two-fold: the students earn salaries for their work, and ARCO gains their contributions to various research goals. The company, in turn, shows what it can do and hopes that the students consider ARCO when making career choices. Other valuable activities were demonstrations and visits to other departments and sections within ARCO, as well as social events. Ursula reports that she was also able to sample the local culture, including barbecues, country & western dancing, rodeo, horseback riding, and that all ARCO lab employees enjoy health club privileges.

Ursula's project was in the Carbonate Group of the Geology Division, with Dr. Robert Loucks as supervisor. She studied the diagenesis of a deep-water carbonate in the Permian Basin, contributing to an ongoing reservoir study involving porosity, facies distribution, and depositional environment. In order to conduct this research, she was able to use all available equipment and facilities at the lab.

Ursula in her '72 Chevy Impala.

Ursula said "This working experience was valuable for my professional studies, and was a good learning and cultural experience." ▲

Geology Graduate Students Organize—Look Out, World!

February 1990 saw the first edition of *The Geo Grad Rap,* published by the Geology graduate student organization, the Geo-Club. A summary of information from the Rap:

Dan Levish and Ted Mowers were elected Co-Presidents, Chuck Patterson is to be the Bagel Buyer and Lisa Barlow the Cookie Supplier.

Representatives to faculty meetings and the Grad Student Advisory Council are Jeff Snyder, Dan Levish, Raoul Miller, Ted Mowers and Bev Johnson. Field trip coordinators are Jeff Snyder and Bill Manley.

Activities included a biweekly socializing at FAC which will rotate between the Department, INSTAAR, and CIRES.

Grad student research talks during the FAC are being organized by Jeff Swope on a biweekly schedule to inform and to improve both their research work and their presentation/defense skills. The May 4th FAC included a slide show of the recent Hawaiian field trip and the usual socializing.

Also from the *Geo Grad Rap,* a list of degree completions expected this spring and summer:

Margaret Berry, Farley Fleming, Penny Patterson, Ted Scambos, Kathy Tegtmeyer, and Chris Waythomas for the PhD.

Andres Aslan, Margaret Bobb, John Boylan, Ken Dol, Tom Doyle, Lesley Evans, Tim Garfield, Dan Miller, Henrietta Smith, and Dan Taranik for the Master's.

Nine undergrads are also completing their Bachelor's degrees, three of whom are graduating with Honors. Congratulations for all the hard work, and good luck out there in the 'real'(?) world!

Graduate student plans for the summer or year include: Peter Harries will be studying for a year in Munich via a Fulbright scholarship. Chris Wold will be attending a 3-D computer modeling conference in East Germany. Darrell Kauffman, Raoul Miller and Mark Abbott will summer on Baffin Island, while Lisa Barlow is just across the strait on Greenland and David Bahr is on Ellsemere Island. Do you suppose they'll meet on an ice floe for a BBQ or FAC on the 4th of July?

Scott Lundstrom will work in the Mt. Hood area of Oregon, and Maria Sampayo in Puerto Rico.

Natasha Vidic will be returning to her home in Yugoslavia, but hopes to return in 1990 for another year of soils studies.

And to prove that there are still a few geo-questions in the Rockies, Eric Hiatt will be working in Wyoming and Dan Levish will stay close to home on Boulder Creek. ▲

ALUMNI RELATIONS

Roger Dewey, a minerals and environmental consultant in Denver, has helped part-time with alumni relations for the past year. His contributions include helping with this newsletter and several exhibits and receptions at professional society meetings.

1989 Geology Graduates

1989 was a productive year in terms of degrees earned:

Bachelor of Arts:

Behr, Jeffrey A.
Boyd, Thomas Gene
Bridges, Nathan Thomas
Clayton-Jones, Mary C.
Intrasook, Chaimuchai
Marshall, Robert
Nagy, Elizabeth Ann
Schmidt, Keegan Lee

Master of Science/ Thesis Title:

Al-Douri, Raed K.
[Plan II]

Babcock, William Henry
Kinematic and Geometric Analysis of the Bear Creek Anticline, Caribou Mountains, Idaho

Bright, David A.
Electrode Response to the As (V)/As (III) Redox Couple and the Use of Arsenic Speciation as an Indicator of Redox Conditions in Natural Water Systems

Burgmann, Roland
Transpression and Fault Interaction along the Southern San Andreas Fault, Durmid Hill, California

Gardner, Cynthia A.
Temporal, Spatial, and Petrologic Variations of Lava Flows from the Mount Bachelor Volcanic Chain, Central Cascade Mountains, Oregon

Gupta, Colleen Ann
Foraminiferal Record of the Thatcher Interval in the Graneros Shale

Haymes, Steven R.
Mixed Regressive-Transgressive Sedimentation, Relative Sea Level Change, and Coal Accumulation—the upper Pierre Shale, Trinidad Sandstone, and *Lower Vermejo Formation (Upper Cretaceous)*, Cimarron Area, Southern Raton Basin, New Mexico

Horn, Brian W.
Seismic Stratigraphy of the Muddy Sandstone, Powder River Basin, Wyoming

Miller, Dean Charles
Geology and Mineral Deposits of the Mupong Hills, West Humboldt Range, Churchill County, Nevada

Simons, Frederic W.
Volcanic Stratigraphy and Hydrothermal Alteration of the Calico Hills, Nevada Test Site

Singh, Gurinder
[Plan II]

Tashi, Tsering
[Plan II]

Wolfe, Douglas Gerald
Stratigraphy and Paleoenvironments of Middle Cretaceous Strata along the Central Arizona–New Mexico Border

Wyatt, Philip H.
Stratigraphy and Amino Acid Chronology of Quaternary Sediments in the Central Hudson Bay Lowland

Doctor of Philosophy Dissertation/Title:

Goldfarb, Richard Jeffrey
Genesis of Lode Gold Deposits of the Southern Alaskan Cordillera

Gustason, Edmund R., III
Stratigraphy and Sedimentology of the Mid-Cretaceous Dakota Formation and Lower Tropic Shale, Southwestern Utah

Jennings, Anne Elizabeth
Late Quaternary History of Cumberland Sound, Baffin Island, Arctic Canada

Lea, Peter Donald
Quaternary Environments and Depositional Systems of the Nushagak Lowland, Southwestern Alaska

Lehman, Scott
Quaternary Glacial and Marine Paleoenvironments of North and West Spitsbergen, Svalbard

Ponti, Daniel J.
Aminostratigraphy and Chronostratigraphy of Pleistocene Marine Sediments, Southwestern Los Angeles Basin, California

Schelling, Daniel
Geology of the Rolwaling and the Eastern Nepal Himalaya

Schenk, Christopher J.
Sedimentology and Stratigraphy of the Eagle Valley Evaporite (Middle Pennsylvanian), Eagle Basin, Northwestern Colorado

Shaw, Christopher Allen
Mass-Balanced Paleogeographic Modeling: Examples from the Western North Atlantic Ocean and the Gulf of Mexico

Thorleifson, Leonard H.
Quaternary Stratigraphy of the Central Hudson Bay Lowland, Ontario, Canada

Wilson, Kevin Mark
Mesozoic Suspect Terranes and Global Tectonics

Four-Year Degree Largely a Myth

Many Students Take up to a Decade to Finish College, Study Reveals

by Associated Press from Denver Post, *2/15/90*

Earning a college degree has become a six-year to ten-year chore for most students, according to a study released in February 1990 by the National Institute of Independent Colleges and Universities.

The report said that only 15 percent of college students complete a bachelor's degree within four years of high school graduation. Six years after high school, only 46 percent of the students who went straight on to college had earned a degree.

Counting both those who went straight to college and those who took some time off after high school, 55 percent had either earned a degree or were still working on one six years after high school graduation.

"The picture of the average American college student today is not the picture that many of us have in our minds based upon our own experiences 15, 20, and 25 years ago," said Oscar Porter, author of the study. "It's clear that completing an undergraduate college degree in four years is not the norm in either the public or independent sector."

Among private colleges, 54 percent of students who enrolled straight out of high school completed the degree in six years; for public institutions, 43 percent finished within six years. The study noted that a half-century of research has shown a remarkable stability in the fraction of students starting college who win a degree—about 50 percent.

The study drew its conclusions from the Federal "High School and Beyond" data base, a national survey of what happened to 28,000 high school seniors in the class of 1980. ▲

Zena Hunter Andrews, 1907–1989

Retired Associate Professor Zena Hunter Andrews passed away in Boulder at the age of 82 on August 2, 1989.

Born in Rangoon, Burma, she attended school in Scotland and the U.S., earning B.S. and M.S. degrees from the University of Pennsylvania in 1926 and 1931, respectively. She taught high school chemistry and physics and worked as a research chemist before joining the CU Geology Department in 1944. She was granted a doctorate in Geology in 1947, the first woman to earn that degree at the University of Colorado.

In his book *Profile of a Department,* Larry Warner reported that: "Dr. Hunter left a lasting mark on the Department . . . she established a rapport with beginning students that became a hard act to follow. Although her classes were large, by the end of the second week she knew all her proteges by first and last names."

Zena was a member of Sigma Xi, the Geological Society of America, and the Fortnightly Club of Boulder. For nearly thirty years, she was a frequent and generous donor to the Department and to the Graduate School, with a special interest in supporting women graduate students.

She retired from the Department in 1960 and married Phillip Andrews, a petroleum geologist alumnus of the Department who preceded Zena in death in 1983. ▲

Typical departmental FAC.

Student Support

Students have been fortunate to receive financial support from many sources outside the University. Donors include the following government agencies, scientific societies, corporations, individual alumni, and, of course, family:

American Association of Petroleum Geologists
ARCO
BHP-Utah International
Colorado Mountain Club Foundation
Colorado Scientific Society
EXXON
Fulbright Commission
Gary Grauberger
Geological Society of America
Marathon-USX
NASA
NSF
Parents!
PTI Environmental Services
Shell
Sigma Xi
Society of Economic Paleontologists and Mineralogists
Section
Spouses!
Texaco
Union Pacific Resources Corporation
U.S. Geological Survey

Oil Company Recruiting at CU

Amoco, Shell, and Exxon sent recruiters to Boulder last fall to interview CU geology students. Representatives from all three companies praised the caliber of our students.

Three students were offered summer employment: Andres Aslan with Shell in Houston, Ted Mowers with Exxon in Midland, and Maria Sampayo with Amoco in Denver.

At this date, we also know of one student, Tim Garfield, who has accepted full-time employment with Exxon Production Research Company in Houston. A number of other students have had location visits and second interviews.

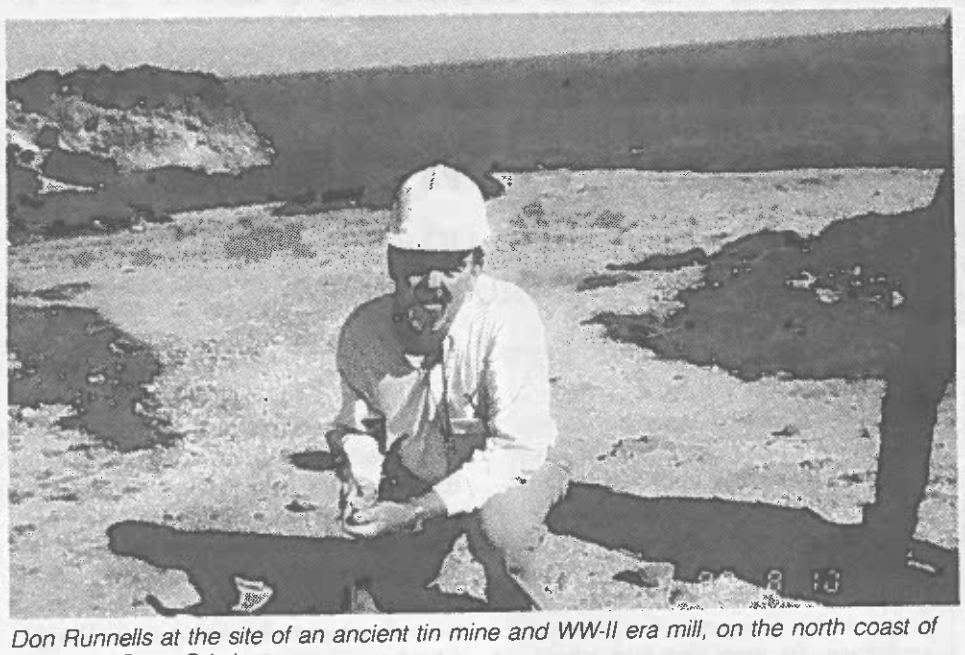
Mobil has committed to visiting CU during their Fall '90 recruiting effort.

We hope more companies will take the opportunity to visit the campus and talk with our students. For any of our alumni who can advocate recruiting at CU, we would appreciate your help and your advice about this important aspect of industry-education cooperation. ▲

TRIVIA

Do you have any idea how many of our alums are on the faculties of universities and colleges across the U.S.A.? Look on page 6 to learn the answer.

FACULTY NEWS



Don Runnells at the site of an ancient tin mine and WW-II era mill, on the north coast of Cornwall, Great Britain.

Visiting the Mines and Waste-Dumps of Cornwall

By Professor Donald D. Runnells

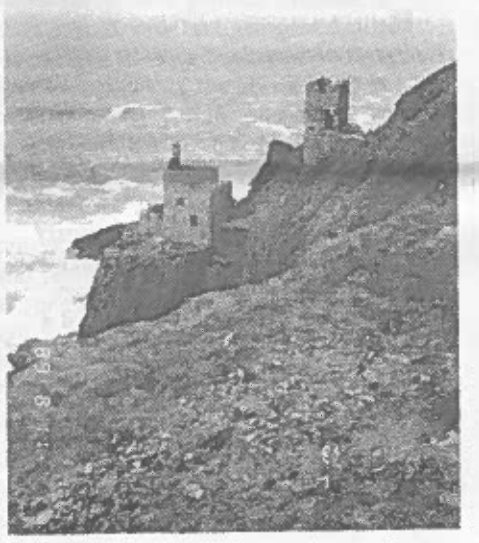
Cornwall, in southwestern England, is one of the most famous and most ancient of the world's mining districts. Tin, copper, lead, zinc, and china clay have all played an important role in its history. Tin has been mined since at least the time of the Romans, and the need for tin and copper in the production of bronze was probably one of the factors leading to the Roman conquest of Britain by Claudius Caesar. Together with the classic deposits of Freiburg, Germany, the tin deposits of Cornwall are mentioned in virtually every introductory course in mining and economic geology.

So, when a chance came for a trip to Cornwall, I was not about to turn it down. The opportunity came in the form of the Sixth International Conference on Water-Rock Interaction, organized by the International Association of Geochemistry and Cosmochemistry. The Hydrogeology group of the British Geological Survey did a remarkable job of organizing a meeting of more than 300 people from about 35 countries, including about 60 spouses and friends. My wife Erika took part in the non-technical program.

The technical sessions were held at Malvern, western England, an old spa famous for its very pure, cold spring water. The water is bottled and sold worldwide by the Schweppes Company; it is second only to Perrier in sales (and probably now first as no benzene has been detected in Malvern's supply or containers!). We traveled from London to Malvern on the 125-mph Britrail express, which was quiet, clean, and cheap. Britrail, recently privatized, is said to be the only passenger rail system in the world that operates at a profit.

The meeting consisted of four days of technical sessions, with a one-day trip to Wales in the middle of the meeting and a four-day trip to Cornwall following the meeting. I presented a paper on the natural cleanup of a desert stream that had been contaminated by waste from a gold mine and mill in Arizona (Sept-Oct 1988 Applied Geochemistry).

A lot of interesting rocks were seen on the field trip to Wales; however, for someone who works in environmental geochemistry as I do, the most interesting stops were the sophisticated government-owned installations to study the effects of acid rain, snow, and fog. Research on the chemistry and effects of acid precipitation in this part of the world is similar to that carried out in the U.S. at Hubbard Brook in New Hampshire. The work in Wales may be of more academic interest for two reasons: one is to determine what the effect



The remains of classic Cornish engine houses situated on the rocky coast of Cornwall. These mark the site of the Royal Mine, which was active until the early part of the 20th century.

of acid precipitation may be on fairly sizeable timber and paper industries, and the second is to understand the effect of acid precipitation in the complete destruction of all fish life in many of the streams, lakes, and reservoirs of Wales. Low natural alkalinity of soils and streams, due to a lack of carbonate bedrock, makes certain areas particularly susceptible to such damage.

Because I was trained and originally worked as an economic geologist, the field trip to Cornwall was fascinating. I was anxious to see the results of more than 2000 years of mining, milling, and smelting. I am happy to report that in that beautiful land, blessed with abundant rainfall and tenacious vegetation, the effects of the long history of metal mining are barely visible. At most locations, the only visual evidence for past mining activity are the ubiquitous and picturesque Cornish engine houses. Even sites used as recently as World War II have largely been reclaimed by nature. A principal factor aiding this landscape restoration must be the oxide form of the principal mineral, cassiterite, rather than the acid-forming sulphides that characterize minerals extracted in other regions. In fact, the only area where I saw a significant lack of natural revegetation was near a WWII-era sulfide mill. An interesting historical note concerns arsenic that is common (as arsenopyrite) in the tin ores. Until the mid-1800s, arsenopyrite was

Continued on Page 7

New Faculty Appointments in Petroleum Geology and Engineering/Hydrogeology

Phillip Oxley, former Chairman of Tenneco Oil, has joined the CU Geological Sciences Department as Professor of Petroleum Geology and Director of the new Energy and Minerals Applied Research Center (EMARC).

Phil attended Denison University in Ohio, served in the U.S. Navy during World War II, did graduate work at Columbia University in NYC, then joined the faculty at Hamilton College in central New York while completing his doctoral program through Columbia.

He became chairman of the geology department at Hamilton and enjoyed several years of academia, until the combination of low pay and raising a family led Phil to trade the professor's lectern for the gauges and maps of industry. He was employed by Tenneco in 1957 as the first offshore exploration manager stationed in New Orleans, where he participated in OCS lease sales that resulted in the nucleus of Tenneco's enormously successful natural gas business in the Gulf of Mexico.

Oxley then joined Signal Oil & Gas as their Gulf Coast manager, and further honed his business instincts with a smaller family owned company. Rejoining Tenneco in 1971, he climbed the corporate ladder to Vice President of International Projects in 1972, Manager of Exploration in 1976, and Executive Vice President for all Tenneco operations in 1982. By then, he was responsible for a legion of 2,600 employees and an annual budget of more than $1 billion. His final assignment in industry was as Chairman of Tenneco Europe, Ltd. in London, where he participated in the development of North Sea reserves.

The transition from scientist to businessman is not really one that is imposed upon one. Phil says "It's a metamorphosis not brought about in any formal way. Development depends on the interests and ambitions of the individual involved." Tenneco helped groom Oxley with a two-month executive management program at Stanford University in 1977.

The combination of science and business is what Phil Oxley is all about. As he leads the development of CU's Energy and Minerals Applied Research Center, his interests and talents will be very pertinent. "Professionals in the energy and minerals business are expected to make business decisions and risk assessments based on scientific data, interpretations, and presentations of ideas that allow their organization to do the right things." "It's a challenging and interesting game, acquiring leases through sealed bids and competitive sales and acquisitions strategies. It's always intriguing."

Oxley's zest for geology and business is matched by his interest in photography, fishing, and travel. He is also challenged by his wife Dafna Ronn-Oxley, a native of Israel who is a successful international recruiter for the petroleum industry. Dafna intends to continue her business of identifying and pursuing potential senior management and technical people from their new home on 15th Street on the hill in Boulder.

Vijay K. Gupta joined the faculty of the Department of Geological Sciences as a Professor in the fall of 1989. He is also a fellow at CIRES and holds a courtesy appointment in the Department of Civil Engineering.

Born in India in 1946, Vijay received his B.E. in Civil Engineering from the University of Roorkee in India in 1967, his M.S. in Civil Engineering from Colorado State University, Fort Collins, in 1971, and his Ph.D. in Hydrology from the University of Arizona, Tucson, in 1973. During the next four years, Vijay was a Visiting Assistant Professor at the University of Arizona. He joined the faculty of the University of Mississippi in 1977.

His research and professional interests cover many facets of hydrology and applied mathematics, with extensive work in mass transport in saturated porous media, physical/statistical modeling of space-time rainfall, as well as studies of the geometry of river networks and its connections with runoff and sediment fluxes.

Vijay's research has been supported by the National Science Foundation and the U.S. Army Research & Development Office. He has served on the editorial boards of several national and international journals and has edited two books. At the present time, Vijay is an active member of two National Academy of Science/Engineering committees: Opportunities in Hydrologic Science, and Meteorological Analysis, Prediction, and Research.

Vijay plans to participate in the development of a new graduate program that will provide interdisciplinary academic opportunities in the hydrologic sciences. In the area of research, his thrust will be on measurement and modeling of hydrologic processes at various regional scales. This is important in understanding regional and global climate changes and contaminant movement in aquifers. ▲

Report on Retirees

Bill Bradley is our most recent retiree. Bill is actively pursuing his interests that include lecturing on geology, volunteering for "Meals on Wheels," skiing twice a week (see photo with Bill's article on p. 9 for proof that retirement is everything it is rumored to be!), and helping Louise out in the garden. For the month of September 1990, Bill and Louise are looking forward to trading houses with Gordon Craig of Edinburgh, Scotland, who spent 1958–59 here teaching while John Chronic was on leave, and who has visited the Department on several occasions over the past three decades.

Harold Koerner is seen periodically in the Library, still researching in paleontology.

Ted Walker retired several years ago, but hired on half-time to continue offering his popular courses in sedimentary petrology and sedimentation. When not at school, Ted can be found with Barbara skiing (about twice a week), and biking (see photo next page). This summer they biked part of the Danube River valley.

Larry Warner is around the Department and Library quite often, and still takes time for that daily swim at the Recreation Center. His labor of love, *Profile of a Department,* is still available for $12.00 from the Department. Thanks, Larry, for several great evenings of reading about CU's and the Department's history!

TRIVIA ANSWER

A tally from the newest Geosciences Department Directory published by the American Geological Institute puts the number of CU alumni serving as faculty at U.S. universities and colleges at 73. This is an accomplishment of which we can all be proud.

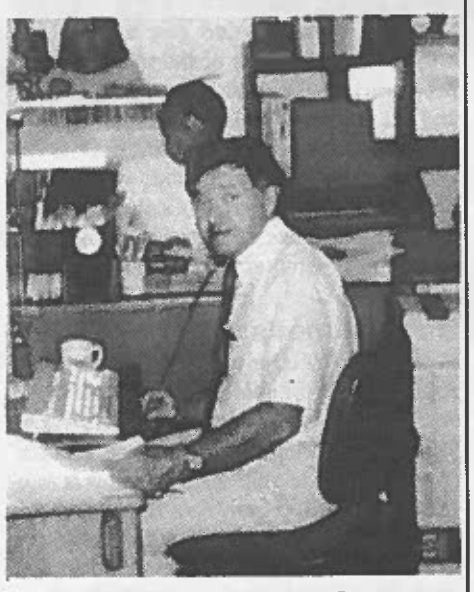
Letter from the Chair

A lot has happened over the last year, and it appears that the rate of change is not slowing down. We have been able to add several faculty over the last seven years because of our strong links to research institutes on campus. This has resulted in an expansion in both course offerings and research opportunities. It appears that we are a 'de facto' Department of Geological (and other) Sciences.

We have had a number of very positive happenings this last year, some of which are given expanded coverage in this newsletter. These include the formal development of the Energy and Minerals Applied Research Center (EMARC). In June 1989 we hired Phil Oxley away from Tenneco Europe (in London, UK) to head EMARC and to start to establish ties with the petroleum and minerals industries. Professor Bill Atkinson was appointed as Associate Director of the new Center. EMARC is presently being funded by generous gifts from several alumni and companies (Bruce Benson, Gary Grauberger, Eric Johnson, and John Masters of Canadian Hunter Exploration, a subsidiary of Noranda and Tenneco), and by University funds via the Dean of the College of Arts and Sciences, the Vice-Chancellor for Academic Affairs, and the Chancellor of the Boulder campus. Twelve faculty members have elected to be involved with EMARC. The Department and the Center will be strengthened in the fall of 1990 when we add an assistant professor in petroleum geology to our faculty (see box, page 1).

In October 1989, V. K. Gupta joined the faculty. He is a world-class hydrologist who will be teaching that subject to our undergraduates and graduates, and working with other faculty (such as Don Runnells, Mark Meier, and Jim White), and with other departments (Applied Math, Civil Engineering, Geography, EPO-Biology, etc.) to establish a national-quality hydrology and geohydrology program on this campus. In this same vein, our next hire will be a groundwater hydrologist.

In addition to our undergraduate major program, we have been able recently to instruct a large number of non-majors in interesting courses that form part of a new A&S college core curriculum in the natural sciences. These two-semester courses are entitled: Introduction to Geology, Global Change, and Our Dynamic Earth; one-semester courses are entitled: Evolution and Extinction, Environmental Issues, Natural Hazards, and Controversies in Planetary Geology.



John Andrews, Chair, entering Program Review information on the computer with Edith Ellis looking on. Program Review is a busy time in the office.

(Photo by Bill Braddock)

On the research and grant front, I am delighted to inform you that the Earth Science Directorate of the National Science Foundation, the source of much of our research money, has listed CU-Boulder's Department of Geological Sciences as sixth nationally in terms of research funding! Virtually all of these funds come to faculty of our Department. We received more research funding through peer-reviewed proposals from this section of NSF than did Harvard, Princeton, Johns Hopkins, and Wisconsin, to name but a few of the more prestigious departments across the country.

This will be my last letter to you as Chair of the Department. The three years have gone quickly. One of the things I have learned in my tenure as Chair is the importance of alumni to the well-being and strength of the Department. I would like to thank all of you for the various ways in which you have supported the Department—it is a Department to which I am proud to belong. ▲

John T. Andrews

Reflections from a Crystal Face

—Jim Munoz takes a break:

For the past four years, the editorial office of *American Mineralogist,* published by the Mineralogical Society of America (MSA), was housed in the Department of Geological Sciences. Jim Munoz served as executive editor and Mary Christenson Eberle (BA '69, MS '83) worked as managing editor. At the end of the 1989–90 term, Jim and Mary will be passing this responsibility on to Don Peacor at the University of Michigan at Ann Arbor and Steve Bohlen at USGS–Menlo Park. Here Jim shares his views on the current state of affairs in research and publishing in the Earth Sciences:

The day-to-day operation of a scientific publication has changed radically in the past ten years. These changes range from those little yellow sticky notes to overnight mailing services and FAX machines. Of course, the most monumental development, not yet undertaken by *American Mineralogist,* has been microcomputer desktop publishing, a technology which is revolutionizing the whole concept of publishing.

Toward the end of my tenure as editor, I got the feeling that the archival scientific literature as we know it today will not be recognizable ten years from now. One reason is the skyrocketing cost of journal subscriptions, combined with the increase in number of journals distributed by profit-hungry publishers (in contrast to the journals published by small scientific societies); these two forces result in some libraries simply cutting some journals from their subscription budget.

Paul Ribbe, former president of MSA, analyzed this problem in his address to the Society (*American Mineralogist,* 1988, v.73, pp. 449-469). I highly recommend this paper if you want documentation on the seriousness of this problem.

Another factor that is changing scientific publication is each author's desire for more rapid publication and dissemination of ideas. This can be accomplished readily by the new technologies such as telecommunications networks that link universities to government and industry research labs worldwide. If this means is to be effectively used, the many conflicting concerns of authors, department heads, deans, research-sponsoring agencies, and others must be considered. Ultimately, the key to advancement of some (or all) ideas, and, for that matter, authors, may be found in the expanding universe of electronic information.

While I worked on *American Mineralogist*, the average publication time was about twelve months. (It was often brought to my attention that the average baby can be made from scratch in considerably less time!) We introduced a "Letters" section to address the need for rapid publication of short articles that are "timely and significant." If speed of publication is a measure of success of this concept, "Letters" was a big winner: during 1988 and 1989, we published nine such articles, with an average receipt-to-publication time of 3.8 months. This was possible only by requiring 'instant' peer reviews with 24-hour turnaround, instant revision, and special handling by our managing editor and printer. I felt vaguely uneasy about these "fast-food" letters, but they were generally perceived as a welcome addition to the journal.

Ideally, journal articles that are archived in libraries should meet three standards—(1) high-quality work in the particular field, (2) a chance that it will be consulted in the future, and (3) as free of error as possible. The first requirement depends on a fair and impartial review system, the second only the future readers and researchers can judge, and the third is probably an impossibly ambitious requirement, despite spell checking programs. I must admit that even after reviews, revision, editing, and even proofreading by non-geologists, we still passed many serious errors, including garbled text, incorrect or missing references, data, tables, figures, etc. Many mistakes were fixed, of course, but many more were missed.

Unfortunately, rapid publication (in any format) is likely to only compound those problems, and author-prepared and instantly released manuscripts are likely to result in serious glitches in information flow from worker to worker. Perhaps there are alternatives, such as some sort of 'credit' for posting research results electronically so that they can be quickly distributed to colleagues worldwide, but some reviewing or screening methods clearly must be applied before journal publication, and perhaps the latter is best limited to review articles, summarizing several years of work on a particular subject, or for articles that require many detailed half-tone illustrations. Presumably there would be more time to get these articles into the best possible shape, and therefore, they would be of maximum use to future readers. ▲

... Visiting Cornwall

Continued from Page 6

avoided in mining to minimize contamination of the tin. However, when it was discovered that arsenic was effective in controlling the boll weevil in the cotton fields in the U.S., arsenic became a desirable byproduct and was recovered in furnaces throughout Cornwall.

Another highlight of the Cornwall trip was a tour through an underground tin mine, the South Crofty, portions of which have been active for at least 200 years. With subsidies, South Crofty managed to survive the 'tin crash' of the 1980s, has been modernized, and is now profitable, producing mainly tin and copper with byproduct tungsten. Portions of the mine are hot and wet, and it was particularly interesting to see, feel, and taste a flow of hot water (45 degrees C) from a drillhole on the 3280-foot level. The water has been flowing for about ten years since the hole penetrated a fault zone and the drillers and their equipment were washed several hundred feet back down the drift. (By the way, the water tasted terrible!)

The most important mineral product of Cornwall today is china clay, used in everything from paper to medicine. Cornwall is the second largest producer of china clay in the world. It is mined hydraulically with the same type of 'monitor' that was used to mine placer gold in California until outlawed in the early 1900s. The suspended clay is washed into settling ponds and various treatment facilities. The principal clay mineral, kaolinite, is produced by late hydrothermal alteration of the same granitic bodies that host the tin veins.

Ironically, it is the modern mining of kaolinite clay that has caused the greatest disturbance of the Cornish landscape. The clay pits are enormous and the waste dumps resemble the huge dumps associated with open-pit copper mines in the U.S. Recently there has been some effort to regrade and revegetate the waste dumps, but on the whole, I had the impression that the people in Great Britain are generally not as sensitive to environmental problems as we are in the U.S.

So, it was a good trip and a great learning experience. The things that I learned and the slides that I took will soon make their appearance in some of my geochemistry classes at CU. ▲

Familiar Cyclists in North Park, Colorado

The Walkers rest (briefly) while biking North Park with friends. From left to right, Peter and Alison (Conn) Richards (Alison was one of Ted's students), Sue Birkeland (Pete was taking the photo), and Barb and Ted Walker.

Faculty Activities in 1989–90

David Budd had a memorable year. As 'forecast' in last year's newsletter, David married Ann Walker. Ann is a CU geology graduate ('78) and daughter of Ted Walker. Dave, a sedimentary petrologist, is Ted's replacement, but swears that Ann was not a part of the recruitment package. Ann and David met through mutual friends.

Actually, now that David has Ted's daughter, his job, and his parking place, he is setting his sights on the ultimate prizes, Ted's office and his thin section collection.

David was also quite active scientifically. A paper on a Middle Eastern carbonate reservoir was published in *Sedimentary Geology* and another on diagenesis in the Bahamas was accepted for publication in the *Journal of Sedimentary Petrology.* David also received an NSF grant to study carbonate diagenesis and rock-water interactions in the Floridan Aquifer. One of Dave's PhD students will be working on the project, and Dr. Len Vacher, a geohydrologist at the University of South Florida, will collaborate with them.

Lastly, David presented a paper at the annual GSA meeting in St.Louis on his continuing study of cementation in some cores from the Atlantic which were collected during the Deep Sea Drilling Program.

In addition to his own research, David taught graduate courses last year in carbonate sedimentology and diagenesis, undergraduate courses in Introductory Geology and Sedimentology, and team-taught with John Andrews and Erle Kauffman a course on sea-level changes. A field trip with seven students over spring break 1989 to the classic outcrops of the Guadalupe Mountains, West Texas, was a particularly rewarding highlight for the carbonate sedimentology class.

David also supervises six graduate students, most of whom are probably destined for careers in the oil industry. All but one are doing subsurface theses. Three of them are working on the Phosphoria Formation in the Big Horn Basin, Wyoming, work which is possible due to valuable assistance and aid of Marathon Oil Company.

David's first MS student will be graduating in May 1990 and has accepted a job with Exxon Production Research Company. One of his other students had a summer job last year with ARCO Technology and another will be joining Exxon in 1990. Good students still get jobs, even in trying times.

Alex Goetz splits his time between teaching three courses in remote sensing and doing administration and research as Director of the Center for the Study of Earth from Space (CSES). Although he is billed as a solid earth geologist/geophysicist, he is also involved in other fields. For instance, he recently had a paper on atmospheric water vapor accepted in JGR-Atmospheres, and is doing research on reflectance spectroscopy of frozen human tissue with the CU Health Sciences Center.

Last November, he was invited by the Joint European Community Research Center in Ispra, Italy to teach part of a week-long short course in imaging spectrometry, the newest and most promising remote sensing technique for earth observation.

He was chosen by NASA as Science Team Leader of the High Resolution Imaging Spectrometer (HIRIS), the largest and possibly the most ambitious of all instruments to be flown on the Earth Observing System. HIRIS collects images simultaneously in 192 spectral bands over a 24-km-wide swath and can sample any point on the globe every two days. The spatial resolution is the same as the Landsat TM, 30m pixels.

Finally, closer to home, NASA has funded a cooperative research project between Goetz and Steve Forman of INSTAAR to study Holocene dune systems in the Colorado High Plains using a combination of field, laboratory and remote sensing techniques.

Bill Hay had a busy year. Spring 1989 was the second half of a sabbatical year spent as Gastprofessor at the Institut fur Palaontologie und Historische Geologie, Ludwig-Maximillians Universitat, Munich, Federal Republic of Germany.

He returned to the Boulder campus at the beginning of July. During the fall 1989 semester he taught the introductory course in Museology and a graduate level course in Marine Geology to a group which included several students from Mines.

Since resigning as Director of the Museum, and as a result of the sabbatical leave, Bill has been able to again be active in research. Most of his work has involved graduate students, and has been directed toward trying to develop an understanding of the interrelationships between plate tectonics, climate, cycling, and environmental change. He has studies underway on a number of topics, the philosophy being to answer the most significant questions as they come along, regardless of whether we are 'experts' in the areas involved. The current work Bill supervises at CU and at NASA Goddard involves the Gulf of Mexico, Europe and Africa, and finally the globe. Various slices of geologic time are being investigated.

Bill is also very involved in geological education. This spring, he addressed the national meeting of the American Association for the Advancement of Science in New Orleans on college level undergraduate education in geology. His ideas will be very helpful to the department as the requirements for the major and various courses are realigned.

Carl Kisslinger was busy again traveling overseas in May 1989. As part of a cooperative effort between the USGS and Spain, he was invited to give a short course in earthquake prediction at the Universidad Complutense, Madrid. In addition to lecturing, Carl gave a general talk at the National Geographical Institute, which manages the national earthquake observation program in Spain.

His other big trip was to Scotland and Turkey in August. Meetings with the IUGG Executive Committee, on which he serves as Vice President, were held in Edinburgh to plan the scientific program for the General Assembly to be held in Vienna in 1991. In addition, the role of IUGG in both the International Geosphere-Biosphere Program and the International Decade of Natural Disaster Reduction was discussed, and we at CU are developing our roles in both of these programs. The fact that the Edinburgh Festival was in progress was a major bonus.

On the way to Istanbul for the meeting of the International Association of Seismology and Physics of the Earth's Interior, Carl stopped by the University of Vienna Geophysics Department to look over the facilities for the 1991 meeting and to enjoy some young wine under the trees in that unique Viennese institution, the Heurigen.

A highlight of the meeting in Turkey was a field trip to the western portion of the North Anatolian Fault. The group examined the sections that broke in major earthquakes during 1944, 1957, and 1967. He also visited some observing stations of the German-Turkish cooperative prediction research project. A lively debate developed about the origin of a fresh crack about 100 meters long that had appeared along the edge of a sag marking this great transcurrent fault. The Turkish geologists think that it is due to accelerated fault creep; others argue that it could be a desiccation crack. Our guides confessed that they had not mentioned this feature the night before, as the hotel in which everyone stayed is adjacent to the fault and about 300 meters from a new crack!

While in Istanbul, Carl gave a paper on a study of aftershocks of intermediate depth earthquakes under northern Japan and the central Aleutians, co-authored with a Japanese colleague. This work is part of an NSF-supported study of aftershocks, as well as part of Carl's efforts to find common features of the seismotectonics of the two rather similar subduction zones.

Don Runnells was recently elected to a three-year term on the Water Science and Technology Board of the National Research Council/National Academy of Sciences. The board is made up of about twenty scientists and engineers from a variety of disciplines, and has responsibility for determining which topics and projects in the field of water science are worthy of study by selected panels of the National Research Council, as well as recommending the most appropriate people to serve on individual study panels. Recent panel projects and reports include the lessons learned from the selenium poisoning of the Kesterson National Wildlife Refuge in California, the state-of-the-art in groundwater modeling, water research programs in the USGS, and the environmental effects of the Glen Canyon Dam.

Don was also appointed as an Associate Editor of the relatively new journal, *Applied Geochemistry,* through 1992. He has served for several years on the editorial board of *Chemical Geology,* an assignment which ended at the close of 1989.

In terms of research, it was a busy and productive year for Don. He had four articles published in journals and books, as well as two book-reviews and four abstracts published. His research funds continue to come mainly from the Electric Power Research Institute in Palo Alto which supports work on computer modeling of contaminant plumes in groundwater. These funds supported one post-doctoral fellow (Ruth Skoda) and two graduate students (Chuck Patterson and Mark Siders). In addition, grants from a private consulting firm (PTI Environmental Services, Inc.) supported two MS candidates (Tom Doyle and David Walker) on projects related to contamination of water. A grant from the National Park Service to study the chemistry of groundwater in Yellowstone National Park as influenced by the fires of 1988 will support one PhD student (Mary Siders).

Joe Smyth received two new NSF grants during 1989 that allow him to take a full sabbatical year to pursue his research in mineralogy. His wife and research associate, Dr. Tamsin McCormick, took over teaching of the undergraduate mineralogy course during the fall of 1989.

One of Joe's research interests has been the mineralogy of the Earth's mantle. He recently completed a manuscript with Florie Caporuscio on the trace element chemistry of eclogite samples from South African kimberlites showing how the crystal chemistry of the minerals controls the distribution of trace elements in these rocks.

He also has been collaborating with Dr. George Rossman of Cal Tech on determining the hydroxyl contents of mantle minerals using infrared spectroscopy. One manuscript from this collaboration (in press) shows evidence of significant hydroxyl contents on natural rutile, and another on pyroxenes is in preparation.

Joe was the Program Chairman for the Spring Annual Meeting of the Mineralogical Society of America held jointly with AGU in Baltimore, May 1990. At that meeting, he organized a special session on the role of eclogites in the Earth's mantle.

Another of Joe's research interests is the application of mineralogy to environmental problems. For the past two years, he has been acting as a consultant to the State of Nevada on zeolite mineralogy of the proposed high-level nuclear waste repository at Yucca Mountain. Joe is also putting together a new course entitled "Minerals in the Environment" to be offered to undergraduate majors and non-majors.

Hartmut Spetzler had quite a varied year. He altered a popular non-science major course, "Our Dynamic Earth." The response was quite mixed, though some actually learned to actually like science.

In the small graduate student class he decided to try something new and offered a course called "Problem Solving in Geophysics" which stressed basic understanding as they calculated the energy in Hurricane Hugo or conditions under which convection can occur in the mantle.

He made a big personal decision to forsake the lure of the Bavarian Geoinstitute for Geochemistry and Geophysics at the University of Bayreuth. Subsequently, CU and NSF decided to support a major research project which will allow his colleague, Ivan Getting, and Hartmut to build a unique high-pressure laboratory in which they will be able to measure the physical properties of minerals and rocks under conditions which exist at a depth of 120km, within the upper mantle of the Earth. They expect to learn much about the composition of the mantle, and the stresses which are responsible for plate motions and consequently also for earthquakes.

Hartmut went to El Salvador to work with a colleague on finding and excavating prehistoric Mayan dwellings. Their field work was halted for several days because the guerillas had decided to demonstrate their influence by stopping all traffic outside of San Salvador during the inauguration of the new president.

He was personally touched by some of the momentous events around the world. A graduate student from China joined his research group shortly before the democratization movement in his home country. He lost several friends in the crackdown.

As Ria and he were watching the Berlin Wall come down, their thoughts were with friends and relatives in the Eastern Zone. A few weeks later Hartmut was able to visit in Germany for just a few days and talked with people from both the East and the West. The former are sure that they will never again allow a totalitarian regime to suppress their personal freedoms, while the latter seem to be ready and willing to make considerable sacrifices to help their brethren from the East.

Finally, Hartmut continues his bike trips. One was the annual bicycle trip, with mostly present and former students, over Trail Ridge Road. The second was a two-week bike trip through eastern Colorado, Nebraska, South Dakota, and Wyoming as far as Yellowstone and Jackson Hole, all of that with his son, Andrew. ▲

University of Colorado Represented at World Gold '89

Research results from four American universities and from three universities in Australia, New Zealand and Canada were among the 110 papers presented at a major symposium and trade show, World Gold 89, held in Reno during November 1989.

Along with the host, the University of Nevada, the other American universities represented were the University of Arizona, the University of California–Santa Barbara, and the University of Colorado.

CU was ably represented by two members of the research staff of the Center for the Study of Earth from Space: Phoebe Hauff and Fred Kruse. Their paper described an application of remote sensing to detect and map alteration-product clas in the Basin -and Range gold province.

Teaching at CU, 1955 and 1989:
A Comparison by Bill Bradley, Professor Emeritus

When a decade ends, people reflect on events of the past ten years. When a career ends, the reflection time is longer—in this case, 34 years, for it was 1955 when I joined the Geology faculty at CU.

What can we remember from 1955? Dwight Eisenhower was well along in his first term as president. The Korean War was over, as were the McCarthy 'witch hunts.' Color television was exciting the public. Brooklyn beat New York, four games to three. Construction of the interstate highway system would not begin for another year; commercial airlines would begin flying jets in another three years.

Colorado had a population of 1.5 million. The state needed a big man for governor, and it had one in Edwin Johnson. The Western Slope was crawling with uranium hunters.

Boulder had a population of about 30,000, all of them thirsty because they regularly voted 'dry'; however, one had only to venture to the city limit to find the nearest body of 'wet.' Trains continued to chug into town, spewing coal smoke and whistling their mournful outrage at the loss of passengers. Automobiles were in, encouraged by the recently built toll road to Denver.

CU and Mines had their present names, but the school in Fort Collins was growing dissatisfied with its name, Colorado Agricultural and Mechanical College. CU had 9000 students on its Boulder campus—fewer than during the peak of World War II veterans, but nevertheless, enrollment was growing. Wark Darley was President, Dayton McKean was Dean of the Graduate School, Jacob Van Ek was Dean of the College of Arts and Sciences, Dal Ward was football coach, and the conference was the Big Seven. Fall semester in those days began late in September and ended late in January.

Warren Thompson was Head of the Department of Geology, Mineralogy, and Geography (Geography formed its own department in 1957). Warren was one of the last department heads in the university; thereafter, governance was accomplished by rotating chairmen. Warren ran his department with an amiable and humorous spirit, not an easy matter considering the recalcitrant nature of some of his faculty:

Geologists—John Chronic, Zena Hunter, Harold Koerner, Warren Longley, Harrison Murray, Walter Toepleman, Ernie Wahlstrom, Ted Walker, Larry Warner, and myself.

Geographers—Harold Hoffmeister, Tim Kelley, John Loeffler, and Al Smith.

Zena Hunter was a Fulbright Fellow in Burma in the fall of 1955; part of her teaching duties were handled by graduate student Dick Kucera.

Who received graduate degrees in 1955? PhDs included Ok Joon Kim, Linus Litsey, and Gerald Richmond. MS graduates included Robert Beckett, James Butler, Don Eicher, Iver Hendrickson, Allen Holmes, Russ Honea, Arthur Humphrey, Forrest Poole, Kenneth Scott, and John Thrailkill.

With that historical review, we can proceed with the aim of this article: to compare the role of teaching at CU in my starting and ending years, that is, Academic Years 1955–56 and 1988–89.

Consider these data on the number of geology courses offered:

	1955-56	1988-89
Lower Division	8	8
Upper Division	21	29
Graduate	15	42
	44	79
Undergraduate Portion	29 or 66%	37 or 47%

and these data on enrollment and faculty:

	1955–56	1988–89
Total Students, Boulder	9,000	21,000
Geology Faculty, Boulder	11	29
Split Appointments	1	12
Total Faculty Available	12	41
Teaching Loads (# courses per year)		
typical range	4 to 6	2 to 3
average	4.5	2.5

Colorado in 1955 was a small and relatively simple university. Its foremost mission was teaching, particularly at the undergrad level—two thirds of the geology department effort was at that level. A teacher's course load was commonly five courses per year, involving 10 to 15 weekly contact hours with those students (independent study and thesis courses were not counted in teaching loads).

Being a newcomer in 1955, I was treated with extra kindness; I taught four courses that year, with only nine contact hours weekly. While I was thus loafing, Ted Walker and Ernie Wahlstrom were both teaching five courses with more than sixteen contact hours. Department heads were not immune; Warren Thompson had four courses and seven contact hours. Contact hours were fairly high because professors taught many labs—even in large introductory classes, professors taught one lab section, plus one quiz (recitation) section where it existed.

Able department heads ran their units efficiently and with minimum interference from the University. They made many departmental decisions themselves. Budgets were modest in size and simple in structure. Although a certain amount of service work was expected of everyone, the foremost mission was still teaching. Faculty members who performed their mission well, and who avoided public displays of moral turpitude, could count on a continuing career in the system. No one pushed us to bring Federal money into the University and no one specified an acceptable level of published research.

Colorado in 1989 is a large and complex university. Its student-body size would have at least trebled (like Boulder's population) were it not for an enrollment cap. The Geology faculty has grown by 2.5 times, though a large part of that growth has involved people who have 'split' appointments with research institutes or the Museum. These 'split' appointments illustrate the increasing complexity.

Geology course offerings have doubled, not as large a growth as the faculty, partly because of the split appointments. Education has shifted its emphasis toward the graduate level—approximately 50% of the geology offerings are now at this level. This reflects the increase in scientific research in the University, and its embodiment in the overall educational plan.

Teaching loads are about one-half of what they used to be (only a small part of this change can be attributed to the increase in 'split' appointments). Thus faculty teach fewer credit hours each year, and have fewer contact hours with undergraduate students. The reduction in contact hours goes beyond the simple reduction in course loads; faculty teach fewer labs than in the past. In AY56-57, my second year at CU, I had four courses and twelve contact hours; the same four courses taught now would involve eight contact hours. My guess is that this factor alone has reduced contact hours by approximately 20%.

With such a reduction in teaching loads and contact hours, how do faculty members utilize their 'freed-up' time? Here are two time-sinks: 1] Committee work and paperwork have both increased. Part of this comes with the change from an autocratic to a democratic form of governance. Part of it comes along with growth. The amount of paperwork now demanded of departments by the University would stagger one accustomed to the old ways. Edith Ellis, our premier secretary, estimates that during her 21 years with the department, paperwork has increased 10 to 20 times, maybe more. The office staff bears the brunt of this, of course, but no one escapes the ripple effect. Recruiting a faculty member these days can consume a major portion of a year. 2] Contract research is now a big and integral part of the University's operation. In 1955 there were no contracts (as we now know them) for Geology faculty. NSF had been in existence for five years, but its budget was small and people were unaccustomed to the opportunity it provided. Now, Geology faculty have yearly contracts that total more than $3 million. Time is consumed in: writing and rewriting proposals (those submitted to Earth Sciences at NSF have a 25% chance of succeeding); conducting the research; writing and publishing reports; and reviewing the proposals of others.

The University now claims that teaching and research are its foremost (and equal) missions. If time validates this claim of equality, then teaching has regained some of its lost importance, for, until very recently, getting grants and publishing papers were what counted most heavily in matters of tenure, promotion, and salary adjustments.

Research is a part of education. One cannot say that its increase has hurt education. Rather, one can say that its increase has enhanced certain aspects of education, at the sacrifice of other aspects. Both 'time-sinks' and the factors behind them have affected geology education at CU; it is different from what it was 34 years ago (as it is in most universities around the country).

Is the education better? That depends on one's evaluation of the changes. No two people will make precisely the same analysis; no two students would have been affected by the changes in exactly the same way.

For my part, the educational mission 34 years ago suited me perfectly. I was interested in research, but I was more interested in teaching. 1955 was a lucky year for me in many ways—lucky that CU was hiring someone in my field; lucky that Ted Walker, a good friend from Wisconsin, was already here; and lucky that the head of the department was Warren Thompson. ▲

Bill only skis where the geomorphology is well expressed—here at Winter Park!

Long-Range Facilities Planning for Geoscience Department

Background

During the last 7-year Program Review cycle, the campus-wide panel recognized the transition of the geological sciences from a concentration on natural history to a concentration on hard science, with attendant increased emphasis on experimentation and quantification. The effect of this change has been growth in faculty, research and teaching equipment, laboratory space and improved facilities, and in funded research.

While some of these needs were being addressed, only limited improvements have been made to physical facilities. The Geological Sciences Department and Earth Sciences Library are housed in a building originally erected in 1910, a building which underwent a major addition in 1952 and some remodeling in 1960.

Existing Building

The existing Geological Sciences building contains 30,000 assignable square feet, including the Earth Science Library and two lecture halls shared with other departments. The net space occupied by the Department totals 24,900 sf, while the Library uses only 5,000 square feet. As a consequence of these space limitations, the library has stored about ⅓ of its books and its entire map collection in the basement of Norlin Library.

Besides the building being just too small, the Department suffers from an inefficient overall layout, dark and dismal rooms on all floors, inadequate mechanical and electrical systems that preclude installation of new analytical instruments, classrooms with structural columns in the middle of the rooms, and outmoded energy conservation features (windows, doors, walls, etc.).

Former classrooms and laboratory space have been converted into office space for faculty and graduate students. Offices have been created out of storage space. Mineral and fossil collections used in teaching and some equipment are nearly inaccessible. Donations of valuable research material cannot be accepted because of lack of space. Rock sample preparation is usually a dirty task, one which nobody wants to accommodate in or next to their own office or lab. The new Computer Laboratory, funded in part by Amoco, preempted the drafting facilities and a storage room, but the computers are threatened by dust from rock grinders located just across the hall.

Research equipment such as a new mass spectrometer, a device that is fundamental to work underway by several professors, has been installed at CIRES because of space and utility service limitations.

Role of Facilities in Geologic Education at CU

Excellence in the natural sciences is a major strength of the University of Colorado at Boulder, and, as is stated clearly in the University's Master Plan, further improvement in these sciences is a high priority goal.

The original building was occupied in 1910 by a small department of five faculty members and fewer than 50 students. In the 1970s, the faculty had grown to 16 and was producing some 40 baccalaureate degrees and 20 graduate degrees annually. Since then, the faculty has grown to more than 30, and the number of graduates peaked in 1981 at about 130.

Given the central position of the Geological Sciences Department and its associated library in fulfilling the University's role, and given the clearly inadequate state of the present facilities, an investment in better facilities is needed. ▲

Adjoining Library Planned

According to the the CU-Boulder Master Plan, "planning for libraries must be done in light of the role of the campus and the library within the state. For UCB this means recognition that:

1) UCB is a research university and needs adequate books and periodicals to carry on this role,

2) in those areas where substantial research is conducted, UCB will have an extensive library collection and will provide materials to other institutions, and

3) certain UCB programs (including physical sciences) are nationally recognized and library resources should be provided to maintain this level of excellence."

The proposed new Geological Sciences Building includes space for an expanded Earth Science Library which will be sized to house its collections through the year 2000. By that time, and in conjunction with the relocation, it is thought that little-used books and other materials will have been culled and placed in a nearby compact storage area. The proposed Library space will be adequate to restore availability of the much-desired map collection.

Proposed Location Near Folsom Field

Four new buildings are being proposed to be constructed on the present Fischer Field just southeast of Folsom Field. This part of the Campus Master Plan, when completed, would constitute a combined Science and Engineering Department/ Library facility with great potential for improved operating efficiency. Two discipline libraries also being planned for this site are a combined Science Library (now in Norlin) and a joint-use Engineering Library and Mathematics Department Building. Also to be located next to Duane Physics Center is a building housing APAS —Astrophysical, Planetary and Atmospheric Sciences (formerly Astro-geophysics), and the Center for Astrophysics and Space Astronomy.

Results of Relocation

Relocation of the Geological Sciences Department and Earth Sciences Library to the new building will make the old Geology Building available for other uses. This structure has been identified in the campus Master Plan as appropriate for renovation to accommodate the School of Journalism and the Department of Communications, which would benefit from that proximity. It is thought that the building can be remodeled for this purpose at much less expense than for the larger and more utilities-intensive geology program.

In turn, the Macky Auditorium Renovation Study makes the case that the current Journalism space there is needed for support facilities to enable Macky's use as a major performance facility.

CCHE and Regents Approval

The process of planning and funding any building on campus is intertwined with the process of obtaining approvals from the Regents of the University of Colorado, the Colorado Commission on Higher Education, and the Colorado State Legislature.

The "Program Plan" for the new Geological Sciences building is proceeding through the system, but it is likely that full State funding for the project would be years away, because of the many requirements of the State for "capital construction" needs.

The Importance of Private Support

As is the case with all major universities, public or private, the University of Colorado must forge a partnership with its alumni and friends to encourage private donations to supplement state funds for vital projects such as the Geological Sciences Building.

The University of Colorado Foundation, Inc., the entity established by the Regents of the University of Colorado to solicit, receive and manage private gifts, is in the process of determining the feasibility of raising the $14,000,000 necessary to construct the new Geological Sciences building, probably from a combination of State and private resources.

As that feasibility assessment and planning for this campaign are completed, alumni and friends of the Department will be receiving additional information about the project. ▲

Department Hosts Weekly Colloquium

Under the leadership of Professor Max Wyss, the CU Geoscience Colloquium Committee offered these lectures by visiting geological research specialists during the Fall 1989 semester:

Dr. Michael Arthur, Graduate School of Oceanography, University of Rhode Island—*Atmospheric CO_2 Over the Last 100 Million Years: A Record in the Carbon Isotopic Composition of Marine Phytoplankton*

Dr. Anita Grunder, Department of Geology, Oregon State University—*Volcanism Related to Early Stages of Extension, East-Central Nevada*

Dr. Steward Nishenko, U.S. Geological Survey, Golden, Colorado—*Earthquake Probabilities* (actually scheduled for the week before the Loma Prieta/World Series event in California)

Dr. D. Turcotte, Department of Geological Sciences, Cornell University—*Chaos and Fractals in Geology*

Dr. Larry Benson, USGS-Denver and NCAR-Boulder—*Mesoscale and Lake Thermal Evaporation Modeling of Late Quaternary Fluctuations in the Size of Lake Labontan*

Dr. Jim Brooks, AAPG Distinguished Lecturer, University of Glasgow, Scotland—*New Role of Petroleum Geochemistry Quantitative Prospect Evaluation and Basin Assessment*

Dr. J. Gephart, Department of Geological Sciences, Cornell University—*Inferring the State of Stress in the Earth from Observations of Slip on Fault Planes*

News from the Front Office

Edith Ellis continues to cheerfully run the entire show, a smoothly running, well-equipped modern office. Edith and her husband George, who has been retired for several years, spend a lot of time with their grandchildren. In May they went to the Caribbean and a week-long cruise with her brothers and their families! They extended their vacation with a visit to some of the popular spots in Florida.

Betty Taylor is the staff member who takes care of the Department's 200+ students, watching their progress, helping get their committees together, assigning meeting rooms, etc. She also interacts a lot with the computer, putting the course schedule together and helping students with drop-add. Last year she took off for Indiana for a high school reunion (but she won't say which!), and this summer she and husband Paul, who works at Rocky Flats, are heading for Florida to help celebrate her parents' 50th anniversary.

Kay Fox has the main task of handling graduate student admissions, which total about 110. The rest of her time is spent on a variety of department operating tasks, so she is on the go quite a bit. In November she traveled to Washington, D.C. to enjoy watching her daughter perform in a string quartet at the Kennedy Center; soon she'll be off to San Francisco for a piano teaching workshop, and in the fall she's planning to go to London to visit family. Around the Department, she enlists support for the Boulder Philharmonic.

Mark Bishop is our newest staff member, joining the Department in April to handle our accounting. Mark's arrival relieves Edith from tracking invoices, preparation of grant budgets, etc. He hails from New York and the University of Wyoming, and loves Boulder as he is an active runner, skier, and cyclist.

Colleen Velie also joined the staff in early 1990 to assist Phil Oxley in the formation of EMARC as well as industrial relations and research grant development.

Sara Hatch, the Department's word processing computer operator, has moved to Houston, where she owns a very successful piano studio. She reports that her move was satisfactory, and we are all sure that piano students are easier to work with than Birkeland's and Kauffman's scrambled reference lists!

We certainly appreciate the great and cordial staff here in the Department, and hope that you alumni will continue to send those postcards from all over the world as you travel to so many very interesting places. Your address change/job change notices are also very helpful as we try to keep up with our extended family. And yes, Scott Burns, they still like your Christmas letter, even in July! ▲

Don Runnells New Chairman

Professor Don Runnells will be taking over the Department chairmanship from John Andrews starting summer 1990. Don has appointed two associate chairmen: Bill Braddock for undergraduate student affairs and Lang Farmer for graduate student affairs.

Don's agenda for the next three years will include:

1) leading the drive for a new building;
2) continuing the expansion of undergraduate course offerings for both majors and non-majors, as well as revamping courses and course requirements for the major;
3) involve more undergraduate students in department affairs;
4) continue the high-quality effort in graduate student teaching and research; and
5) add a hydrogeologist to the faculty. ▲

Review of the Role of Women in the Geology Department

Because of the recent death of Dr. Zena Hunter Andrews, one of CU's earliest female geology Ph.D. graduates, a retrospective on the opportunities for and contributions by women in the Department might be of interest.

Progress in hiring female geology professors has admittedly been difficult: In the late 1940s, we had Zena Hunter and Mary Oswald; in the late 1980s, we had only one woman, Mary Kraus. Hopefully, more women will soon join the faculty as new positions are filled.

In contrast, a review of our female students suggests that there has indeed been good progress in the number of Ph.D.s awarded to females. In the current academic year, 1989–90, there are 43 women and 92 men enrolled in the graduate program, a 32%–68% mix. A review of past graduates since 1975 indicates an extremely variable mixture:

at the B.A. level, the percentage of women graduates has ranged from more than 50% to less than 10%;

at the M.S. level, the male-female mix has often been equal, especially since 1979;

at the Ph.D. level, the proportion has been 22 women and 84 men, that is, 21% to 79%.

The increase from two Ph.D. graduates in the 1960s to four in the 1970s to eighteen in the 1980s exemplifies that the field of geology and, in particular, the University of Colorado, offer quite a good opportunity to women.

Listed below are our women Ph.D. graduates and their current positions where known (if we have omitted anyone, please let us know):

Beverly McMahon, 1966
residence Ontario, Oregon
Margaret Larsen, 1968
residence Arvada, Colorado
Dana Isherwood, 1975
Lawrence Livermore National Lab
Kim Manley, 1976
Self-employed, Los Alamos National Lab
Dawn Kaback, 1977
duPont, Savannah River National Lab
Marcia Rottman, 1977
Exxon Research, Houston
Barbara Bates-Tewksbury, 1981
Professor, Chair, Hamilton College, NY
Peggy Guccione, 1982
Adjunct Professor, Univ. of Arkansas
Debbie Harden, 1982
Assistant Professor, San Jose State Univ.
Lisa Osterman, 1982
Assistant Professor, George Washington University
Mary Kraus, 1983
Associate Professor, Univ. of Colorado
Margo Toth, 1983
USGS, Denver
Marith Reheis, 1984
USGS, Denver
Carol Williams, 1984
Consultant, Houston
Betty Skip, 1985
USGS, Denver
Julie Brigham-Grette, 1985
Assistant Professor, Univ. of Massachusetts
Jean Crespi, 1985
Research Assistant, Brown Univ.
Elizabeth Forester-Browers, 1985
USGS, Denver
Hanna Pavlik, 1987
Geohydrology consultant, Golden, CO
Christine Turner-Peterson, 1987
USGS, Denver
Aslaug Geirsdottir, 1988
Research Associate, Univ. of Iceland
Kerstin Williams, 1988
Research Associate, CU-INSTAAR
Carol Finn, 1988
USGS, Denver
Anne Jennings, 1989
Research Associate, CU-INSTAAR ▲

What's New in the Earth Sciences Library

The Earth Sciences Library, which underwent a major transformation in August 1988, continues to rush headlong into the 21st Century with the arrival of CD ROM technology. The CD ROM is a relatively new format for storing and retrieving information: CD stands for "compact disk," and ROM stands for "read only memory." The disk itself is physically identical to an audio compact disk, but contains computer-readable information. These disks have a capacity of as much as 650 megabytes, a tremendous amount of information.

The Library currently uses two databases in CD ROM format, both acquired on a subscription basis like a journal, and are updated quarterly. The *Selected Water Resources Abstracts (SWRA)* covers all aspects of water, including glaciology, oceans, groundwater and surface hydrology, as well as biological and engineering aspects of water resources. In addition, the database includes some information on soils, sedimentation, geomorphology, and other geologic fields related to the overall subject area of water. This database is especially useful because it provides citations for abstracts as well as articles.

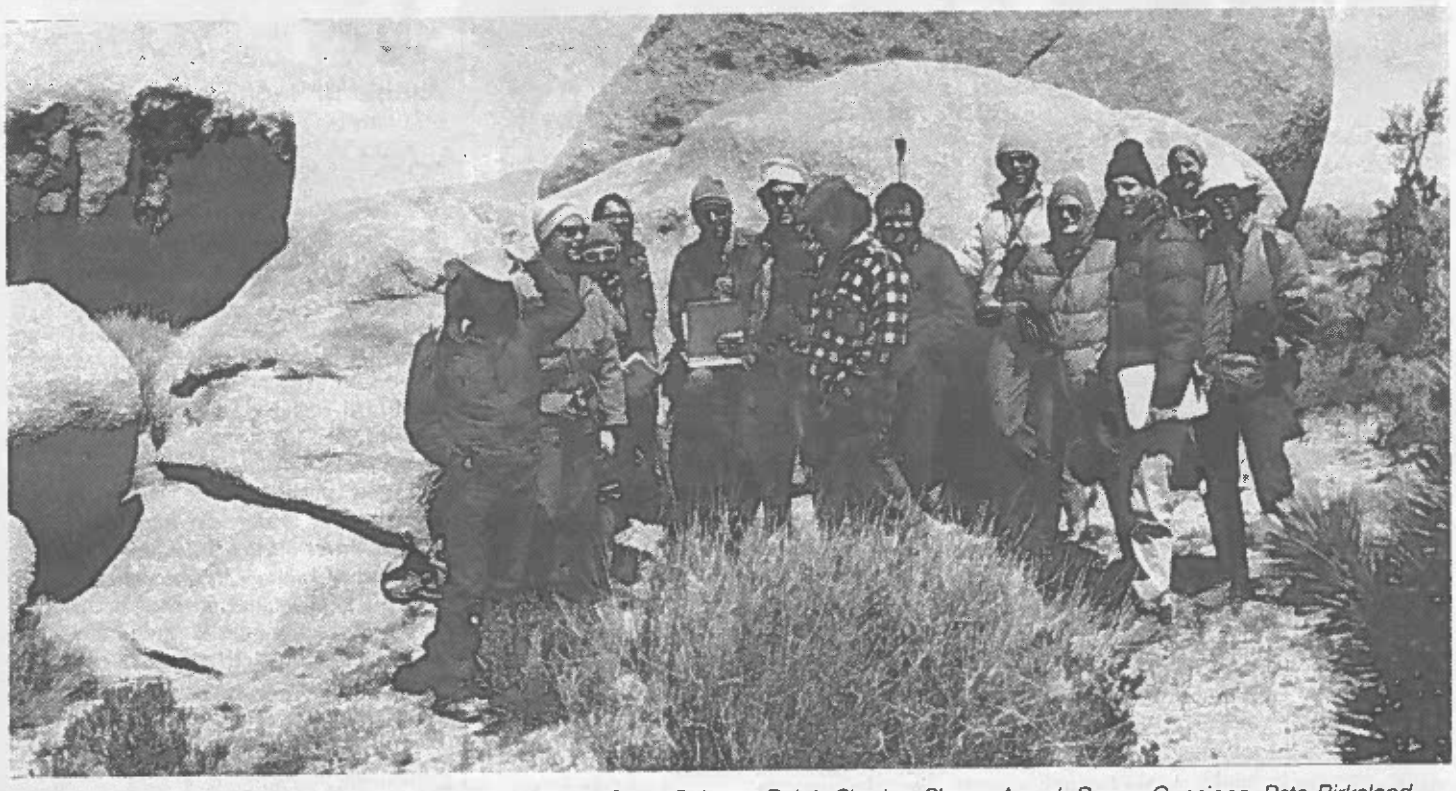
The second CD ROM database is called, *Earth Sciences,* and consists of three files: Earth Sciences Database Directory, Geoindex (maps), and the USGS Library (everything since 1975). None of these files contain abstracts, but the databases are searchable by keyword, author, and numerous other access points. The keyword access concept is far more readily understood and used by researchers than the rigid subject headings used by most traditional indexing systems. The search format is menu-driven, with lots of "help screens" available, so that the system can be used very effectively with little training. Best of all, there is no cost to the user.

The CDs available in the Earth Sciences Library have proven very popular, not only with geology students, but with engineering and geography students as well. The entire University Libraries System subscribes to nearly all of the dozen or more databases available in this format. Others, including AGI's Bibliography and Index of Geology, will eventually find their way into this format, we trust.

The key to the entire system, however, is an extremely helpful Suzanne Larsen!

The CD ROM databases are viewed through a workstation consisting of a microcomputer with a color monitor, a printer, and a CD drive, all purchased through a gift from the Crail-Johnson Foundation in the memory of Jerry Crail Johnson.

Eric Johnson (BA 1982) is President of this Foundation, as well as being a member of the Department's Alumni Advisory Board. This source of funding has enabled the Earth Science Library to support, and even anticipate, Department research and teaching with the newest technology as well as a book and journal collection of greater depth than has previously been possible. Thanks, Eric and family, for your generosity and for your interest in the excellence of geologic education and research at the University of Colorado. ▲



Desert geomorphology field trip in Mojave Desert, 1970s. Steve Colman, Ralph Shroba, Sherry Agard, Peggy Guccione, Pete Birkeland, Bill Bradley, Tom Carroll, John Andrews, Bud Burke, Marith Reheis, Tom Oesleby, Alison Conn, and Tom Berg (l. to r.).

Geo-Nuggets

Borrowed from *Pandora's Bauxite—The Best of Bates,* Selections from "The Geologic Column," by Robert L. Bates, 1966–85, published by Geotimes, 1989.

"I could have been" is the name of a game publicized some time ago by San Francisco columnist Herb Caen. To play it, you make up funnies like "I could have been a cab driver, but I couldn't hack it," "a tobacconist, but I wasn't up to snuff," and so on.

I regret to report that a West Coast brother made Caen's column with that pre-Pleistocene gag, "I could have been a geologist, but I had rocks in my head." Our science deserves better.

Modesty prevents me from identifying the author of the following. I could have been . . . a big oil man, but I depleted my allowance . . . an oceanographer, but I got in over my depth.

Any nominations from the floor?

Here are a few of the better and more printable replies: I could have been . . .

- a speleologist, but I caved in
- a sedimentologist, but I settled down too soon
- a vertebrate paleontologist, but I didn't have the backbone
- a phosphate producer, but I didn't have the apatite
- a geomorphologist, but I didn't shape up
- an Arctic oceanographer, but I couldn't get my Berings Strait
- a reservoir engineer, but it's a pore way to make a living
- a volcanologist, but I blew it
- a mining engineer, but I was lousy adit
- an igneous petrologist, but I took it all for granite
- a successful photogeologist, but nothing developed
- a mountain climber, but it put me on edge

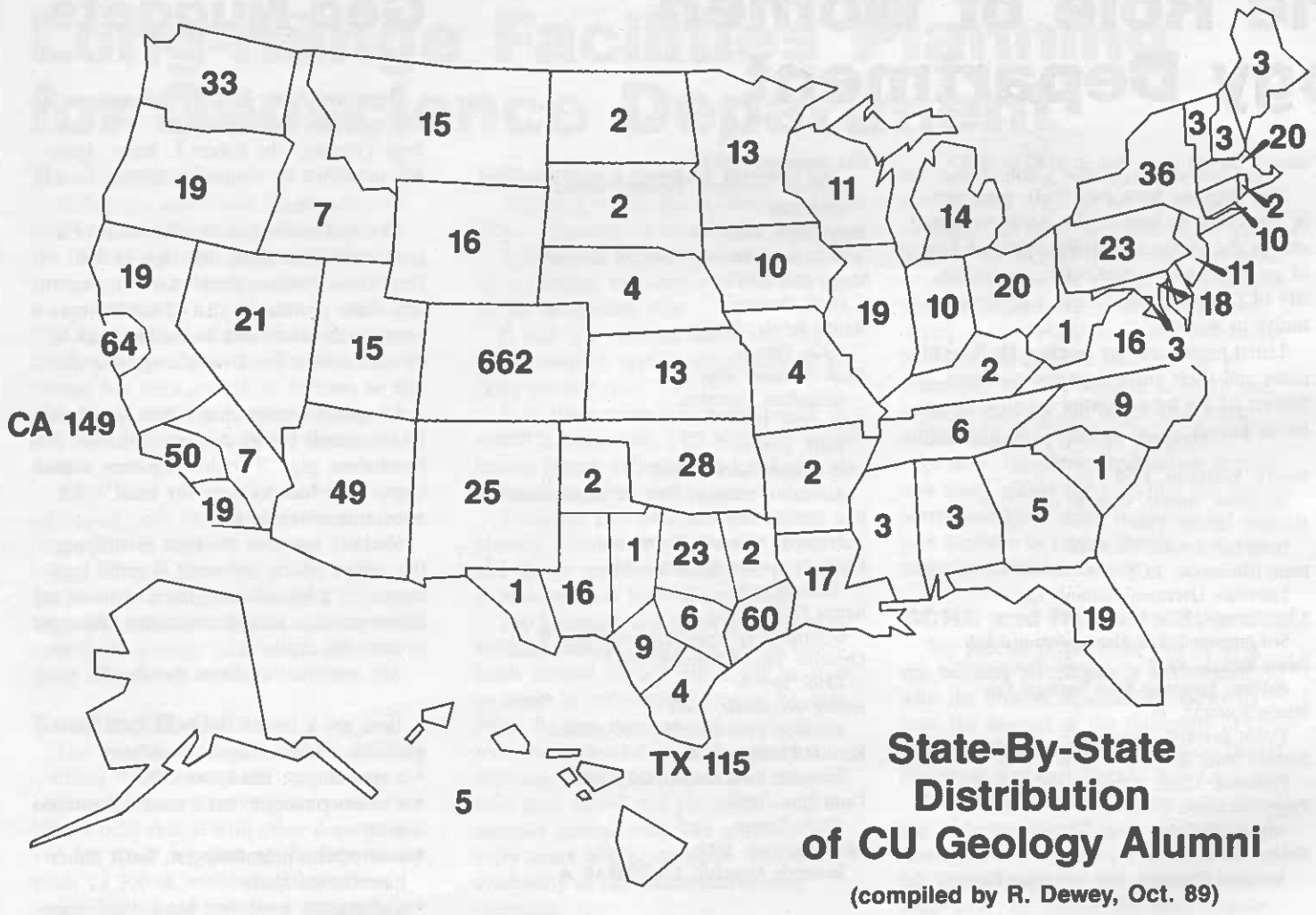
Senior Citizens Taking Geology Courses

One delightful aspect of the Department's role in education is the advent of older students taking courses for the sheer joy of learning. The University encourages seniors from the community to take courses on campus if classroom space is available.

One of our most enthusiastic senior students recently passed away, but we thought you would enjoy knowing about Fred Berquist. Though close to ninety years of age, Fred was a very active student, always full of good questions, and always in class. He even arranged his golf outings around his geology classes!

Fred's interest in Geology was founded on a long association with minerals and refining industries and several resource agencies during a distinguished 36-year career in Federal government service as an economist. In 1929, he was responsible for the U.S. Census of Mines and Quarries. He was a co-author of the Bituminous Coal Code. In 1936–37, he served in Switzerland as U.S. Representative to the International Labor Office. After World War II, Fred supervised war plant disposal throughout the country.

We will certainly miss Fred, as he was a delight to have in class. With students such as Fred and many other seniors, we believe that our Department's educational program is contributing to a much wider Boulder community. ▲



State-By-State Distribution of CU Geology Alumni

(compiled by R. Dewey, Oct. 89)

Alumni Prominent in State Agencies

Several CU Geology alumni hold jobs with State Geological Surveys and with various regulatory agencies. The profiles of five of our alumni are described below, but we would like to hear from others with similar roles for future newsletter features.

Tom Berg, *B.A. 1962 and M.S. 1967,* was appointed State Geologist of Ohio in March 1989 after working 24 years with the Pennsylvania Geological Survey. His last post with the PGS was as Associate Director and Chief of the Geologic Mapping Division. His most noticeable work was compiling the 1980 geologic map of the state, a significant improvement on prior editions. His last project with the PGS was remapping the bedrock and surficial geology of Warren County as a part of a groundwater resource investigation in cooperation with the USGS. Tom also became well known for his work on Archanodon (upper Paleozoic clam burrow), Upper Devonian and Lower Mississippian stratigraphy, and mapping of glacial and surficial deposits. He also published Pennsylvania's first-ever correlation chart and an atlas of preliminary geologic quadrangle maps.

The Ohio Survey was founded in 1837 and has had ten previous directors, including William W. Mather, John S. Newberry, Edward Orton, and George White. Tom's new responsibility will include ongoing work on glacial geology—mapping bedrock topography, drift thickness, and detailed county maps. Another interesting topic will be the OGS's study of Lake Erie sediments and shoreline features, facilitated by their own research vessel. A new Quaternary map of the State may be on the drawing boards before long!

Tom has also agreed to serve on the CU Geology Department's Alumni Advisory Board for the next few years; thanks, Tom for your enthusiasm and energy!

Charles G. (Gil) Mull, *B.A. 1957 and M.S. 1960,* is a Senior Geologist with the Alaska Division of Geological and Geophysical Surveys in Fairbanks. Gil was instrumental in the recent publishing of a major work on the Geology of the Dalton Highway Region, from the Yukon River to Prudhoe Bay, including such features as the eastern Koyukuk Basin, the central Brooks Range, and the eastern Arctic Slope. Gil served as a co-editor and authored seven of the thirty-plus papers in this volume.

Jim Pendleton, *Ph.D. 1978,* serves as Director of the Mined Land Reclamation Division of the Colorado Department of Natural Resources. After several years as the County Geologist in Boulder, during which he was instrumental in evaluating abandoned coal mines and associated hazards with respect to community development, Jim moved to the MLRD in 1982.

John Rold, *B.A. 1948 and M.S. 1950,* has completed twenty years as Director of the Colorado Geological Survey after working for the California Company for about twenty years. He began the State job after the Colorado Legislature renewed its support of the energy/minerals and engineering geology services to citizens and businesses of Colorado that are provided by that agency. John's tenure has seen the tremendous energy boom of the 1970's followed by the slump of the 1980's, the expanded environmental concerns of a state with a growing population and conflicting land uses.

Dave Shelton, *M.S. 1972,* is in the 'hotseat' as the Director of the Hazardous Waste Division of the Colorado Department of Health. Dave formerly worked for John at the Survey, then held Jim's current job as director of the MLRD, but switched to Hazwastes under Governor Romer's administration in 1988. ▲

Roger Dewey, Phil Oxley, John Andrews, Julie Brigham-Grette, Giff Miller, Bill Hay, Ted Ball, Vera Markgraf (INSTAAR), Terry Okumura, Janet Thornburg, and Marcia Rottman (l. to r.).

Reception at St. Louis GSA in November

Alumni and faculty who attended the Geological Society of America Annual meeting in St. Louis, November 6–9, enjoyed the reception on Monday night, and a breakfast buffet on Tuesday.

Roger Dewey, Alumni & Industrial Relations Coordinator for the Department and the CU Foundation, hosted these events.

Alumni News

1931

Louis O. Quam—*AB 31, MS 32, DSc (Honoris Causa) 74*—retired 1971; PhD Clark University 1938; received honorary DSc degree from University of Alaska-Fairbanks in May 88; living in Falls Church, VA.

1934

David M. Seaman—*MS*—retired in 1973 from 20 years with American Museum of Natural History, Department of Mineralogy, 4 years with Harvard University Mineralogical Museum, and 10 years with Carnegie Museum Mineralogy and Paleontology Departments; lived in Maine from 1973 to 1988; then moved to Grand Junction where Dave and his wife are active in the Gem & Mineral Club, the Colorado Archaeological Society, volunteer at Dinosaur Valley cleaning dinosaur bones for exhibits, and at the Museum of Western Colorado; published over 45 articles for *Rocks & Minerals* magazine, and expecting to have another article published soon entitled "Reflections of Sixty Years of Mineral Collecting"; a fossil cephalopod (Pennoceras seamani) was named after him by two University of Iowa paleontologists, to be described in the Rocks & Minerals column, Who's Who in Fossils. Dave writes that at age 82, he is in excellent health and can still actively collect minerals in the field, sometimes at 12,000 feet elevation. "I wrote my report for the Master's degree on the 'Mineral and Mineral Deposits of the San Juan Region, Colorado,' spending six weeks in the field during the summer of 1934 and another six weeks identifying the *minerals I found back in the laboratory." He* identified his professors, Dr. Russel George for economic geology, Dr. Philip Worcester in geomorphology, Dr. R.D. Crawford in crystallography, mineralogy, and ore deposits, Dr. Warren Thompson in field geology, and Dr. Ernest Wahlstrom in optical mineralogy.

1938

Marlow D. Melvin—*BA*—Independent oil operator, geologist, drilling contractor in Evansville, Indiana; three children and 7 grandchildren, one attending CU.

A. Reynolds Morse—*BA*—received a doctorate of humane letters from Rollins College, Florida, where his collection of M.P. Shield art is housed. The King of Spain also awarded him the Order of Isabella Catolica in recognition of the Dali Museum in St. Petersburg, of which Ren is President of the Foundation. He is also a trustee of the Denver Museum of Natural History, and lives in Chagrin Falls, Ohio, just outside of Cleveland.

1941

Donald E. Beck—*BA*—retired in March 1983 after 37 years with Phillips Petroleum including 18 years of international assignments, culminating in E&P position in Denver; earlier employment with Kennecott at Bingham Canyon and four years in the Army Air Force; wife Helen, two children and four grandchildren; living in Englewood, and enjoying golf, travel and grandchildren.

William R. Judd—*BA*—"more or less" retired since January 1988; Professor Emeritus of Civil Engineering, Purdue University, Editor-in-Chief of *Engineering Geology—An International Journal,* and consultant on dam safety; published three books—*Principles of Engineering Geology & Geotechnics, State of Stress in the Earth's Crust,* and *Physical Properties of Rocks & Minerals;* founded and chaired U.S. Committee on Rock Mechanics (NAS-NAE), received Special Award for Contributions to Rock Mechanics from USCRM (NAS-NAE), first American selected as Alex duToit lecturer in South Africa and Rhodesia (1967); five daughters scattered from Connecticut to Alaska; elected to Colorado Ski Hall of Fame in 1983; still in Lafayette, Indiana.

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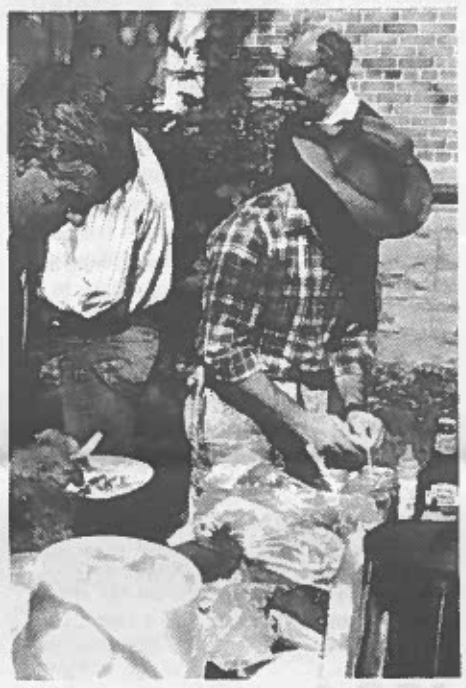

Alumni socializing at 1989 Homecoming.

JOIN US Before the Buff-OSU Game November 10

Q. Do Football and Geology Mix?

A. You bet they do.

Last fall at Boulder, while the Buffs football team was having its most successful season in 100 years, the Department hosted about thirty alumni for Homecoming 1989.

On October 21, the Kansas Jayhawks provided the weekly fodder for Ralphie and colleagues. Just before kickoff, the Department hosted a bratwurst & beer cookout for alumni, students and faculty. Following the game, a reception was held at the University Club and a dinner was enjoyed at the Memorial Center.

During the 1990 football season, we may hold these events on the site of the proposed new building, directly across Colorado Avenue from Folsom Field. Some 50,000 people will then be exposed to our project.

Alumni News

Continued from Page 12

Bonnie Enderud McCosh—*BA*—enjoyed tent safari in Kenya and "Society Explorer" cruise to Antarctic Peninsula during 1988; 5 grown children and 5 grandchildren; now living in San Diego, CA.

Zena Hunter Andrews—*PhD*—deceased August 2,1989 (see article).

Ralph L. Langenheim, Jr.—*MS*—half-time Curator of Paleontology at the University of Illinois Museum of Natural History, Urbana, IL.

1948

J. Charles Fox—*BA*—moved in 1988 from Hartford, Connecticut to Silver City, New Mexico; retired from Vermont Agency of Transportation in 1979, moved to Connecticut and worked as guide at Old Newgate Prison and Simsbury Copper Mine and Connecticut State Dinosaur Park; active in local Audubon Society, teaching square dancing, and hiking.

1949

C.P. (Chet) Abrassart—*BS 49, MS 51*—Consulting Petroleum Geologist in Casper, Wyoming since 1960 after working for Sinclair 1953-60; published in 1989 on the Lite Butte Field, Big Horn Basin, Wyoming Geological Association Annual Symposium.

Charles Butler—*BS 49, MS 50*— President, Sunwest Abrasives Co., developing an industrial garnet property in SW Montana through joint venture with Cominco, plans to dredge tailings from early 1900's placer gold operations; living in Durango, CO with wife Kathy.

Elwin M. Peacock—*BA*—consulting geophysicist in Houston since 1972; awarded a Life Membership in the Society of Exploration Geophysicists at Anaheim convention in October '88 and is standing for election as SEG's President for 1991; Pinky also serves as a member of City Council of Hunters Creek Village, a suburb of Houston.

1950

R. James Leithead—*BA 50, LLB 53*—Attorney in Tulsa, Oklahoma; certificate in Executive Program, Columbia University, 1971; four children.

1951

George A. Clough—*MS*—retired from ARCO, last position was Rocky Mountain District Exploration Manager, living in Englewood (reported by Chet Abrassart . . . thanks, Chet)

1952

S. Dave Hixon—*BA*—Systems Programmer, Shuttle & Related Space Activities, UNISYS, Houston, Texas; continued education at University of Texas-Austin, MA 1959, and PhD at University of Michigan, 1964; published "A Synthetic Aperture Radar (SAR) Imagery Lineament Analysis determining Integrity of Woodburry Clay of New Jersey" in *Selected Case Histories of the Successful Application of Remote Sensing in Geology,* by Geosat Committee, 1988; three grown children.

1954

Ralph J. Anctil—*BA*—appointed Director of Business Development for IntraSearch, 37-year-old airphoto and mapping service firm located in the Denver Tech Center.

Gene C. Campbell—*BA*—Assistant District Manager for Minerals, Bureau of Land Management, Dickinson, ND.

Dale L. Johnson—*BA*—"Upon graduating, I was drafted into the Army where, since I was a geologist, I was put to work teaching telephone installation and repair. After the Army, I worked for three years

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Alumni News

Continued from Page 13

with the oil company J.Ray McDermott in Denver.

I then joined Gerry Cunningham in the original Gerry Company and we made ski clothes and camping gear for eight years. I then went to work for the Denver–U.S. National Bank (now United Bank of Denver) learning banking and computers. After three years, I started my own company, "Frostline Kits," making do-it-yourself, or rather sew-it-yourself kits of camping gear and outdoor clothing. After twelve years, I sold out to the Gillette Company (razor blades, shavers, etc.) who had in mind diversifying into mail-order. They failed miserably, but I took my money and ran.

I invested the money in many different areas and retired. I now spend my time managing my money, traveling, skiing, and backpacking. I am a pilot with instrument and seaplane ratings and own a Cessna 206. Last summer, my wife and I spent seven weeks in Alaska flying on "floats" from lake to lake from the Alaska Peninsula to the Brooks Range. We spend a lot of time on conservation work and are volunteers for "Project Lighthawk," a non-profit air service for conservation organizations.

I was a mountaineer most of my life, climbing in the European Alps, New Zealand, Rockies of U.S. and Canada, the Peruvian Andes, and Africa. Frandee and I just returned from Kenya and Tanzania where we climbed Kilimanjaro, Africa's highest mountain." [Dale and Frandee live in the foothills above Boulder and enjoy regular cross-country ski outings with Sue and Pete Birkeland.]

Joan B. Stough—*BA 54, MA 57*—Supervisor of Palynology Lab for Exxon USA, Houston, Texas, since 1984; "single and loving every minute of it as it allows me to study and travel and enjoy my friends and cats."

1955

John L. Pardee—*MS*—consultant in Salt Lake City, planning a trip to Australia to search for gold along the Central NSW coastal region.

1957

Scott Laurent—*MS*—Exploration Manager, Preston Oil Company, The Woodlands (north of Houston), Texas; seven grown children & spouses and grandchildren.

1959

G.L. (Larry) Bale—*BA*—Independent Landman, Casper, Wyoming.

1960

Charles G. (Gil) Mull—*MS*—Senior Geologist, Alaska Division of Geological and Geophysical Surveys, Fairbanks.

Daughter Christina is a freshman at Cornell, son David in 8th grade. New publication Guidebook 7 by AK DGGS: *Dalton Highway, Yukon River to Prudhoe Bay, Alaska; Bedrock Geology of the Eastern Koyukuk Basin, Central Brooks Range,* and *East-Central Arctic Slope.*

1961

John O. Maberry—*BA*—retired from USGS in 1986 after 25 years, moved to mid-coast Maine where Andrea and John operate a Bed & Breakfast in their 135- year-old home called Laphroaig (Scots for the beautiful hollow by the broad bay), on Deer Isle, 55 miles south of Bangor; 10% discount to geologists! [207/348-6088].

Keene Swett—*MS*—Professor, Department of Geology, University of Iowa, Iowa City; specialties sedimentary petrology and sedimentology; completed PhD at University of Edinburgh 1965; enjoyed homecoming in Boulder and GSA meeting in Denver in October 88; "I'm still chasing polar bears around the Arctic, having switched to the Northwest Territories after 8 years of work in Greenland and Spitsbergen"; daughter JoAnn is a high school PE teacher and coach in Madison, Wisconsin, and son Alan is a dentist in Des Moines, Iowa.

Charles J. Taft—*BA*—Lutheran pastor, Kenmare, North Dakota; ordained 1972, Luther Theological Seminary, St. Paul, Minnesota; wife Susan, son Charles H. (16) and daughter Rachel (12); "switched from geo to theo, but still enjoy using the geology I learned at CU!"

Warren Yeend—*MS*—Assistant Chief, Branch of Alaskan Geology, USGS, Menlo Park CA; PhD University of Wisconsin, 1975; published Late Cenozoic sedimentary history along major fault zones in Alaska, geologic map of Rulison quadrangle in Colorado, and a comprehensive study of the geology of the placers of the Circle District, Alaska is "in the mill"; remarried 1985, daughter (16).

1962

Thomas M. Berg—*BA 62, MS 67*—appointed State Geologist for Ohio in March 1989 after serving 24 years with Pennsylvania Geological Survey; also appointed to CU Geoscience Alumni Advisory Board (see article).

Philip R. Bigsby—*BA*—Hydrogeologist, USGS, Lawrence, Kansas; earned MS in 1970 at Iowa State University; published several USGS Open-File Reports and MF Maps and U.S. Bureau of Mines Mineral Land Assessments; wife Roxanne.

1963

George Ulrich—*PhD*—Deputy Chief in USGS Office of Regional Geology, working primarily on the National Geologic Mapping Program. "After 27 years, I'm planning to retire at end of 1990 before my brain turns completely to cement."

My career has taken me from Kentucky, to Flagstaff, AZ, Hawaii, and Reston, VA. It has been a lot of fun and much of the credit for the interesting assignments and many good breaks along the way belongs to the faculty support I received at CU during those creative years, 1958–63.

Future plans include continuing research in volcanology and more time on the coastal waters of Florida, if I can find a boat I can afford.

1964

Bruce Florquist—*BA*—Public Works Director, City of Somerton, Arizona (12 miles south of Yuma) starting 1-1-89; moved from Montrose, CO; wife Karen and daughters Kristal (22) and Melody (18).

1965

Donald L. Baars—*PhD*—"starved out consulting petroleum geologist" joined Kansas Geological Survey in June 1988 as Senior Scientist in Petroleum Geology Section; living in Lawrence, KS.

1966

Arnold J. Boettcher—*BA*—retired from the U.S. Geological Survey, and now doing contract work for the Environmental Protection Agency, living in Lakewood.

1967

Tim Beesley—*MS*—President, Geological Services Inc., Toronto; mining geological consultant; three children (15), (11), and (7).

Richard B. Koepnick—*BA*—Research Associate, Geology, Mobil Research & Development Corp.; Dallas, Texas; continued education at University of Kansas, MS 69 and PhD 76; published in paleontology, carbonate sedimentology and diagenesis (stylolites), radiogenic isotopes (Sr in Cenozoic seawater); wife Fran and sons Brian (17) and David (12).

John R. Matis—*BA*—Bureau Of Land Management Executive-on-Loan at Colorado School of Mines, working in the Special Programs and Continuing Education (SPACE) office, developing programs for government and industry scientists to interact with school teachers and students (K-12), with emphasis on earth science, technology, minority programs and regional science education alliance; received MS Geology in 1969 from University of Northern Arizona; lives in Arvada with three children.

Robert E. Webster—*BA*—Senior Exploration Geologist, Central and South America, Hunt Oil Company, Dallas, Texas; received MS from University of Texas-Arlington, 1978; wife Rosina, son Alan (9) and daughter Sara (7).

1968

Fred Barnard—*PhD*—doing mineral exploration consulting in Bolivia, Turkey, Costa Rica, Venezuela, and Uruguay; offering a subscription report on gold mining opportunities and development procedures in Venezuela; gave a paper on nickel resources of the Caribbean region in San Jose, Costa Rica; wife Nancy received PhD in English Literature in May 1989 and now teaching at CU-Boulder, CU-Denver, and Red Rocks Community College; still living in Golden.

Dick Smith—*MS 68, PhD 75*—started with EG&G in Idaho Falls as Scientific Specialist in early 1986 after Climax Mine 'cratered'; "working on seismic and volcanic hazards for Idaho National Engr Lab, actually looking at trenches across faults, in stuff I used to call dirt"; seriously into floating the nearby Salmon River, the distant San Juan River, and competitive horse trail rides; publications include "Dyke Emplacement at Spanish Peaks"—Geol. Assn. Canada Sp. Paper 34; "Surface Deformation in the Arco Rift Zone Eastern Snake River Plain, Idaho"—GSA Abstract 1988; "Field Trip Guidebook for 28th International Geological Congress: Snake River Plain-Yellowstone Volcanic Province," 1989.

1969

Steve Ludington—*MA 69, PhD 74*—promoted in 1987 to Assistant Chief, Branch of Resource Analysis, USGS, Menlo Park, CA; living in Palo Alto; family news . . . wife Beth Nord, daughter Betsey (18) graduated June '89 from Rocky Mountain School in Carbondale, CO.

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CU Geology Exhibit and Reception in San Francisco

About twenty CU Alumni attending the AAPG Annual Meeting in San Francisco during early June stopped by our exhibit and attended an evening reception.

Roger Dewey, the Department's Alumni and Industrial Relations Coordinator, organized a hospitality oasis among the 500-plus technical exhibits, and hosted a reception on Monday night, June 4, at the new Marriott Convention Headquarters hotel.

Contacts were also made with several interested students looking for the best graduate school for them; a definite commitment from Mobil to include CU in their 90–91 recruiting schedule was obtained; and several guest lecturers from AAPG and industry were tentatively scheduled.

32 Attend CU Reception at San Antonio AAPG

A CU Geology Department exhibit with photos, banner, and brochures was organized by Alumni & Industrial Relations Coordinator Roger Dewey. More than sixty people stopped by for a chat with Roger or John Rold, Director of the Colorado Geological Survey and a member of the Alumni Advisory Board for the Department, or with each other.

An evening reception in an adjacent hotel was enjoyed by 32 alumni and spouses, including:

1930s

Howard Lester—North Central Oil, Boerne, TX;

1940s

John Rold—Colorado Geological Survey, Denver;
Elwin 'Pinky' Peacock—consulting geophysicist, Houston;

1950s

Tommy Thompson—consultant, Boulder;
Don Rusk—Amoco, Houston;
Keith Murray—independent, Denver;
Fred Tietz—BHP Petroleum, Melbourne/London/Houston (we're never sure!);
John Hubert—UMass, Amherst;
Scott Laurent, Houston;
Don Gates—USGS, Denver;
John Harms—independent, Denver;

1960s

John Treckman—Shell, Kingwood, TX;
Pete Varney—Terrasciences, Denver;
Rod Tillman—consultant, Tulsa;

1970s

Buster Bryant—BP Exploration, Houston;
Dana Isherwood—Lawrence Livermore National Lab, CA;
George Aubrey—Torch Energy, Houston;
Tom Oesleby—Marathon, Denver;
Phil Mollicone—Van Dyke Energy, Houston;

1980s

Paul Burns—Sierra Geophysics, Boulder;
Tim Garfield—Boulder;
Kurt Johnson—Mandeville, LA ▲

Alumni News

Continued from Page 14

1970

John S. Empsall—*BA*—Senior Geologist, Pennzoil Sulphur Co., The Woodlands, Texas; completed MSc at Rhodes University in South Africa in 1982; wife Glenda and John have a son Nathan (2); visited CU campus first time in 17 years during GSA in November 88; worked for Duval Corp., and as a consultant, before joining Pennzoil, riding the copper boom, then the moly boom, then the gold-silver boom, and now the sulphur boom. "Who knows what will be next?"

1971

Diana Grunig Catalan—*BA*—Geologist, Hayes Petroleum, Rangely, Colorado; "still hanging on in the oil biz"; new son Eric born December 1988.

K.C. Koutsopoulos—*MS 71, PbD 75 Geography*—Dean, School of Agricultural and Surveying Engineers, National Technical University, Athens, Greece; married, two children.

Steve Kridelbaugh—*PbD*—President, Olney Central College, Olney, Illinois; involved in exciting project to start American-Chinese Education Consortium for Academic and Technical Exchange, to foster faculty and student exchanges between U.S. and P.R.C.; with wife Linda, three kids: two daughters Kari (13) and Kristen (4), son Erick (11).

1973

David A. Lopez—*BA*—Senior Exploration Geologist, North American Resources Co., Billings, Montana since June '82; continued education at University of New Mexico—MS 75, and Colorado School of Mines PhD 81; published five quadrangle maps and a stratigraphy OFR with USGS, and two papers in AAPG Bulletin and RMAG/DGS Bulletin, all from the Idaho-Montana Rockies or west-central New Mexico; wife Carolyn (BA-73) and children Paul (13), Matt (11), twins Marty and Mia (3).

Ted Walker's Geology 512 class of 1962 in the Gore Range. John Cys, Robert Parkinson, Harold Poelchau, Rod Tillman, Wolfgang Berger, John Hurst, Maug Thein, and Sam Boggs (l. to r.).

1974

Timothy W. Gorham—*BA*—Operations Support Manager, EXXON CO. USA, Midland, Texas since October 88; earned MS University of New Mexico, 1979, and published on Eocene Galisteo Formation, Hagan Basin, in the 1979 New Mexico Geological Society Guidebook; ten years with Exxon, stationed in LA, Ventura, Denver, and now Midland; wife Becky and kids David (5) and Laura (2).

Marith Reheis—*MS 74, PbD 79*—Geologist, Central Regional Geology Branch, USGS, Denver, CO; started a new project in 1987 on Quaternary stratigraphy and tectonics of Fish Lake Valley, California-Nevada; adopted son Carlos (6) and daughter Marisol (2) from Peru; living in the mountains west of Golden.

Lee C. Wilson—*MS*—Maintenance Director, Snowmass Lodging Co., Snowmass Village, Colorado; also teach geology courses at Colorado Mountain College, Carbondale and Aspen Centers; living in Basalt.

1975

Jerry Grocock—*MS*—Vice President Exploration for General Atlantic Resources.

William L. Hiss—*PbD*—working for Hambrecht & Quist, Inc., investment bankers specializing in growth & technology stocks, downtown San Francisco.

Jim McCalpin—*MS*—promoted in 1987 to Associate Professor, Department of Geology, Utah State University, Logan, UT; earned PhD from Colorado School of Mines, 1981; research interests in dating of faults, trenching active faults in New Zealand and Utah.

1976

Kim Manley—*PbD*—self-employed, currently guest scientist at Los Alamos National Laboratory, studying dinosaur gastroliths and the Rio Grande Rift.

1977

Terry Bailey—*MS*—Geologist, Chevron's Eastern Region, Lafayette, LA; survived acquisition of Tenneco by Chevron.

James N. Barkeley—*MS*—Attorney in Anchorage, Alaska, handling natural resource and environmental, mining, oil & gas, and hazardous substances; University of Oregon law school, 1981; published "A Survey of Case Law Interpreting Valid Existing Rights (VER)—Implications for Unpatented Mining Claims," Rocky Mountain Mineral Law Foundation, 1988; wife Susan completed MS in 1981 at Oregon in micropaleontology; children Daniel (5), Clare (3) and Shannon (1) and Labradors Kimberlite and Blue.

Steve Colman—*PbD*—promoted to Head of Coastal Geology Section, Branch of Atlantic Marine Geology, USGS, Woods Hole, Massachusetts; publishing on Quaternary Geology of Chesapeake Bay; Matt (10) and Betsy (7) attack life rather than live it, wife Marian doing lots of watercolor and pen-and-ink drawings.

Greg Foley—*BA*—President and Head Guide, Trailblazer Snowmobile Tours, Inc. and Fat Tire Tours, Inc., Winter Park CO; married.

1978

Bryan T. Richardson—*BA*—President, Red Rose Investments, Inc., real estate management firm; MBA Wharton School 1988 (where there were lots of geologists and oil people in the program); wife Barbara and kids Anna (4) and Andrew (1).

G.M. (Jed) Thomas—*BA*—Economic Geologist, Sage Resources, Missoula, Montana; continued education with MS at University of Montana, thesis on structural geology of Badger Pass, SW Montana, published in 1981 Guidebook of Montana Geological Society; wife Virginia and son Collin (1).

1979

Steve Lawless—*MS*—Geologist with Conoco in Houston, responsible for Chukchi Sea exploration in Alaska.

Harold F. (Hal) Miller—*MS*—Projects Director—Alaska, Conoco, Inc., Houston, Texas, supervising group responsible for Conoco's on-shore and off-shore exploration in Alaska; remarried in 1988 to Jenifer, expecting first child May 89.

1980

Louise M. Kiteley—*MS*—President, Smoke-5 Oil Company, Kiowa, CO; worked with Cavanaugh & Cavanaugh out of Larkspur, CO, doing well-site work in SE Colorado, handling leases and workovers, also dabbling in Idaho and Colorado gold; involved with horse training and events; two daughters (20) and (22) attending CU and Red Rocks College; living in Lakewood, CO.

John C. Webb—*MS*—Consulting sedimentologist & petrologist, working in clastic and carbonate reservoirs, mainly for oil & gas exploration & production clients in the Midcontinent, Rockies, Alaska, and Appalachian Basin; wife Becki and John welcomed their first child Tim in December 1987; living in Boulder.

1981

Brad Dunning—*BA & BS*—Field Supervisor/Task Leader, Groundwater Contamination Investigation and Feasibility Study, DOE's Fernald, Ohio Feed Materials & Production Center, working for hazardous waste consulting firm Advanced Sciences, Inc.; "after working in the oil business for 6 years, I got caught up in the massive extinction of the oil geologists. After an unsuccessful attempt as a stock broker, I decided to go into something with a future, i.e. hazardous waste and the impact on our groundwater"; married, one son and one daughter.

Nan Oleson Glenn—*BA*—Staff Hydrogeologist, R.L. Stoller & Assoc., Lakewood, CO, since November 1987; earned MS from Baylor University in 1986, married in June 1988.

Continued on Page 16

Alumni Advisory Board

The Department's Alumni Advisory Board meets twice annually on campus to review and comment on programs, priorities, funding, etc.

Members serving in 1989-1990 are listed below, with their CU degree and class, and their present professional affiliation:

Jon Connor—PhD 63; USGS, Denver
Dave Eggler—PhD 67; faculty, Penn State
Bob Graebner—BS 48, MS 54 (Physics); Halliburton Geophysical Services, Dallas
Gary Grauberger—BA 71
Tim Grove—BA 71; faculty, MIT
John Harms—MS 59; independent, Littleton
Eric Johnson—BA 82; Victory Oil Co., Long Beach
Howard Lester—BA 36; North Central Oil, Boerne, TX
John Masters—MS 51; Canadian Hunter Exploration, Calgary
Elwin Peacock—BA 49; geophysical consultant, Houston
John Rold—BA 48, MS 50; Colorado State Geological Survey, Denver
Omer Raup—PhD 62; USGS, Denver
Jane Silverstone—MS 81; faculty, Harvard

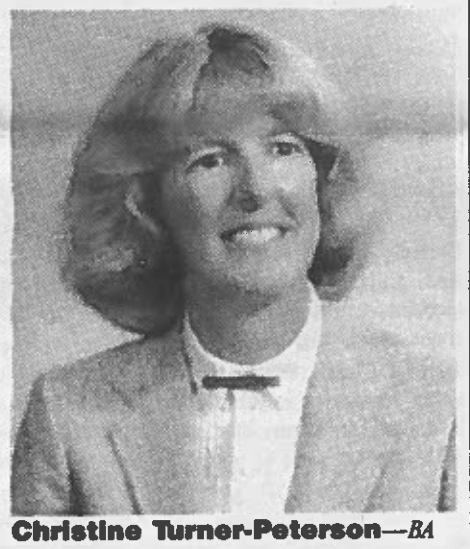
Six new members were appointed in 1989 for terms through 1992:

Jeff Abbott—*BS Harvard 1965; PbD 1970 from CU;* Jeff is Vice President and Managing Director of Homestake International Minerals, Vancouver. Previously he worked with the USGS, taught for a short time at CU and the University of British Columbia, then did porphyry exploration with Phelps Dodge. He is a member of CIMM, SEG (serving as chair of both the Research Committee and the Distinguished Lecturer Committee), GSA, AGU, Sigma Xi, and is a counciler for the Mineralogical Association of Canada. He returns to the Golden office of Homestake late this year.

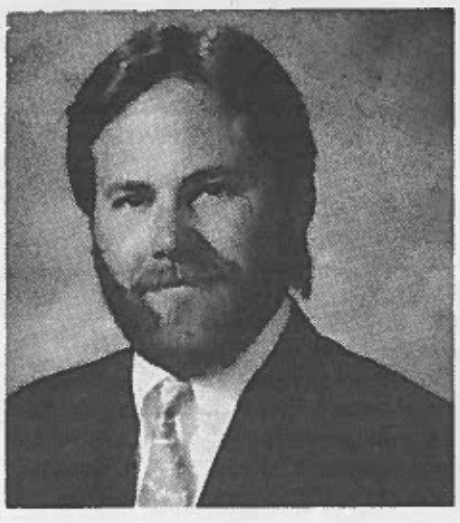
Tom Berg—*BA 1962 and MS 1967 from CU;* Tom was appointed State Geologist of Ohio in March 1989, after 24 years service with the Pennsylvania Geological Survey, where his last post was as Chief of the Geologic Mapping Division. He is a member of GSA, SEPM, and Sigma Xi (see p. 12).

Wolfgang Berger—*BS 1961 from Universitat Erlangen, Bavaria, FRG; MS 1963 from CU; PbD 1968 from University of California—San Diego;* Wolf has been on the faculty of the Oceanography Department of Scripps Institute of Oceanography/ University of California-San Diego since 1968. His research interests include ocean productivity, climatic change, and carbon isotopes in the deep-sea record. Wolf is a Fellow in AAAS, AGU, and GSA.

Gene Shearer—*BA 1948 and MS 1951 from CU;* Gene works as a consulting geologist in Denver after many years as a partner in the photogeology service firm Knox-Bergman-Shearer, later known as IntraSearch. Gene will also serve as Chairman of the Advisory Board for the coming year.



Christine Turner-Peterson—*BA William & Mary, MS Northern Arizona University, PbD 1987 from CU;* Christine is with the USGS in Denver where her research interests include Mesozoic basins, uranium deposits, basin analysis, and clay diagenesis. She is a member of AAPG, SEPM, RMAG, and was honored as a 1988 AAPG Distinguished Lecturer.



Tom Vinckier—*BA UC-Santa Barbara 1976; MS 1978 from CU;* A Partner with the consulting firm Dames & Moore, Tom serves as Principal Hydrogeologist and Manager, Geosciences for Southern California. He is a Registered Geologist in California and specializes in consulting fields such as mine dewatering, landfill and storage tank leak detection-remediation, and sub-surface contamination from refineries and industrial sites. He is a member of GSA and NWWA. ▲

Alumni News

Continued from Page 15

Margaret J. (Peggy) Guccione—*PhD*—University of Arkansas, Fayetteville, Geology Department; earth science education and teacher training, funded by NSF and state, works with archaeologists on geomorphology of sites; published "Environmental Constraints of Human Settlement in an Evolving Holocene Alluvial System, the Lower Mississippi Valley" in Geoarcheology, GSA's Centennial Field Guide, South-Central Section; son Jeremiah (13).

Ed Kwasnica—*BA*—Project Geologist, Dames and Moore, Irvine, CA; earned MS San Diego State University, 1986; currently working on environmental/hazardous waste studies in southern California; still single.

Steven D. Richtel—*BA*—Hydrogeologist, BP Minerals, Salt Lake City, in charge of all groundwater projects at BP's various minerals properties in the USA and Papua New Guinea; spent five years with consulting engineering company doing hazardous waste studies, and one year at USGS doing general hydrogeology; earned MBA University of Utah 1988; married, with son born in Feb 89.

Ron Stokes—*MS*—Conoco in Houston, wife Lana Czerniakowski working in Conoco's Alaska group.

Thomas R. Stotler—*BA*—transferred Jan 89 to District Coordinator, Maxus Exploration Co., Dallas, Texas; working Western Interior (Montana-Wyoming-Colorado); married, two daughters.

1982

Vance T. Holliday—*PhD*—Assistant Professor, Department of Geography, University of Wisconsin-Madison; research in the Late Quaternary of the Southern High Plains on a two-year NSF grant, elected to GSA Panel for Quaternary Geology & Geomorphology; married Diane Young in 1986.

Sarah (Sally) Odland—*MS*—Project Manager, RPI International in Boulder, working projects in the Cambrian and Ordovician section in the Illinois Basin, after 5 years in the Powder River Basin; published with coauthors Patterson & Gustavson "Amos Draw Field—A Diagenetic Trap Related to an Intraformational Unconformity, Muddy Sandstone, Powder River Basin, Wyoming" in the Wyoming Geological Association Annual Field Conference Guidebook; husband Bruce is a composer; son Michael (3) and daughter Marty (1).

Dave Rhode—*MS*—Senior Geologist, Michigan Group, Shell Western E & P, Inc., Houston, Texas; wife Sara, children Whitney (4) and Taylor (2).

Roger A.E. Slavin—*BA*—Senior Project Hydrogeologist with the Mark Group Engineers and Geologists in Pleasant Hill, CA (East Bay Area); conducting environmental and hazardous materials investigations and remediation studies; Amy expecting their first in August 89.

Richard C. Stanland—*BA*—Risk Control Consultant, Industrial Indemnity Corp., after 5 years as U.S. Navy officer aboard the destroyer USS *Lynde McCormick;* still single and living in San Diego.

Laura Von Holdt—*MS*—Consulting paleontologist, self-employed, Houston, Texas; with Chandler Wilhelm (see '83) two children Anna (3) and Rachel (1).

1983

Grand Anderson—*BA*—Project Engineer, R.W. Sullivan Engrs., Boston, MA; graduate studies in Civil Engineering at Illinois Institute of Technology; lived in Sweden/Finland 87-88, planning marriage to Finnish fiancee in June 89.

Kevin Francis—*BA 83, MS 87*—Geologist, Round Mountain Gold Corp., Nevada; formerly Mine Geologist, Manhattan Mine; wife Robin and Kevin report there are four of them now, with Kelinda (7) and Andrew (4); Kevin volunteers as an ambulance attendant and hikes a lot in the Nevada desert mountain ranges.

Susan Plymell Goter—*BA*—Geologist, USGS National Earthquake Information Center, Golden, CO; recently published full-color seismicity maps of Alaska, California, Hawaii, and the world; worked at INSTAAR from 82 to 88; married Dan Goter (CHEM-82); two dogs, no kids; living in Louisville, CO.

John A. Rohde—*BA*—Assistant Project Scientist, IT Corporation, Denver; completing MS Hydrogeology at Washington State University; published "Methods and Field Audit Results of a Remedial Design Using a Verified Ground Water Model," in NWWA Conference Proceedings: Solving Groundwater Problems with Models, 1989; two children Bridget (2) and Sean (1).

Matt Silverman—*MS 83*—Staff Geologist with Gustavson Associates in Boulder working international petroleum geology-engineering investment services; formerly with Total Minatome Corp. in Denver; published with coauthor Peter Stanton "Sedimentology, Diagenesis, and Reservoir Potential of the Pennsylvanian Tyler Formation, Central Montana" in Sandstone Reservoirs of the Rocky Mountain Region, RMAG, 1989; married, two daughters (7) & (5).

Chandler T. Wilhelm—*MS*—Senior Geologist, Pecten International, Houston, Texas; married to Laura von Holdt (see '82), two kids.

Lyons Witten—*BA*—Geologist, IEP, Inc., an environmental consulting company in Falmouth, Massachusetts, "doing hazardous waste site assessments and cleanup, landfill monitoring, and as much windsurfing as possible"; married to Laura Fitch ('82-ENVD); just accepted to U. Mass-Amherst for MS in hydrogeology.

1984

Peter Clark—*PhD*—Assistant Professor, Department of Geology, Oregon State University, Corvallis, Oregon.

David A. Schroeder—*PhD*—Assistant Professor, Geology Department, Augustana College, Rock Island, Illinois through June 89; single.

Dave Swanson—*MS*—Soil Scientist, USDA-SCS, Fairbanks, Alaska; completed PhD in Soil Science at University of Minnesota, 1988; married Shelli in 1988; published during 1988 and 1989 on wetlands and organic soils in Oikos and Soil Science Society of America Journal.

Sandy Werren—*BA*—Geological Technician, Ampol Exploration USA in Denver; teaching certification from CU-Denver 1988; single and skiing.

David (Rod) Wilson—*BA*—Manager, Kelfor Industries, custom lumber kiln-drying business, Vancouver, BC Canada; "still seen with Rooette."

1985

Anne M. Wood—*BA*—Geologist & Senior Computer Applications Coordinator, PetroStar Energy, Traverse City, Michigan; northern Michigan is gorgeous . . . winters are a little long though; PetroStar explores the Michigan Basin for deep gas with 100 employees.

1986

Pete Davenport—*MS*—working for Environmental Solutions.

Shelley E. Engman—*BA*—pursuing a BSN at the University of Iowa School of Nursing.

Rene Evans—*BA*—traveling through Nepal in spring of 89, after 1 year with USGS in Utah and Idaho and Golden, CO; traveled throughout Europe in summer 88, worked a couple months in Sussex, England, then began trekking in India and the Himalayas; enrolled at "Global University" learning languages, politics, religion, sociology, women's studies, economics, business, geography, and geology.

Michael R. Kulka—*BA*—Systems Field Engineer, Geodata MWD (Measurement While Drilling), Lafayette, LA; planning wedding in September 89.

Richmond T. (Toby) Leeson—*BA*—Master's candidate June 89 at San Diego State University; published results of a study of the Harper Creek gneiss, 1988, GSA Abstracts.

1987

Josh Marvil—*MS*—Geohydrologist, Science Applications Inc., Golden, CO; married.

Mike Rosol—*MS*—Sales Representative, Precision Visuals, Inc., Boulder, CO; computer graphics software systems for mainframe and workstation environments, selling to geologists and other scientists and engineers; wife LeeAnn and son Brian (1).

1988

Jorge Munoz—*PhD*—working for RTZ Exploration, Santiago, Chile.

1989

Scott Lehman—*PhD*—appointed Assistant Scientist at Woods Hole Oceanographic Institution, Department of Geology & Geophysics.

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 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 just some recollections.

Name _____ Date _____

Address _____

Degree(s) _____
before, during, and after CU-Boulder

Current Activity/Position/Employer/Location, etc.

Publications/Awards/Accomplishments

News About Family/Kids/Friends

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