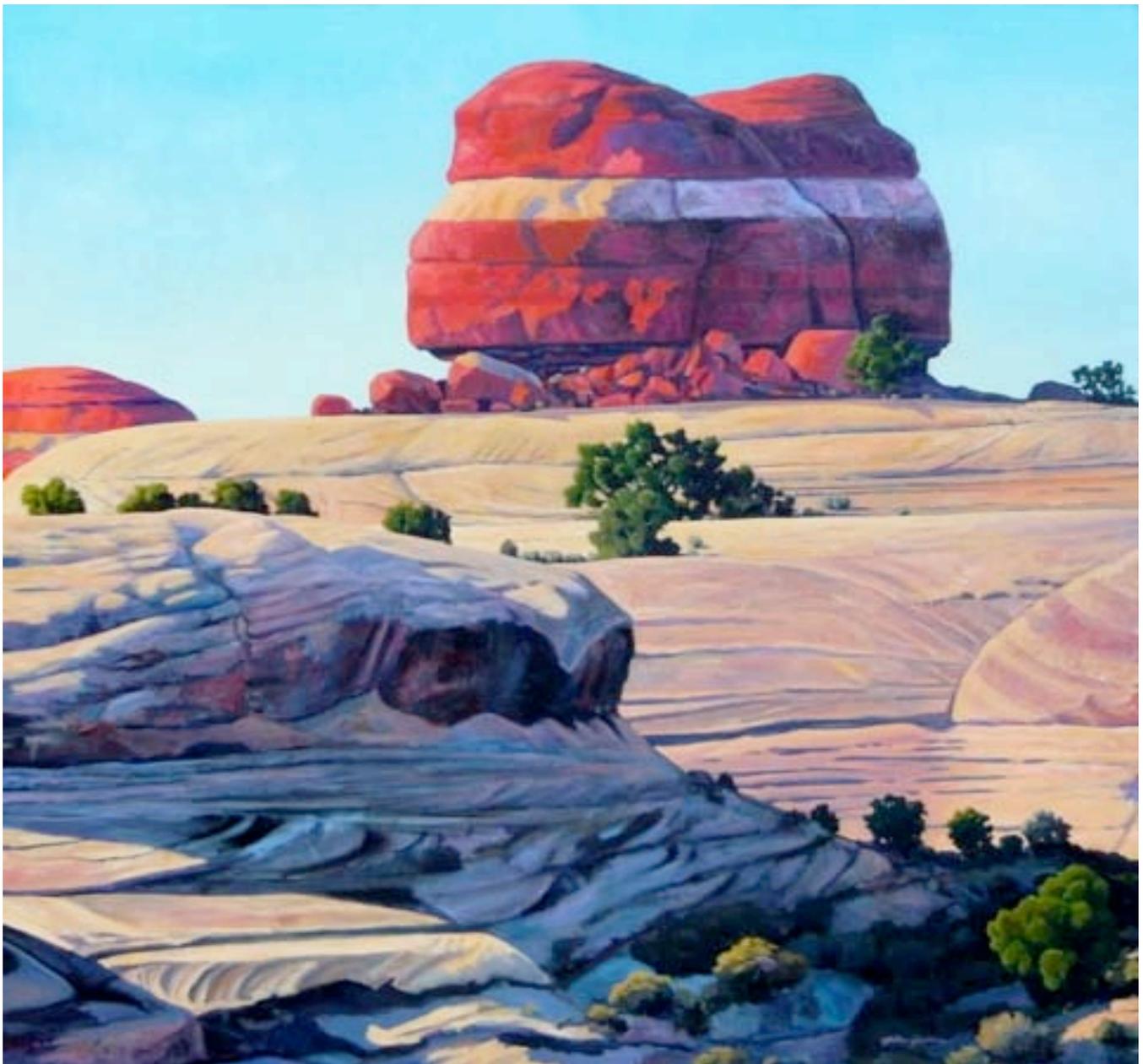


Down to Earth



Newsletter of the Geology and Geophysics Department
University of Utah, Salt Lake City, Utah

Fall 2009



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Message from the Chair

Dear Alumni and Friends,

After serving as Department Chair for seven years, Margie Chan stepped down on June 30, 2009. She accomplished much during this time for the Department, but her work on the new Frederick A. Sutton Building (FASB) probably will remain as her greatest achievement. Under Margie's leadership, and thanks to the generous gifts of many alumni, faculty, and friends of the Department, the FASB has a museum-like character and it is a pure joy to come to work each day.



With the momentum of the new building now driving us forward, there is much that I hope to accomplish in the next three years. First, we must find a way to overcome a nearly twenty percent budget cut. One-time federal stimulus money is lessening the blow, but the longer term is currently unclear. Our goal is to fortify our budget

by adding endowed chairs. We currently have none, which is unusual for a department of our size and stature. Second, we must provide a more vital part of the general undergraduate curriculum. Wouldn't it be great if non-major students at the University were examining rocks and fossils, constructing hazards maps with satellite images, and testing the thermal, hydraulic, and mechanical properties of earth materials in a modern laboratory in the FASB? My goal is to impart some Earth science education to ten percent of the undergraduate population. Finally, we need to rebuild the long-standing strengths of the department that continue to be weakened by faculty retirements.

Although there will be many challenges the next few years, in many respects the department has never been stronger. Our graduate enrollments remain healthy, we have new analytical instruments, and I am pleased to have an extraordinarily capable executive committee. Thank you all for helping to make the Department of Geology and Geophysics a premier institution for education and research in Earth science and engineering!

Kip Solomon

Cover image: "Confluence Sentinel", oil painting of Permian Cedar Mesa Sandstone in Canyonlands National Park, hanging in the Sutton Building. Commissioned from John Collins (U. of U. -B.A. 1987).

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Chair phone: (801)581-7162; E-mail: gg-chair@lists.utah.edu
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We will "go green" with an online edition next year, though you can still get a hard copy upon request. See p. 5 for details.

Department's Laboratories Employ Sophisticated New Techniques

The past two years have seen the continued development of our research laboratory facilities. Much of the expansion was made possible by quarters in the Sutton Building that provide the operating environment on which highly sophisticated machinery depends. We feature three important departmental laboratory facilities that will carry us into the future.

ICP-MS Facility Offers Elemental Analysis for Diverse Applications

Inductively coupled plasma (ICP) equipment combined with a mass spectrometer (MS) analyzer can be used in combination to identify trace elements and isotope concentrations for most elements in the periodic table. ICP-MS can interface with other separation techniques to analyze liquids, gases, solids, gels and tissue. This versatility is manifested in multiple applications in the geosciences as well as biological and forensic sciences and engineering.



New instrumentation for analyzing and identifying trace elements and isotopes is ready to go.

In the past three years, our quadrupole ICP-MS analyzer has processed 3,000 samples 40 trace elements in volcanic glasses, surface and ground waters, tissue digests, reactor sludges, soil extracts, carbonates, and column eluates, including analyses of physiological solutions and cultured cells. Beyond our own programs, researchers from laboratories in nine academic departments at the University of Utah have requested analyses from the facility.

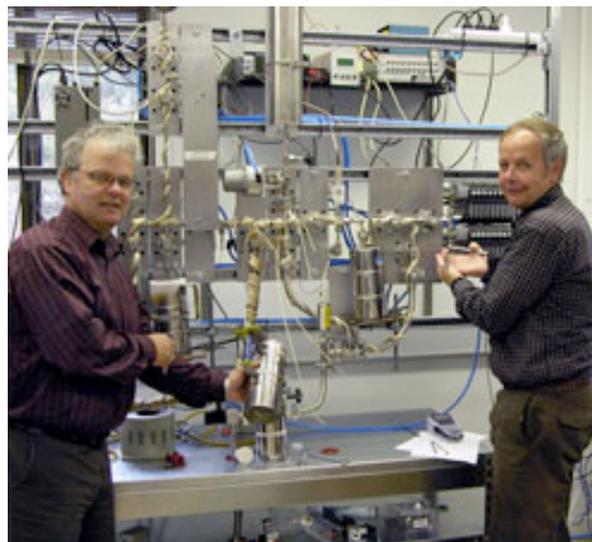
A multi-collector ICP-MS and a laser ablation system, soon to arrive, will be devoted to obtaining elemental and isotopic ratios for scientists in the Intermountain West interested in dating geological and archeological samples, conducting environmental, petrogenetic, provenance/forensic, and biological studies. Some planned projects across diverse disciplines include U/Th

dating of soil, cave, and spring carbonates as terrestrial palaeoenvironmental records, evolution of magmas, igneous petrogenesis, correlation of volcanic ashes, provenance of materials for forensic studies, U-Pb geochronology, effects of aging on metals in the brain; and colloid transport.

The lab is available to students and researchers working at the University, other academic institutions, and the broader science community, bringing a major scientific tool used in a variety of fields and contributing to an interdisciplinary environment.

Noble Gas Laboratory Produces Precise Gaseous Isotope Data

The laboratory's primary research focus is on the precise isotopic measurement of dissolved gases within water and rock systems, analyses that are very useful in several areas of study including groundwater recharge age determinations, groundwater recharge temperature determinations, cosmogenic age dating of earth surfaces and gas permeability, and diffusion studies in rock. This facility is one of only a handful of labs in the country capable of these types of measurements, providing research opportunities to our students and commercial services to a wide range of clients, both locally and internationally.



Andrew Herczog, a senior geochemist with CSIRO Land and Water, and Kip Solomon measure noble gases in Australian groundwater to understand the interactions between groundwater and surface water resources.

The centerpiece of the Noble Gas Laboratory is comprised of two mass spectrometers and two computer systems, optimized with lab-written software, so that the system can analyze the spectrum of gases at a rate of one sample per hour. Most samples analyzed by the lab are collected from natural waters and are used to determine the recharge age using the $^3\text{H} / ^3\text{He}$ technique. Water samples are introduced as a gas and processed directly by the system. For solids such as

rock, an attached high-temperature crushing system and vacuum furnace release gases which can then be let in directly to the process line. The lab also recently implemented a new database system which will greatly improve the tracking and reporting of lab data.

Successfully moved into its new home in the Sutton Building, the lab was again running research and commercial samples by late January. The lab is currently operating near capacity, having analyzed over 500 samples, and is involved in over thirty research projects.

New Advanced Rock Characterization Laboratory Installs Novel System

The Advanced Rock Characterization Laboratory (ARCL) became a reality in the spring with the installation of equipment which combines high-resolution electron microscopy with powerful data interpretation in a linked system. It rapidly obtains thousands of high-resolution mineralogical images and applies statistical evaluation to the data in order to quantitatively characterize rock mineralogy. Four high-speed, nitrogen-free energy dispersive detectors gather and merge element x-ray data. The merged data, when analyzed, yield mineral identifications, and permit quantification of minerals, abundances, and morphology.



Erich Petersen operates the new QEMSCAN equipment.

This equipment will have a major impact on the study of fine-grained materials (down to 1 micron) where quantitative mineral characterization has been historically challenging. There are myriad of possible applications in mining, metallurgy, mineral exploration, oil and gas exploration, coal studies, and environmental geology, as well as provenance and forensic geoscience.

This laboratory is the first of its kind housed entirely within an academic department in a U.S. university. The facility plans to serve students and academic researchers from local to international levels, as well as instituting collaborative projects with industrial partners.

Activities Expand Department's Scope and Relevance

The past year has seen the continued expansion of programs that enhance both our focused scientific interests and our wider relevance to the University and to the community beyond our corridors.

Sutton Building Grand Opening

On April 17th the Department of Geology and Geophysics, along with the College of Mines and Earth Sciences, celebrated the Grand Opening of the Frederick A. Sutton Building. The weather was brisk, yet comfortable for the approximately 450 alumni, faculty, dignitaries and friends of the department who were present. Donna Shalala, former cabinet member in the Clinton administration and current President of the University of Miami, was a special guest of Rev. Marta Weeks, the primary donor to the building fund. Donna was warmly greeted and acknowledged by University of Utah President Michael Young. A special dinner at the home of President Young was held the evening before the Grand Opening to honor the major donors to the building project.



Marta Weeks fascinated us with her stories about her father, Frederick Sutton.

Dean Frank Brown, President Michael Young, and Department Chair Marjorie Chan made comments during the ceremony, however, the highlight was hearing from Rev. Marta Sutton Weeks.

Her remarks were warm and intimate as she spoke of the relationship with her father, Frederick A. Sutton, after whom the building is named. She drew excerpts from his letters, drafting an insightful snapshot about what it was like to be the child of an exploration geologist. *[Read about him in "Getting to Know Frederick Sutton" in this issue.]*

After the ribbon cutting ceremony, attendees were hosted to a luncheon, and the faculty and students provided tours of the building and demonstrations. "This was the best grand opening I have ever been to," and,

"The building is spectacular," were often-heard remarks from many of the attendees.



Marjorie Chan, Frank Brown, and Karl Wulf look on while Marta Weeks and Pres. Michael Young cut the ribbon.

Round Table Generates Productive Ideas

An enthusiastic group of alumni and friends met for the annual Round Table Advisory Board meeting in conjunction with our Sutton grand opening on April 17, 2009. Our meeting was brief, but very productive. A number of great ideas were generated including the need for a marketing plan for the department, with specific suggestions on how to improve outreach, and staying competitive. The group targeted specific tasks, and a subgroup of the advisory board met during the summer. A Round Table focus group helped come up with a department marketing plan that was presented to the faculty at the fall retreat. Many thanks to Dan Barnett for leading this effort!

We are especially grateful to Chuck Williamson, who has graciously served as the chair of our Round Table for the last four years. His energetic, effective and enthusiastic leadership catalyzed the formation of this advisory group.

The 2009 Round Table alumni members were: Chair Chuck Williamson, Edith Allison, Dan Barnett, Geoff Bedell, John Dorrier, David Duke, Tom Fassio, Robert Garvin, Jeff Gentry, Bereket Haileab, Jerry Knaus, Margaret Kerr, Michael King, Hans Rasmussen, Peter Stifel, Tekla Lake Taylor, and Randy White. Department faculty members who participated were: Chair Marjorie Chan, Associate Chair Erich Petersen, Incoming Chair Kip Solomon, Gerard Schuster, and Dean Frank Brown.

PICP Still Inspires Students

The Petroleum Industry Career Path is still going strong with some 22 students enrolling in our modules this year. We are deeply indebted to Bob Bereskin and Bill Keach for their expertise and wonderful teaching in the program. PICP 2 enjoyed a repeat field trip to the

Wyoming Overthrust belt in 2008. Sadly, Hurricane Ike left John Byrd (of Hess Corp.) stranded in Houston and unable to join us. Fortunately, Lee Shannon (from Anadarko) was able to make it out of Denver to help guide us.

Consortium Holds Annual Meeting

In March, 2009, Professor Michael Zhdanov, Chair of the Consortium for Electromagnetic Modeling and Inversion (CEMI), hosted the annual meeting in the Rev. Marta Weeks auditorium in the Sutton Building.

There were over twenty representatives from twelve international company sponsors attending. Graduate students and researchers gave technical presentations, and a dinner at the Alta Club capped the all-day meeting. Participants also received a QEMSCAN presentation from Professor Erich Petersen.



Michael Zhdanov and Antony Price of TOTAL exchange ideas.

Faculty Retirements Spur Nationwide Searches

Our department has long been fortunate in the abilities and high standards of our faculty. Ultimately, though, we have to say goodbye to our leaders and mentors. Geophysics Professor and founding mentor of the WEST program Dr. David Chapman has stepped down from his longtime post as Dean of the Graduate School, and is beginning a phased retirement. Director of the University of Utah Seismograph Stations (UUSS) Dr. Walt Arabasz has also begun a year of phased retirement, all part of his "succession plan". In addition, geophysicists Dr. Rich Jarrard and Dr. Sue Halgadahl announced their phased retirements. Geophysicist and founder of the Utah Tomography and Modeling/Migration Consortium (UTAM) Dr. Jerry Schuster has recently departed for King Abdullah University of Science and Technology (KAUST) (located on the Red Sea, north of Jeddah). Thus, this year we are searching nationwide for promising, capable scientist-teachers to fill faculty positions in exploration geophysics and hydrocarbon geoscience, as well as seismology. If you know any good candidates, please send them our way!

Guy Atkinson Lectures Draw Attention to Advances in our Science

We are pleased to be able to explore new developments in our field through the Guy Atkinson Distinguished Lecture Series. The lectures are open to the public as well as the University community. Once again, the range of topics was enormously diverse and always interesting. For details of future talks, contact our department at 801-581-8767. Topics and visitors for 2008 – 2009 were:

Raymond Jeanloz, University of Berkeley CA, Earth & Planetary Science. "From Earth to Stars: Minerals and Melts at Extreme Conditions."

Matt Kohn: Boise State University. "Making the Himalaya: the Metamorphic Perspective from Central Nepal."

Brian J. McPherson, University of Utah, Energy & Geosciences Institute. "Testing Geologic Carbon Sequestration in Utah: Ongoing Results and Implications."

Bolor Minjin, Montana State University, Department of Earth Sciences, Bozeman Montana. "Skeletons of Multituberculate Mammals from Mongolia."

Ross Whitaker, University of Utah, Scientific Computing and Imaging Institute. "Partial Differential Equations, Graphics Processors, and Seismic Analysis."

Ken Golden, University of Utah, Mathematics. "Climate Change and the Mathematics of Fluid Transport in Sea Ice."

Wayne Narr, Chevron Energy Technology Company, San Ramon, California. "Guilt and Absolution in Naturally Fractured Reservoir Characterization: The Cause and Devilish Effect of Heterogeneity."

John Bowman, University of Utah, Dept. of Geology & Geophysics. "Abstract: Lead and Oxygen Isotopic Zoning in Granulite-grade Zircons, Kapuskasing Uplift, Canada: a Micro-Record of the creation of Archean crust."

Alan J. Walker, University of Utah, Director of USTAR Technology Outreach and Innovation Program. "Energy and Geoscience Institute – USTAR Initiatives in Iraq."

Lee Siegel, University of Utah, Public Relations Science News Specialist. "'Splainin' Stuff in Science."

John McLennan, University of Utah, Energy and Geoscience Institute. "Future Trends in Simulating Hydraulic Fracturing for Low Permeability Resources."

Ed Medley, Geosyntec Consultants, Oakland, California. "The Comforts of Ignorance and the Benefits of Arrogance – Lessons of the Failure Kind for the Geopractitioner."

Sue Halgedahl, University of Utah, Geology and Geophysics. "Geophysical and Geological Signatures of Relative Sea Level Change during the Middle Cambrian, Upper Wheeler Formation, Drum Mountains, West-Central Utah: A Perspective into Exceptional Preservation of Fossils."

John Vidale, University of Washington, Director of the Pacific Northwest Seismic Network. "What does a Tremor Really Look Like? Initial Results from an 84-Element array."

Kent S. Udell, University of Utah, Mechanical Engineering, and Emeritus Faculty, University of California Berkeley. "Thermal Geo-Technical Engineering: Energy Solutions in a Carbon-Constrained World."

Zach Sharp, University of New Mexico, Earth & Planetary Sciences. "Chlorine Isotope Homogeneity of the Mantle, Crust and Carbonaceous Chondrites."

Thomas Painte, University of Utah, Geography. Director Snow Optics Laboratory. "Where Deserts and Mountains Collide: the Implications of Accelerated Snowmelt by Desert Dust."

Faculty Members Honored

We join wholeheartedly in applause for these outstanding members of our faculty. We salute their long-term commitments to their disciplines, to the people they serve, and to the University.

Dr. Thure Cerling Reappointed to Nuclear Storage Board

President G.W. Bush reappointed Dr. Thure Cerling to a second term on the U.S. Nuclear Waste Technical Review Board (NWTRB) in October. The National Academy of Science recommended Dr. Cerling for reappointment to the eleven-member board, which he had joined in 2002. The NWTRB reports to Congress on scientific and technical issues related to non-defense high-level nuclear waste disposal, in particular the spent nuclear fuel generated by commercial nuclear reactors.

YWCA Honors Dr. Marjorie Chan for Leadership Role

The YWCA recognized Dr. Marjorie Chan with its 2009 Outstanding Achievement Award, given at the Fall YWCA leader luncheon. The prestigious award praised her leadership for women in science, and her contributions to the community including her guidance in developing the University's new Sutton building and its spectacular displays.

Dr. David Chapman Receives Governor's Science Award

Dr. David Chapman, known for his studies in measuring and interpreting thermal aspects of geological processes including global warming, was presented with the Governor's Science Award from Gov. Jon Huntsman Jr. The award recognizes Chapman's scientific contributions in education, research, industry and government. Utah governors have presented the annual awards since 1987 to recognize career achievements and service to the state through science.

Mercator Professorship Awarded to Dr. Barbara Nash

Dr. Barbara Nash received a Mercator Professorship from the German Research Foundation. She spent nine months doing research at the Institut für Mineralogie at Leibniz University, Hannover. This prestigious award is issued annually to twenty individuals from all scientific disciplines.

Dr. Dane Picard Receives Writing Prize

Emeritus Professor M. Dane Picard received Honorable Mention in the 2009 Utah Arts Council Writing Contest; Biography/ Autobiography for his book, "Field Book of a Geologist." Congratulations, Duke!

Dr. Robert Smith Recognized for Contributions that Benefit National Parks

The National Park Service awarded Dr. Robert B. Smith, Professor Emeritus, the prestigious 2008 National Park Service (NPS) Director's Award. The 2008 award recognizes Dr. Smith's distinguished career in studying and interpreting earthquakes, fault zones, volcanoes, and their impacts on the geologic evolution of Yellowstone and Grand Teton National Parks. He has been the only non-federal employee to receive a Director's Natural Resource Research Award.

The Director's Award recognizes excellence in developing scientific programs and in publishing research that furthers the cause of science or natural resource management in national parks.

University Bestows Scholarly Research Award to Dr. Michael Zhdanov

The University of Utah gave the 2009 honor of "Distinguished Scholarly and Creative Research Award" to Dr. Michael Zhdanov, in recognition of his stellar career in geophysics. This campus-wide, prestigious award applauds his important textbook in inversion theory, his many international honors, and his innovations and company consortia in electromagnetics.

Down to Earth is *Going Green*

This will be our last blanket mailing of the hard copy of your newsletter. We are going to continue our "eco/green" efforts by publishing *Down to Earth* in an online form which you may view or download from our website by next year. However, if you would like to continue receiving a hard copy, just let us know. We can still send you one if you request it by e-mailing the Geology and Geophysics Department chair at kip.solomon@utah.edu, and we will maintain a mailing list of those who prefer to read our news on paper. Going to online publication not only allows us to reduce our impact on the environment but it saves printing and postage costs during these tight budgetary times.

Faculty Focus

Our faculty continues to exercise their widely diverse interests around the globe. Their highly successful efforts to find support are providing amazing opportunities for them and their students as they continue to contribute to Earth Science understanding.

Walter Arabasz, as he begins a one-year period of phased retirement, is watching pieces of his "succession plan" as director of the University of Utah Seismograph Stations (UUSS) continue to fall into place. Recent changes include UUSS's move into the new Sutton Building and the opening of the Rio Tinto Earthquake Information Center; securing state funds to have his successor be a tenured faculty member, based on a partial academic teaching appointment in the Department; and successfully competing for federal "stimulus" funds to continue modernizing seismic monitoring in Utah. Including these stimulus funds, a total of \$3.3 million, half of it from private sources, will have been invested since early 2007 in development, modernization, and expansion of the UUSS. A major research project, funded by the National Institute for Occupational Safety and Health, involved studies of mining-induced seismicity for improved mine safety.

John Bartley continues his field work on granites and the structures that affect them along the Wasatch Front and in the Sierra Nevada. Early in the summer, he and Mike Stearns worked toward completing a magnetic susceptibility map of the Little Cottonwood stock, building on preliminary work by Brian Sparks (B.S. 2007). Magnetic susceptibility has proven useful for mapping gradational variations across large areas of plutonic rock. The Cottonwood stock provides an exceptional view of the three-dimensional anatomy of a



Mike Stearns (M.S., 2009) measures the orientation of an offset across a minor fault related to the West Pinnacle fault zone in the Sierra Nevada, California.

granitic pluton because tilting of the Wasatch range in the footwall of the Wasatch fault and Pleistocene glaciation have exposed several kilometers of structural relief through very fresh rock. In the granite of the Sierra Nevada, significant fault zones and their anatomy are a valuable source of insight into how faults grow from massive, unfaulted rock.

Bartley also visited the Ludwig Maximilian's University (LMU) in Munich, Germany, where he gave a talk about pluton growth and went on a field trip to the Ries impact

crater with former student Anke Friedrich (M.S., 1993), who is now Chair of Geology at LMU.

John Bowman taught two core courses, Introduction to Earth Systems and Earth Materials II, this past academic year. In addition, he taught Reviews in Earth Science, the seminar course for all entering Masters students, for David Chapman who was on sabbatical. He made periodic trips to use the ion microprobes at the Stanford University/USGS and the University of Wisconsin laboratories. He and Des Moser continue to measure lead and oxygen isotopes, and trace elements, *in situ* within Archean zircon grains from high-grade paragneisses within the Kapuskasing block, Ontario. Their initial results were published in the March, 2008, issue of *Geology*.

Clay Jones finished his M.S. thesis documenting the alteration mineralogy of several drill cores in the Salton Sea geothermal system. Ben Johnson also finished his M.S. thesis, wherein he measured Ti concentrations in quartz (a new geothermometer!) and oxygen isotope compositions of the major minerals within the Alta stock. Kristie McLin's Ph.D. thesis studies the impact of salinity on the phase equilibria of metamorphic reactions and the possible role of fluid immiscibility in the outer aureole of the Alta stock. Melinda Hilber's M.S. thesis studying the U-Pb age, trace element, and oxygen isotope compositions of zircons from high-grade mafic gneiss in the Kapuskasing block is nearing completion.

Frank Brown again spent his summer in northern Kenya. During the first two weeks he and Thure Cerling introduced a dozen students to the geology of the Koobi Fora region as part of their NSF grant for study in the area. The aircraft that flew the students out of Koobi Fora brought Ron Bruhn in, and together Ron and Frank ranged widely over the terrain east of Lake Turkana, trying to understand the structural, geomorphic, and geologic history of the larger area. They were accompanied by biologist Woody Coterrill, who collected specimens of tiger fish from the lake for genetic analysis with an eye to reconstructing ancient hydrologic connections throughout the African continent. Frank also cleared up a few persistent stratigraphic problems on both sides of the lake: three new early man sites were placed nicely within the regional stratigraphy. In addition, the fieldwork allowed placement of two tuffs within the regional stratigraphy, one of which obstinately resisted placement since first collected in 1980. On behalf of the National Museums of Kenya, he also visited a new fossil site near Nairobi noticed by a now well-educated Maasai (Laiyaman) while herding goats many years ago.

Ron Bruhn is taking a well-deserved sabbatical this year. He continues to work on active tectonics and has a new grant from NASA. He recently co-authored a study showing that gigantic earthquakes in Alaska 1,500 and 900 years ago ruptured multiple fault segments, suggesting those quakes and related tsunamis were worse than the magnitude 9.2 Alaskan earthquake that

occurred on Good Friday, 1964 -- the second largest quake ever recorded. Ron has found geological evidence indicating that the two great prehistoric earthquakes ruptured the same fault, but that these earlier ruptures continued along the plate tectonic boundary, affecting an area about fifteen percent greater than that in 1964, and generating even greater magnitude earthquakes. Importantly, the ruptures spread eastward and southward beneath the wide continental shelf into the eastern Gulf of Alaska, suggesting that the northeastern end of the Aleutian megathrust has greater earthquake magnitude and tsunami potential than previously thought because the 1964 event did not rupture the full extent of the subduction interface or fault system.



Ron Bruhn stands atop a section of sediments on Alaska's "Forgotten Coast" east of Cape Yakataga.

His discovery indicates that this fault system has the potential to generate a tsunami even larger than that of 1964, which caused the most devastating seismic sea wave to impact the northwestern coast of the U.S. in historical time as it spread southward along the coast of British Columbia, Washington, Oregon and into northern California, causing damage and deaths as far south as Crescent City, California.

Thure Cerling notes that he has a number of projects involving students in Geology, Biology and Math, but "since everyone comes to barbecues, we are not differentiating among 'official' departmental homes".

Naomi Levin left in July 2008 to begin a one-year post-doc at Cal Tech. She and Ben Passey, after finishing post-docs at Cal Tech and getting married in late June, are setting up a new stable isotope facility at Johns Hopkins University. Anthony Macharia studied the effects of corraling animals using traditional pastoral methods and how that is manifested in nitrogen isotopes in soils. Jared Singer studied tooth formation processes and Keith Christiansen that of Acacia trees as climate indicators in Africa. Dave Podlesa is now at Los Alamos National Laboratory.

In summer, 2009, Kevin Uno, Chris Remien, Thure, and Dan Fisher (of the University of Michigan) went to Samburu Reserve in Kenya where they are studying the life history of elephants as recorded in animal tissues, in order to provide an analogue for understanding isotopes in the fossil record. From there, they went up to Lake Turkana to meet Frank Brown and nine other students—one of whom was Kendra Chritz, a new student in the Cerling Lab. They spent two weeks in the Turkana Basin teaching the “Geology of the Turkana Basin” as part of an NSF grant to Drs. Brown, Cerling, and Bruhn. Chris Remien and Thure continued temperature monitoring efforts in Kenya, focusing on National Parks and Reserves.

On other fronts, work using stable isotopes as forensic tools continues unabated in collaboration with Dr. Jim Ehleringer’s lab in Biology. New post-docs working on forensics include Dana Biasatti, Brett Tipple, Shannon O-Grady, and Luciano Valenzuela.

Marjorie Chan’s year was a blur, consumed with building and administrative activities! The Sutton building is everything we wanted it to be, leaving a long-lasting legacy. She enjoyed meeting many great friends and supporters of the department during her tenure as chair and hopes to continue those interactions with alumni and friends in the future.

This year she got in some field work at Palo Duro, Texas, and the Vermillion Cliffs National Monument in Arizona and Utah. She is continuing sedimentary research on Earth analogs to Mars. Plans for getting a stronger geoconservation movement in the U.S. are afoot, with a Special Topics session at the 2009 GSA national meeting.

Her graduate students continue to do remarkable work. Sally Potter successfully defended her M.S. thesis in spring, Greg Nielsen is planning his defense this fall, and Crystal Hammer did a summer internship with ExxonMobil in Houston. Holly Godsey continues outreach activities for several science departments at the U and has Bonneville research still in the works.

David Chapman stepped aside from his administrative role in the University’s central administration, allowing him to devote more of his time to teaching and research in the department. Dave was Associate Dean of the Graduate School from 1993 to 1998 and Dean of the Graduate School and Associate Vice President for Graduate Studies for the last eleven years. He continues to be influential in the WEST program which he was instrumental in founding.

Dave enjoyed a short sabbatical break that included a month in the village of Uzes in southern France where he wrote several science and graduate education articles, and a month in Hyderabad, India, where he was at the National Geophysical Research Institute. As recipient of the Indian Government’s Distinguished Foreign Scientist Award, Dave spent his time lecturing,

mentoring young scientists, and working on heat flow and climate change problems in the Indian subcontinent.

Back in the department, Dave will continue working with his graduate students on global warming using borehole temperatures, on the thermal effects of groundwater flow with application in Snake Valley, Utah/Nevada, on using repeat gravity surveys to study aquifer storage and artificial injection, and on geothermal systems in Indonesia.



David Chapman, attempts to solve a physics puzzle with Diane Crim, master teacher of mathematics, at the annual WEST Fall Retreat.

David Dinter once again taught Geologic Field Methods and Summer Field Camp. [See “*Summer Field Camp...*” in this issue.] He also teaches Natural Disasters: Hollywood vs. Reality, and Earthquakes and Volcanoes, popular large-enrollment courses that fulfill the University’s Science Foundation requirement for non-majors. In August, 2009, Dinter and Prof. Cari Johnson represented our faculty on a spectacular, multi-institution geologic traverse of the Swiss and Italian Alps. [See “*Students Travel to Alps*” in this issue.]



Anke Friedrich (standing) at the Rhonegletscher (Furka Pass, Valais, Switzerland), with Petra Schwager, Florian Hofmann, and Bernd Lammerer (all from LMU-Munich) and David Dinter.

Dinter’s primary research focus is the seismic hazard posed by active faults submerged beneath the Great Salt Lake and Utah Lake, for which he, seismologist James Pechmann, and USGS collaborator Rob Baskin

have collected high-resolution seismic reflection data in the two lakes, imaging tectonostratigraphic horizons formed by at least nine surfacing-rupturing, late Quaternary earthquakes. Dinter is also involved in field-based studies of late Sevier orogenic deformation in southern Utah, metamorphic core complex evolution in northern Utah, the geologic record of shallow marine meteorite impacts, and the late Wisconsinan deglaciation of the Arctic.

Allan (Tony) Ekdale, as usual, taught the introductory Paleobiology course this past spring semester, and this year the weather for the two fossil-collecting field trips in central and western Utah was quite pleasant (unlike the frigid wintry weather of many past years). In this coming fall semester, he will teach his usual National Parks: Geology Behind the Scenery course for General Ed students, and he also will teach Paleocology for graduate students. In November the Paleocology class will take a nine-day field trip (offered regularly since 1975) to the northern coast of the Gulf of California in Sonora, Mexico, to study modern marine sedimentary environments.

He continues his research on paleoecological and sedimentological aspects of trace fossils. He is currently working with Dr. Jordi Maria de Gibert, a post-doc in our department in the late 1990's, on Neogene ichnofacies and ichnofabrics in northeastern Spain. He also is working with his graduate students Sherie Harding on trace fossil signatures of glauconitic greensand deposits in Texas and Wisconsin, and Michelle Mary on bioerosion of Pleistocene corals in the Florida Keys. Jim Lehane, a newly arrived graduate student, will be working on a new trace fossil project. Dr. Ekdale also participated in the tenth International Ichnofabric Workshop in Jiaozuo City, China, and delivered a series of mini-lectures on current topics in ichnology to students at Henan Polytechnic University.



Dr. Tony Ekdale explains Green River Formation fish fossils in the Donor wall of the Sutton Building.

Diego Fernandez has been busy preparing the new laboratory for the ICP-MS and laser ablation systems, including designing and building an interface that allows

mercury to be analyzed in the ICP-MS. He has continued measuring trace element concentrations in a variety of samples, including those he collected from desert pavements in Utah.



Dr. Diego Fernandez is hard at work analyzing samples in the new ICP-MS laboratory.

Susan L. Halgedahl continues geophysical and paleontological work on Cambrian rocks in Utah's West Desert with Dr. Rich Jarrard, other colleagues, and students. Sue recently gave an Atkinson Distinguished Lecture in the department about the geophysical and geological signatures of relative sea level change in the upper Wheeler Formation. She and Rich Jarrard continue to teach Earthquakes and Volcanoes online. She also continues research into the magnetic behavior of fine particles.

Randy Irmis finished his first semester as a faculty member at the University of Utah, and has enjoyed every moment of it! He spent most of his time settling in, but found time to do fieldwork in the Triassic and Cretaceous of southern Utah, the Late Cretaceous of Grand Staircase-Escalante National Monument, the Late Triassic at Ghost Ranch, New Mexico, and the Early Permian and Late Triassic of southeastern Utah. Together, these trips yielded numerous new fossil vertebrate specimens.

Randy co-authored a taphonomic study of the middle Miocene Sharktooth Hill bonebed that was featured on the cover of the June, 2009, issue of *Geology*. He is also participating in the Colorado Plateau Coring Project, whose goal is to drill several continuous cores through the early Mesozoic sedimentary strata of the Plateau.

Randy is especially excited to have two new M.S. students, Deanna Brandau and Carolyn Levitt, joining him this fall.

Rich Jarrard's current research on marine geology and geophysics involves projects in Utah, Antarctica, offshore New Zealand, and the North Pacific. Sue Halgedahl and he are continuing their study of Cambrian sedimentary rocks of Utah to explore the relationships among sequence stratigraphy, sea-level change, and exceptional fossil preservation. The international Antarctic Drilling Project (ANDRILL) has completed its

drilling, and Rich is now using data from well logs and a hydrofracture experiment to study the intraplate stress pattern and Late Tertiary tectonics of rifting between East and West Antarctica. His graduate student Olga Brusova will join an oceanographic expedition offshore New Zealand in November, using log analysis to aid in the development of a Neogene sea-level curve for this region. Rich and geophysics undergraduate Chris Bradbury are beginning a feasibility study of using the department's new QEMSCAN system to study Cenozoic Pacific wind patterns and micrometeorite fluxes.

Paul Jewell spent the past year working on projects centered on the surficial geology and paleoclimate of the eastern Great Basin and Colorado Plateau. Ph.D. student Daren Nelson is now mapping and dating complex Lake Bonneville shorelines near the Hogup Mountains of northwestern Utah that will constitute the bulk of his Ph.D. dissertation. Daren will spend the 2009-2010 academic year as a visiting professor at BYU-Idaho. Krysia Skorko is using both airborne and ground-based LiDAR data and fieldwork as the basis for her M.S. thesis on fluvio-lacustrine facies associated with the current low stand of the Great Salt Lake.

Paul began a new project in conjunction with National Park Service personnel at Bryce Canyon. A variety of park features have now been mapped and the 3-D data are being processed with the help of the National Center for Airborne Laser Mapping (NCALM) at the University of Florida. The Park Service hopes to quantify erosion rates of the spectacular features of Bryce.



Paul Jewell with a terrestrial LiDAR scanner in front of Thor's Hammer, Bryce Canyon National Park.

Paul also oversaw the ABET review of the department's Geological Engineering program.

Cari Johnson enjoyed a wonderful year, with the usual excitement of teaching PICP, Exploring Earth, and Seismic and Sequence Stratigraphy, as well as research and fieldwork. Much of her ongoing work is focused on the Straight Cliffs Formation in southern Utah, where several students are working on marine-nonmarine correlation, sequence stratigraphy, basin analysis, and 3-D outcrop imaging and modeling. She didn't go to Mongolia this year but Matt Heumann is working on

processing that field data from the last four years. She took students to the Alps for the summer field trip exchange program with the University of Munich. She is also enjoying life as a newly promoted and tenured Associate Professor. It was an honor to receive the department's teaching award last spring. And of course, she is thrilled to be in the beautiful Sutton building.

Jess Allen successfully defended her Ph.D. dissertation, and Vaughn Thompson completed his M.S. thesis. They are both working close by at Energy and Geoscience Institute. Matt Heumann, Jared Gooley, and Will Gallin spent the summer in Texas doing oil company internships and will return in the autumn to continue their thesis work. Ian Semple is working on using digital outcrop models as teaching tools, and is working with K-12 teachers and students as a WEST fellow.



The PICP 2 class, led by Dr. Cari Johnson and Lee Shannonn of Anadarko, eyes a Wyoming outcrop.

William Johnson will spend part of his sabbatical working with UNESCO IHE in the slums of Kampala, Uganda to co-direct a Ph.D. candidate from the University of Makerere who is examining the transmission of phosphorus and other contaminant nutrients from surface to groundwater. He expects this to be in stark contrast to a recent cycling holiday in France with his wife and friends. He also hopes this year to initiate a project regarding mercury transport and transformation in Ecuador, and to visit two of his Ph.D. students, Drs. Xiqing Li and Meiping Tong, who are now professors at Beijing University. While in China he will initiate a project at badly contaminated Lake Taihu in China as part of the developing Utah – Wuxi Taihu Institute of Environmental Research.

Bill's graduate students have been busy! Greg Carling, Wenjie Huang, Abigail Rudd, and Eddy Pazmino are working in the areas of mercury cycling and colloidal transport. They recently conducted a 24-hour study (along with Dr. David Naftz at the USGS) to examine diel changes in methyl mercury concentrations in Farmington Bay. One immediate observation from the study: the spiders are large and plentiful on the Antelope Island Causeway! The students are working with Dr. Johnson on a proposal to examine colloid-mediated mercury transport and transformation in mercury-contaminated

zones in Ecuador, in collaboration with Dr. Ximena Diaz, who finished her Ph.D. with Dr. Johnson in 2008, and who is now a professor at the National Polytechnic University in Quito, Ecuador. Post-doc Dr. Huilian Ma is preparing manuscripts that will lay a platform for a new theory of prediction of colloid retention in porous media.

Barbara Nash returned from a sabbatical year, spending time with research collaborators in Australia and Europe. At the Research School of Earth Sciences at Australian National University, Barb used several mass spectrometers to measure trace elements in glass and minerals in volcanic rocks from the Yellowstone hotspot, and hafnium isotopes in zircons.

She spent most of the winter semester at Leibniz University in Hannover, Germany, where she took advantage of the superb experimental petrology laboratory at the Institute for Mineralogy, conducting variable pressure and temperature melting experiments on obsidian from a Miocene super-eruption in the Snake River Plain, with the objective of determining the pre-eruptive water contents of these highly explosive magmas. One of the highlights of Germany was a trip to Laacher See caldera, the site of the enormous eruption just 13,000 years ago that blanketed Europe with ash. Barb and her post-doc Henny Cathey closed out the summer with a field trip along the track of the Yellowstone hotspot for visiting students from Germany, as well as Stefanie Whittaker, and Angie Seligman. This year Barb will teach her usual introductory and advanced courses in natural disasters, and she will introduce a new course in Volcanism.



Barb Nash stands next to the internally-heated high-pressure autoclave at Leibniz University in Hannover, Germany, that she used for her melting experiments on rhyolite erupted from supervolcanoes of the Yellowstone hotspot.

Kristine Pankow continues to collaborate in a wide variety of projects. She, Walter Arabasz and Relu Burlacu completed a paper for the Utah Geological Association 2009 Guidebook, focusing on the lack of earthquakes in western Utah, and a prominent band of earthquakes in the Escalante Valley in southwestern Utah. She has also worked with colleagues from the USGS and University of Nevada, Reno in the analysis of the 2008 Wells, Nevada, earthquake. With postdoc Eleanor Sonley and Prof. Kim McCarter from Mining Engineering, she continued work on refining the locations of mining induced seismicity. She continues to work with colleagues from Southern Methodist University to study seismo-acoustic coupling and propagation, and the analysis of earthquake generated infrasound. Mark Hale (B.S. 2009) will join the project this fall as a M. S. student. She, M.S. student Simin Huang, and colleagues from the Utah Geological Survey collected microtremor data in Cedar City and St. George, Utah. They will collaborate with Bill Stephenson at the USGS in processing this data in order to determine the shallow shear velocity structure in southwestern Utah near recently deployed strong-motion instruments.

As Associate Director of the Seismograph Stations, she continues her work with the ongoing development and maintenance of the network and earthquake response, ShakeMap, for the Utah region.

Bill Parry published "Diagenetic Characteristics of the Jurassic Navajo Sandstone in the Covenant Oil Field, Central Utah Thrust Belt" with Marjorie Chan and Barbara Nash. The article appeared in the August 2009 issue of the *AAPG Bulletin*. He also completed studies on iron oxide concretions in the Navajo Sandstone, and a manuscript is in review. Work on fluid inclusion gas analysis on the Uinta Fault is in progress. Much summer time has been devoted to fly fishing in the Uinta Mountains and on the Green River, as well as hiking in the Wasatch and Teton Mountains. Book writing projects progress, too.

Jim Pechmann has continued to further develop and test the Wasatch Front "Community Velocity Model" with colleagues from San Diego State University. They are also using this model to simulate strong ground motions from future magnitude 7.0 earthquakes expected to occur on the Salt Lake City segment of the Wasatch fault. Jim co-authored a paper on the 2008 magnitude 6.0 Wells, Nevada, earthquake and its aftershocks with seismologists from the University of Nevada, the USGS, and the University of Utah. He has also been working on various projects related to the ongoing operation and modernization of the University's regional seismic network. As the primary after-hours responder to felt and/or significant earthquakes in the Utah region and sometimes the Yellowstone region as well, Jim had a hectic Christmas week because of the occurrence of the 2008 – 2009 Yellowstone Lake earthquake swarm. Finally, Jim finished up a time-consuming assignment as

the Seismograph Stations representative on the Sutton Building Committee.

Erich Petersen continued to co-lead field trips for professional geologists and students. In conjunction with the U2009 Conference that focused on historic and current uranium mining in the four corners area, he led a pre-meeting field trip with Dr. William X. Chavez of New Mexico Tech, Keystone, Colorado. This was followed by the fifth annual international Society of Economic Geologists Foundation (SEGF) student field trip to Northern Nevada. [See "SEGF Field Trip Leaders Lauded" in this issue.]

Anita Brown, working on her M.S. thesis on the Twin Creeks deposit, also had a summer internship with Newmont Gold. Ph.D. student John Porter is working as a geologist at the Kennecott Bingham mine while completing his research on emplacement timing of the Morgan Creek Pluton in California. Daniel Amoakoh, with a background in geostatistics, entered the Ph.D. program in Economic Geology. On the heels of the move to the Sutton building, Erich supervised the installation of the new QEMSCAN laboratory. His course on QEMSCAN technology attracted students from several departments who were interested in using automated, quantitative, mineralogical analyses of rocks in their thesis research projects. Anita Brown received a University Teaching Assistantship to work with Drs. Petersen and Bowman in developing QEMSCAN-based laboratory exercises that will enhance the laboratory sections of the Earth Materials course series. A companion University Teaching Grant to Dr. Petersen will provide an opportunity to enhance the research opportunities for undergraduate students.

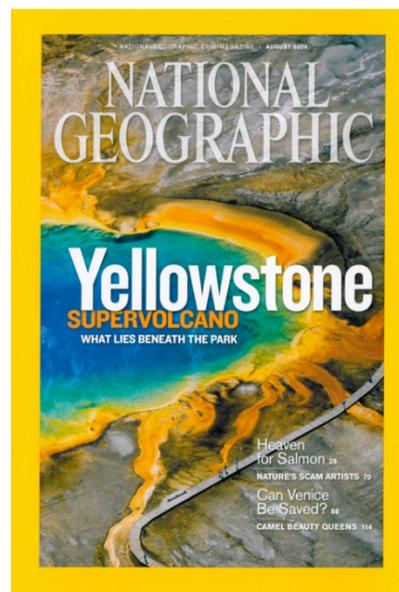
Duke Picard spent much of this year gaining strength following a knee replacement, which he is still limping from. The move into the new beautiful building was a large effort, as it was for everyone. He invites all to drop by and see the lovely pictures in his office. In the last months of the move, Duke helped Marjorie Chan with writing signage for the Sutton Building. Last year he wrote a paper on First Oil in Nevada that will appear in *Earth Sciences History*, v. 28, no. 2. He also finished an article on F.V. Hayden submitted to *Rocky Mountain Geology*. Two book reviews were published in *Earth Sciences History*, vol. 28, no 1, entitled "Language of the Earth" and "Biography of Wallace Stegner".

Peter Roth designed a new web course for the Exploring Earth class and taught it for the first time last fall semester and again this year. He also taught The Oceans and Micropaleontology, and Earthquakes and Volcanoes as a lecture course for the first time. He continued his research on calcareous nanofossil biostratigraphy and evolution, especially of Jurassic and lower Cretaceous rocks.

Gerard Schuster moved to King Abdullah University of Science and Technology (KAUST) just in time for fall

classes. KAUST, located on the Red Sea about 50 miles north of Jeddah, is a new international university with the world's second largest university endowment (just behind that of Harvard). Two research associates, from the Utah Tomography and Modeling/Migration Consortium (UTAM) followed him to KAUST as will three Ph.D. students and one M.S. student. Four of his students will stay at the University of Utah for the next year to finish their research programs. He will still be affiliated with the University of Utah as an adjunct professor in our department and will host the final UTAM meeting in Salt Lake City in January of 2010. He will attend the annual SEG meeting in October 2009 as a keynote speaker at the SEG Interferometry workshop and as an invited speaker at the Reverse Time Migration workshop. As well, he will chair a VSP session at this Houston meeting. His book *Seismic Interferometry* was published by Cambridge Press in May, 2009, and is the first book in this new field of seismology. His main research interests remain in the areas of seismic imaging algorithms, interferometry, and experimental studies in seismic data acquisition, which he will continue to pursue at KAUST.

Jerry feels privileged to have been a part of the Geology and Geophysics Department and thinks it is one of the best Earth Science research institutions in the USA. He will always remember the friendly faculty and the stimulating University of Utah colleagues that he has worked with over the years. He thanks the University of Utah administration which generously supported the research mission of UTAM.



Bob Smith's work was featured in the National Geographic, "Yellowstone Supervolcano: What lies beneath the Park. When Yellowstone Explodes", August 2009.

Robert Smith and his Seismology and Active Tectonics research group was highlighted when Jamie Farrell received the Best Student Presentation award at the

National EarthScope meetings in May, 2009. Christine Puskas defended her Ph.D. dissertation this spring and published her second paper in the *Journal of Geophysical Research*. Christine was invited to be a member of the western U.S. GPS uniform processing group that advises the community on how to tie all GPS surveys together across the entire continent.

Dr. Smith delivered the keynote address at the International Lithosphere Project (ILP) conference in Lyon, France, in September 2009. It featured his work on the geodynamics of the Yellowstone hotspot and mantle plume. The ILP is an arm of the International Union of Geodesy and Geophysics.

Kip Solomon's dissolved and noble gas lab completed the move to the Sutton Building in early January. [See the "Instrumentation" story in this issue.] The lab also serves as a center for several graduate student projects.

New to the lab but not the department, Stan Smith has recently joined us as an M.S. student and has begun a groundwater project in Eastern Canada. Melissa Masbruch is currently working with the USGS and continues her research on dissolved gas seasonality in the Brighton area of Big Cottonwood Canyon. Bert Stolp, also employed with the USGS, continues his research on a project based in Austria. This year also brought personnel changes to the lab with the graduation of two of Kip's students. Payton Gardner finished his dissertation on groundwater flow in the Norris Geyser Basin of Yellowstone National Park (YNP) and is now a researcher in Adelaide, Australia where he is continuing his work with dissolved noble gases. Payton's work, especially his Xe measurements, has provided new insights into the origin of hydrothermal waters in Yellowstone National Park. Tom Marston finished his M.S. on "dirt" – clay minerals in waste rock piles – in New Mexico and is currently employed with the USGS here in Salt Lake City. Tom's thesis represents the first known measurements of environmental tritium in the structural sites of clay minerals and this is helping to understand whether or not clays are actively forming in waste rock piles.

Michael Thorne continues his quest to take over the world of seismology both on Earth and now on the Moon. Recent earth-side efforts focus on the dynamics of deep mantle structure providing evidence that the most prominent features of the lower mantle, called Large Low Velocity Shear Provinces, are actively scooting across the Core-Mantle Boundary. Blasting off into the world of planetary science, Thorne has written the first ever software for computing synthetic seismograms for the Moon, enabling the simulation of moonquakes. Current efforts are underway at re-analysis of Apollo seismic recordings and planning the best locations to place seismometers for future lunar missions. Thorne currently has three students: Kevin Jensen is working on deep Earth seismology, Simin Huang is looking at shallow seismic site characterization

in urban settings, and Mark Hale is studying the link between earthquakes and infrasound recordings. Additional efforts in collaboration with Gerard Schuster and student Sam Brown are merging the gap between exploration and global seismic processing techniques.

Aurel Trandafir presented the results of his geotechnical investigations outlining the deformation mechanism of shallow landslides in northern Utah, at the GSA Meeting, Rocky Mountain Section, in May, 2009. Also, results of his cooperative work with Dr. Mihaela Constantin from the Institute of Geography, Romanian Academy, on the morphology and environmental impact of landslides in the Romanian Carpathian Mountains were published in the international *Journal on Environmental Earth Sciences*. This fall, he and geological engineering graduate and undergraduate students Ben Erickson and Jesse Moyles will start working on the National Science Foundation funded project addressing the cyclic stress-strain characteristics of EPS geofoam. This will employ laboratory triaxial tests to investigate in detail the behavior of geofoam under cyclic loading. He is excited to teach the course on Landslides and Slope Stability Engineering, while continuing teaching Introduction to Geological Engineering and Geological Engineering Design. He also serves as the representative of the University of Utah Dept of Geology and Geophysics on the State Mapping Advisory Committee (SMAC) with the Utah Department of Natural Resources. SMAC is a committee that helps set priorities for geologic mapping in Utah.

Michael Zhdanov spent the summer traveling in Europe and working on several research and book projects. He was invited to give talks about the recent developments in marine electromagnetic methods at several major European energy companies: TOTAL in Paris, France; ENI in Milan, Italy; and Rocksource in Bergen, Norway. He also was invited to present a talk at the Annual Meeting of the European Association of Geoscientists & Engineers (EAGE) in Amsterdam, the Netherlands, on new advances in electromagnetic geophysics. His new book, *Geophysical Electromagnetic Theory and Methods*, was published in May 2009 by Elsevier. This book will serve as a major textbook in his Physical Field II: Electromagnetic Methods class. During this summer, he also completed editing another new book *Active Geophysical Monitoring*, to be published in 2010. It presents new methods for studying the time-evolving structures and states of the earth's interior.

Come join us for the Utah Universities Alumni and Friends Reunion at the GSA meeting in Portland, Oregon. We'll meet on October 19, 2009, from 6:00-8:00 pm at the Double Tree Inn, Sellwood Room, 1000 NE Multnomah Street.

Field Trips Promote Crucial Understanding of Geology

Our faculty and students gain vital professional expertise through their exposure to geological and geophysical problems out in the field. Each year they find remarkable new opportunities.

Summer Field Camp Once Again Challenges Geoscientists-in-Training

A fine time was had by all the Geology, Geological Engineering, and Environmental Earth Science majors as they learned to map and measure rocks, structures, and geomorphic features, work in teams, write professional technical reports, and cook great food. This department's version of the perennial intellectually and physically demanding rite of passage for Earth scientists everywhere, takes advantage of Utah's peerless Great Basin mountain ranges as natural laboratories. It requires students to draw upon skills learned in stratigraphy, structure, petrology, and geological engineering courses to solve complex field problems. With eighteen participants, the 2009 camp contingent was 50% larger than average for the past decade. Veteran field instructor David Dinter, and stalwart camp manager Michael Buchanan were fondly acknowledged in nearly every field report.



Field camp 2009 students with instructor, David Dinter, in hinge zone of recumbent anticline in the Elba Quartzite, Raft River metamorphic core complex, northern Utah.

Two projects were undertaken in ranges where Mesozoic compressional deformation is overprinted by Cenozoic extensional structures. The first project focused on the Parowan Gap, northwest of Cedar City, where students mapped the Iron Springs thrust, marine strata deposited at the western margin of the Cretaceous inland sea, Sevier foreland deposits, Tertiary boulder conglomerates, Oligocene pyroclastics, and Basin-and-Range normal faults. The second project was in the Raft River Mountains in Utah's northwest corner, a metamorphic core complex exhumed from mid-crustal depths in Miocene time by low-angle normal faulting, which exposes the oldest rocks in Utah. Camp was pitched in the northern part of the range in Clear Creek

Canyon, site of the world-famous Elba stretched pebble conglomerates

First Alpine Exchange Field Trip Attracts Canadian, German and Utahn Participants

In August 2009, University of Utah students Deanna Brandau, Jared Gooley, Melinda Hilber, Ben Johnson, Nick Kerr, Dawn McShinsky, Kimberlee Pulsipher, Ian Semple, and Jared Singer, accompanied by Professors Cari Johnson and David Dinter, traveled to Ludwig-Maximilians-Universität (LMU) in Munich, Germany to join University of Alberta and LMU peers for a geologic field excursion through the central and southern Alps in Austria, Switzerland, and Italy. Guided by legendary Alpine geologist and climber, Bernd Lammerer, as well as local experts Thorsten Nagel, Hugo Ortner, Petra Vesela, and Andreas Wetzell, participants studied world-class Alpine rock and structural exposures from Garmisch to the Matterhorn.



Alpine exchange trip students and adviser pose high in the Alps. That's the Matterhorn behind them!

This international academic exchange was facilitated by Utah alumna Dr. Anke Friedrich, now Chair of the Department of Geology at LMU, who was great company and an inspiration for our students. Her students will join us next year to tour geologic highlights of the North American Cordillera.

The students noted that they also found time to swim in the Rhine, ride the world's longest Alpine coaster down the flank of Muttekopf, go dancing in Bellinzona, visit two UNESCO World Heritage Sites, and sample Bavarian pretzels, Austrian beer, Italian espresso, and Swiss raclette, all the while making new friends from half a dozen countries. They paid their own airfare and food; additional funding was provided by the Department of Geology and Geophysics and the College of Mines and Earth Science. They also raised money by selling department T-shirts. (It's not too late to order yours! See the order form at the end of newsletter.)

Uranium Symposium Participants See Lisbon Valley

Erich Petersen led a field trip during May, 2009, to the Four Corners area of Utah for the Uranium Symposium Pre-Meeting Field trip. Participants who attended the meeting in Lisbon Valley, Utah were mostly senior managers, geologists, and government leaders representing five countries.

Leaders Praised for SEGf Field Trip to Gold Fields

The Director of the Society of Economic Geologists Foundation (SEGf), John A. Thoms, congratulated Erich Petersen and Bill Chavez for their efforts for the fifth SEGf Student Field Trip, "Gold Systems of Northern Nevada", held in May, 2009. The pair led seventeen students from seventeen different universities in nine countries worldwide, including Page Anderson (M.S. 2009) and Anita Brown (M.S. candidate), to eight gold deposits in the area. Students receive these trips enthusiastically, considering them to be of great value in furthering their education and developing their professional careers.



SEGf leaders and participants pose at the airport before the field trip.

EarthScope Participants See Rare Hydrothermal Explosion

On May 17, 2009, Robert Smith and Hank Heasler were leading the Yellowstone EarthScope field trip with a stop at Biscuit Basin. They had been considering earthquakes, magma chambers, and so forth, including rare events known as hydrothermal explosions. To their great surprise, a Biscuit Basin hot spring exploded right in front of them, literally 40 feet away. They first thought the sudden roar was a truck coming down the boardwalk, but then realized what was happening. It took only milliseconds to contemplate whether one should run or grab a camera, but the whole thing was over in a few seconds.



Explosion in Yellowstone's Biscuit Basin sends rocks and sinter skyward.

Fortunately, several people in the group were focusing on the explosion and got some great images. It is one of those once in a lifetime experiences in Yellowstone that we all hope for, but on the other hand wonder how close we should be to such an encounter. As you can see from the picture, the explosion was expelling rocks, black sinter, and blocks, as well as steam and gas.

Geophysics Students Explore Possible Wasatch Front Tear Fault

During April, 2009, students in Professor Thorne's Geophysics class heard Dr. Jim Pechmann describe his idea of a tear fault running through the Salt Lake City Avenues district. To explore the possibility that this could be a connecting segment of the Wasatch Fault, students spent two days in the field collecting microgravity measurements.



Students set up a gravimeter to measure the proposed Pechman Tear Fault.

Initial results from this class project did indeed suggest a fault in the area, so have been incorporated into a proposal for funding to study this and other connecting segments of the Wasatch Fault in the Salt Lake City area.

Students Expand Horizons

Our students continue to amaze and delight us by taking the initiative to expand their activities into areas that will enrich both their professional and non-professional lives.

EGI Poster Session Highlights Students' Research

Energy Geoscience Institute (EGI) associates annual fall meeting in Salt Lake City in September, 2009, hosted many industry partners from around the world, and featured four of our students' posters at EGI's Corporate Affiliates meeting and reception. Dr. Cari Johnson coordinated their presentations of new research. Bandar Ghassal presented "Geochemical Evaluation of the Midyan and Al Wajah Basins, Northern Red Sea, Saudi Arabia". Angela Kennedy displayed work on "New Research: Sedimentologic and Lithologic Controls on Shale Gas Reservoir Mechanics. Lessons from the Mancos Shale". Jared Gooley presented "The Devil is in the Details: Challenges of Regional Correlation in Marine-Non-marine Strata", and Crystal Hammer talked about "Soft Sediment Deformation Features in the Jurassic Navajo Sandstone of White Pocket, Vermilion Cliffs National Monument".



Bandar Ghassal explains his research to an attendee at the EGI meeting.

SAC Pitches in to Enrich Department Life

The Student Advisory Committee continued to help the Department with teaching evaluations and other activities although much of the year was consumed with the move to the Sutton Building. This upcoming year, an enthusiastic group is planning activities to help establish a website for geology and hiking trails of the Wasatch Front as well as more field trips!

AAPG Student Chapter Expands Members' Horizons

The AAPG Student Chapter once again had an activity-filled year. Under Will Gallin's leadership, the group

offered multiple local hikes and field trips, in addition to geo-movie nights and of course the annual Ski Weekend getaway. Guest lecturers included Cara Burberry of EGI, Hikmet Loe, an art historian and expert on the Spiral Jetty, and Robert Keiter from the University of Utah Law School. Congratulations to undergraduate Alex Moyes on receiving the Austin Weeks scholarship this year!

SEG Student Chapter Sets New Agenda

The student chapter of the Society for Exploration Geophysics (SEG) had some restructuring from last year and is getting set on a new trajectory with faculty advisor Dr. Michael Thorne. They have created a new webpage for their chapter at <http://segutah.com/>. Several students from the chapter attended the SEG meeting in Las Vegas, Nevada, which helped them make connections with recruiters and explore future job possibilities.

Department Awards Degrees

We appreciate the diligence and hard work these students have put forth and wish them our very best in their budding careers in the geosciences.

Doctors of Philosophy, 2009

Jessica Allen, Geology, "*Transgressive-Regressive Cycles in a High Accommodation Setting, John Henry Member, Straight Cliffs Formation: Implications for Facies Architecture and Sequence Stratigraphy.*"

Weiping Cao, Geophysics, "*Seismic Interferometry Applied for Seismic Source Location and Interpolation of 3D OBS Data.*"

Douglas Ekart, Geology, "*Stable Isotope Analysis of Phanerozoic Palesols: Implications for Paleoenvironments.*"

Payton Gardner, Geology, "*Groundwater Dynamics of the Norris Geyser Basin Area, Yellowstone National Park.*"

Christine Puskas, Geophysics, "*Contemporary Deformation, Kinematics and Dynamics of the Yellowstone Hotspot and Western U.S. Interior from GPS, Fault Slip Rates, and Earthquake Data.*"

Julie Willis, Geology, "*Subduction Zone Geometry and Stress Transfer Caused by Megathrust Earthquakes Cook Inlet Basin, Alaska.*"

Xiao Xiang, Geophysics, "*Local Reverse Time Migration with VSP Green's Function.*"

Masters of Science, 2009

Naoshi Aoki, Geophysics, "*Fast Least Squares Migration with a Deblurring Filter.*"

Chaiwong Boonyasirawat, Geophysics, "*Acoustic Waveform Inversion of Two-Dimensional Gulf of Mexico Data.*"

Samuel Buist, Geophysics, "*Induced Polarization Effect of Hydrocarbon Reservoirs.*"

Jasmin Caton, Geology, "*Environmental Controls on the Formation and Isotope Composition of a Laminated Tufa in Red Butte Canyon, Utah.*"

Keith Christianson, Geology, "*Analysis of the Spatial Distribution of Oxygen and Carbon Isotopes in East African ACACIA: Implications for Paleoclimate Research.*"

Shuqian Dong, Geophysics, "Fast Three-Dimensional Target-Oriented Reverse Time Datuming."

Samuel Fluckiger, Geophysics, "Geophysic Determination of Mineral Concentrations in the Wheeler Formation, Middle Cambrian, Utah."

Nancy Harris, Geophysics, "Gamma Ray Spectroscopy and Magnetic Susceptibility of Stratigraphic Sequence in the Wheeler Formation, West Central Utah."

Melinda Hilber, Geology, "Tracking Fluid / Melt Flow in Lower Crustal Mafic Gneiss Using Zircon Isotopic (Pb,0) Zoning, Kapuskasing Uplift, Superior Province of Canada."

Timothy Hurst, Geology, "Stable Isotope Fingerprints and age Dates of Groundwater to Examine Potential Solute Sources at an Uranium Processing Mill near Blanding Utah."

Benjamin Johnson, Geology, "Oxygen Isotope, Cathodoluminescence and Titanium in Quartz Geothermometry in the Alta Stock, Utah: Geochemical Insights into Pluton Assembly and Early Cooling History."

Clay Jones, Geology, "A Comparison of the Potential Metamorphic and Igneous CO₂ Fluxes from the Salton Sean geothermal System, California."

Tom Marston, Geology, "An Evaluation of Annual Net Infiltration to Bedrock for Waste Rock Piles Near Questa, New Mexico and the Development of a Method for Examining Tritium in Clay Minerals."

Michelle Mary, Geology, "Bioerosion History of the Pleistocene Key Largo Limestone Florida Keys, Florida."

Sally Potter, Geology, "Navajo Sandstone Hydrous Ferric Oxide Concretions."

Eric Sahn, Geological Eng, "Monitoring Aquifer Recharge Using Repeated High Precision Gravity Measurements: A Pilot Study in South Weber, Utah."

Jared Singer, Geology, "Considerations of Hydrogen in Fossil Tooth Enamel."

Michael Stearns, Geology, "Anatomy and Assembly of the McDoggie Pluton, Near Sawmill Lake, Central Sierra Nevada."

Vaughn Thompson, Geology, "Potential-Field and 2D Seismic Analysis of a Volcanic Rifted Margin: Implications for Crustal Architecture and Petroleum Maturation Off the West Coast of South Africa."

Bachelors of Science, 2009

Warren Anderson, Geoscience	Danielle Fox, Geoscience
Zachary Bowland, Geoscience	Kevin Jensen, Geoscience
Sean Conner, Geoscience	Courtney Neuffer, Geology
Jennifer Eutsler, Geoscience	Stanley Smith, Geoscience
Elizabeth Hardwick, Geological Engineering	Kada Topham, Geoscience

Annual Awards Salute Exceptional Achievements

We take great pride in the achievements of members of our department, and meet to honor them each year. The 2009 celebration luncheon, catered by Tony Caputo's, was held once again at the University Alumni house. Lunch was followed by the recognitions and presentations.

Honors

The Department recognized the following for their exceptional performances:

Outstanding Faculty

Teaching: Cari Johnson

Research: David Chapman

Outstanding Graduate Students

Ph.D: Jessica Allen

Ph.D: Payton Gardner

M.S: Shuqian Dong

Outstanding Undergraduates

Geoscience/Environmental: Ted Balling

Geoscience/Geology: Danielle Fox

Geoscience/Geophysics: Kevin Jensen

Geological Engineering: Jesse Moyles

Earth Science Teaching: Rachel Shurdha

Scholarships, Fellowships and Awards

The College, the Department, and our many Friends made substantial and important support possible for the following students:

Bullock-Keller: Ted Balling, Ian Feltt, Kelsey Jolley, Lars Petersen

Chevron: Hobie Willis

Chevron Fellowship: Kevin Jensen

ConocoPhillips Fellowship: Charlie Kennedy

D. Rice Goode: Mequette Gallegos

Department: Kimberly Hynes, Nicholas Kerr, Rachel Shurdha, Ruthann Shurtleff

Eardley Fellowship: Daniel Amoakoh

Earl Family: Mary Elizabeth Barrett and Nora Nieminski

Frischknecht: Pamela Brecht

Geology & Geophysics: Katherine Clayton, Darin Johnson, Richard Patterson, Marli Stevens

Hohmann Fund: Thomas Etzel

Honda: Katie Bradbury

Ken Cook: Stephanie Whittaker

Marta Weeks: Daniela Anguita

Mikulich: Christopher Bradbury

Mineral Society Utah: Brittany Dame, Luke Dow, David Freistaedter, Rebecca Gage.

U- Continuing: Jesse Moyles

URS Internship: Bryant Bunnell

U-Continuing Freshman High School GPA: Gage Carney, Terry Ritchie and Marli Stevens

Orlo Childs: Jennifer Eutsler and Warren Anderson

PICP Awards: Sean Conner, Wei Dai, Jared Gooley, Simin Huang, Charles Phillips, Peggy Reeder, Orion Rogers, Ian Semple, Xin Wang, Qiong Wu

Special Recognition for Outstanding Service: Matthew Heumann

Stokes Fellowship: Sally Potter

Team of Excellence Award: Anita Brown

Teaching Assistant: Ben Johnson

TGLL Fellowship Award: Greg Carling

TGLL Training Fellow: Megan Crocker

University Graduate Research Fellow: Matt Heumann

University Teaching Award: Anita Brown

Utah Geological Association: Sean Conner and Danielle Fox

WEST Fellowship Award: Ian Semple

Student Research Grants and Internships Awarded

Our students continue to write proposals and compete for national grants aimed at supporting student research projects. We are proud of their efforts. Last year included a NASA workshop travel award to Sally Potter.

Students doing summer internships with industry also included:

Page Anderson	Crystal Hammer
Olga Brusova	Matt Heuman
Kit Clemons	Charles Phillips
Will Gallin	Anita Brown
Wei Dai	Jared Gooley

Outreach Programs Benefit an Ever-growing Audience

Our Outreach programs help establish a dialogue between the geosciences, the rest of the University, and beyond that to the non-scientific community. We aim to provide insight into the interests that engage members of our department. In addition, we hope to promote interest among young people that may bring them into our department as new geoscience majors.

WEST Program Continues to Serve K Through 12 Students and Teachers

WEST (Water, the Environment, Science & Teaching) is an education and outreach program based in the Dept. of Geology & Geophysics that brings together graduate students in the sciences with K-12 teachers and students to enhance science education in public schools. Since 2004, WEST has provided fellowships for 60 science graduate students to devote fifteen hours a week to work with K-12 teachers and students developing and teaching inquiry-based science lessons, leading field trips, and engaging kids in science practice. The program has impacted over 6,000 K-12 students and 75 teachers in 35 schools.

Founded by Dr. David S. Chapman, WEST provides professional development opportunities for graduate students and K-12 teachers including workshops and seminars on pedagogy, communication skills, time management, collaboration, grant and curriculum vitae writing, and science content.

In August 2008, ten fellows from the Departments of Geology & Geophysics, Biology, Atmospheric Sciences and the Professional Masters of Science & Technology program joined their partner teachers for a Summer Workshop hosted at the Utah Museum of Natural History, Red Butte Garden, and the Salt Lake Center for Science Education. Master teachers and experts present

on such topics as vegetation change with elevation, and learning as evidenced by brain activity.

In autumn, WEST fellows engaged over 500 students in a series of environmental studies at Silver Lake in Big Cottonwood Canyon. During winter, WEST fellows were busy mentoring hundreds of students' science fair projects and helped judge at twelve local and district science fairs. WEST Fellows also helped start science fairs in schools. It was a lot of hard work but well worth it.

In the spring, WEST Fellows developed a cross-disciplinary research project in which they created an air pollution profile for the Wasatch Front by sampling the snowpack for CO₂, mercury and other contaminants. Fellows worked in teams (on skis!) to collect the snow from various locations. They also produced a short video about the scientific process implemented in the snowpack study for K-12 students. The three-part video can be viewed at:

<http://www.youtube.com/watch?v=Y1DYFnTQy2s>;

<http://www.youtube.com/watch?v=snuatSpO-SY>; and

<http://www.youtube.com/user/WESTscience>.



Scott Hynek (Ph.D. student and WEST Alumni), shows Krkysia Skorko (M.S. student and WEST fellow), and Gwen Foster (a 6th grade elementary school teacher), how to use a LabQuest water testing probe. The probes are easy to use (especially for kids!) and can measure pH, temperature, turbidity, dissolved oxygen, and other water quality parameters.

Two additional science outreach programs at the University of Utah have their foundations in WEST: the EAST (Embedded Alliance for Science Teaching) program, which employs undergraduate students in a manner similar to WEST, and the TGLL (Think Globally, Learn Locally) program. The EAST program operates on a grant from the National Science Foundation's Math and Science Partnership program and TGLL is a new K-12 program in the Department of Biology. All three programs met and trained together this year, bringing to 28 the total number of University of Utah science students immersed in year-long partnerships with the public schools.



WEST Fellows Seth Arens and Maura Hahnenberger dig a 6-foot deep snow pit to sample for contaminants as part of the WEST interdisciplinary air-quality research project.

After an initial three-year grant from the National Science Foundation, WEST now subsists on donations from various public and private entities. Included in the list of past and present supporters are Salt Lake City School District, Salt Lake Education Foundation, Bennion Center, George S. and Delores Doré Eccles Foundation, CH2M Hill, Lakeview Academy, Utah Museum of Natural History, VP of Academic Affairs, Graduate School, Dept. of Meteorology, and Colleges of Science and Mines & Earth Science.

If you are interested in hearing more about WEST, or in finding out how your organization can become involved with supporting science education in the public schools, please contact Holly Godsey at holly.godsey@utah.edu or visit the WEST website at www.earth.utah.edu/west.

Student Recruiting Escalates

Outreach activities of the Department address our goals to increase Earth Science majors, expand enrollments in GEO courses, and enhance the relevance of Earth science programs and perspectives at the University and within the broader community.

Our beautiful new department home, the Frederick A. Sutton Building, has enormously boosted our outreach and visibility since its Grand Opening in April, 2009. Groups from all over campus hold receptions in the Confluence entry hall, with its signature fossil fish and plant walls from Wyoming's Green River Formation. Folks gather in our sunny, state-of-the-art conference room overlooking the roof garden. Students from across campus come to study, talk, or update their Facebook profiles in our many open, comfortable, informal

gathering places, surrounded by museum quality fossil displays and polished rock slabs from around the world. The Sutton Building is truly the talk of the town.

Annual on-campus recruiting and informational activities include Plazafest (a student information fair), the Majors Expo, Science Day (for visiting high school seniors), Future Students Open House, Transfers Day, and several freshman orientation events, including a geologic tour of Red Butte Garden.

Our superlative "1000-level" general education courses introduce students from across campus to geoscience-related technical and societal issues. These courses include: World of Dinosaurs, Natural Disasters, Hollywood vs. Reality, Earthquakes & Volcanoes (lecture and online versions), Geology of the National Parks.

The Salt Lake City Avenues Street Fair is a huge draw every year with hundreds of enthusiastic visitors to our booth. We get their attention with a cougar-chomping australopithecene, huge mineral crystals, fossils, literature on Utah earthquake hazards, a 3-D map of the Wasatch Front, and free rock specimens.



Dr. David Dinter talks to a fascinated Avenues Street Fair attendee.

Department personnel also visit local schools, provide docent training and geologic field exercises, speak to community groups, judge science fair projects, and staff Geoscience Week exhibits at the Utah Geological Survey. Most outreach activities are planned and coordinated by the faculty outreach and recruitment committee (David Dinter, Erich Petersen, Marjorie Chan, and Kris Pankow), and presented by various faculty members and a cadre of indispensable, world-class student volunteers. You know who you are. Thank you!

PBS's 'Dinosaur Train' Series Spotlights Dr. Scott Sampson

Dinosaur Train is an exciting new half-hour series on PBS television aimed at getting very young children excited about exploring the natural world. Created by Craig Bartlett (of "Hey Arnold!") and produced by the Jim Henson Company (of Muppet fame), every episode

features an animated story followed by a live action segment. The computer generated animation features a wondrous and whimsical world seen through the eyes of Buddy, a preschool-aged *Tyrannosaurus rex*. Buddy and his adoptive family of Pteranodons go for adventures on the Dinosaur Train to meet all kinds of dinosaurs in different time periods and learn about these fascinating creatures. The live action segments are hosted by Dr. Scott Sampson (a.k.a. "Dr. Scott the Paleontologist"), who also serves as the show's science advisor. He interacts with children to present the science behind the stories—not only what we know but how we know it.



Buddy the T. rex and Tiny the Pteranodon star in the new "Dinosaur Train" PBS program (PBS KIDS®).

We're Getting to Know Frederick Albert Sutton

For all of those attending the grand opening of the Sutton Building, Rev. Marta Weeks' talk was a high point. She told us she wanted to share something of her geologist father's life with us because, she said, the building "stands as a monument to all field geologists, everywhere, who have had to work in and under very difficult conditions." Much of what she knows has been gleaned from her father's letters to her mother.

Marta grew up in a home where a geologist often had to be away from home, indeed, out of the country for years at a time, and his letters were very important in the family's life. When Marta's mother died at age 100, she left many of those precious letters to her daughter. Marta says she marvels at them, saying she understands why her mother kept them; they were all love letters. But occasionally one can get glimpses into his challenging work, and she wanted to share some of that with us.

To understand the importance of these letters, one must remember, first, that there was the matter of travel. People as well as mail traveled by steamship and railroads in the 1920s and 1930s. For geologists, there were, on occasion, mules and horses and camels across undeveloped countries. Thus, there could be long and unpredictable intervals between letters. Frederick Sutton's letters always had numbers on them so his family would know if any had been lost. Unfortunately,

due to the difficult places her father often had to work, fewer of her mother's letters (to her father) survived.

Frederick Sutton grew up in Salt Lake City, and after graduating from the University of Utah and spending time in the trenches in France during World War I, he came back to work briefly in Utah, then in Colombia. He wrote many letters to Marta's mother, Anne, asking her to marry him. After completing her Master's Degree at the University of California, and teaching a year to pay back her education debts, Anne agreed to sail to Panama where she and Frederick were married. They then went to Cartagena near where Frederick had been working. After finishing that contract, he landed a job doing field work in Argentina for Standard Oil. It was there Marta's older sister was born in 1925.



Frederick Albert Sutton's passport was granted in 1925 for "Geological work and travel to all countries".

Marta's parents had long decided they would return to the United States eventually, perhaps after a first contract, so with a second child on the way and her father gone for long periods out in the field, her mother returned to the States. Sadly, their second child died of pneumonia at three months. At that time there were few jobs available in the United States, so her father and mother had to be separated for very long periods of time. Her father loved his job and the work he was doing in South America, but without his wife's presence, it was terribly lonely. They were able to join him again in Buenos Aires where Marta came into the world in 1930. When the family was in Argentina, they had to stay in Buenos Aires because there were no places for the

geologist's wives to live where their husbands worked. It was a long way from the city of Salta to Tartagal which was just south of the Bolivian border. Near Tartagal, his company – Standard Oil of Bolivia and Standard of Argentina – had a central camp where many of the company people would stay when working or going through that area.

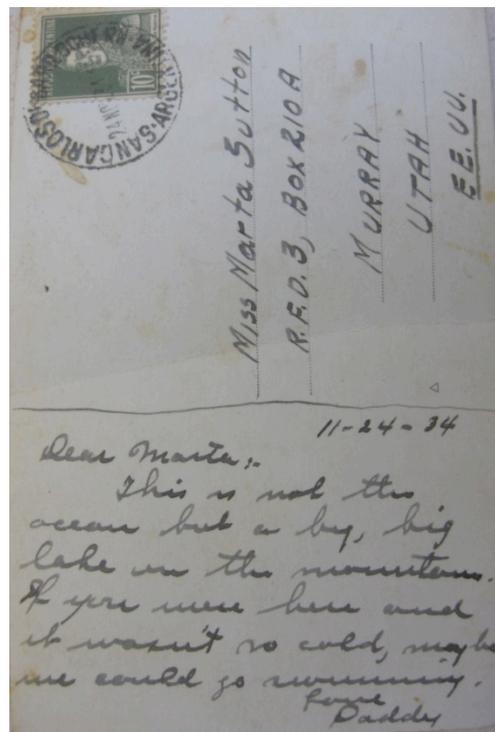
Once again, in 1932, her mother again returned to Utah with the children, leaving her husband behind. This was at the depth of the Great Depression and Frederick Sutton felt very fortunate to have a job. Work was not easy to find, so in order to ensure employment he had to sign a three year contract. Marta added that as she read through some of his letters, she couldn't help marvel at how much of what he said related to our present economy as well.

In November, 1933, he wrote. "When I realize I have only been here two months and have thirty-four months to go, it makes me almost sick." He had been sent back to Agua Blanca, a camp on the Argentine side of the Argentine-Bolivian border. He says, "I shall leave here for Agua Blanca in the morning at 4 o'clock. Johnny the tool pusher will meet me at the Rio Pescado in his truck providing he can get over the road. The Pescado is twelve miles from here and from there to Agua Blanca is another 24 miles. I hope he meets me because I haven't been in the saddle since last Christmas and to ride 36 miles the first day on the job here is apt to be a little hard on certain parts of my anatomy. However, I can do it if necessary. My equipment and peons left here in carts this morning and the mules left here yesterday morning."

He had other observations on the way the company handled its people, too. He grouched, "It's the bookkeepers who get all the good deals in this company." Another letter read, "The men in the accounting department, who are married, and many of whom only get 300 pesos per month, are all getting company houses in the central camp. The accounting department is the only department in the company that gets any consideration at all. The new geologist they have sent to help me says John D. Rockefeller must have been a bookkeeper."

Marta observed, "Through all my father's letters is the theme of wishing there were housing for the geologists' wives. The attitude of the company towards geologists was that they would be much better off if they weren't married. There were constant rumors that the company would supply some housing for the wives in the north, but it never happened."

After they were married and before the Depression began, Marta's father and mother had begun to build a home of their own on a piece of property in the Holladay area given them by Anne's father. Frederick Sutton had a great deal of confidence in the future and his wife's intuition, and he was sure if they worked hard that things



Frederick Sutton sent this postcard to his daughter, Marta, when she was about four.

would go well for them. A letter dated Oct. 16, 1933, to Marta's mother said, "Today Mr. C. handed me the N.Y. stock quotations he'd heard over the radio. Everything seems to be down in the cellar. It would have been nice had we sold just before I left, but we didn't and there is no use worrying about it. When you think they have hit bottom, I hope you load up on some good stocks, on margin. Someday, they will go up again. Perhaps your intuition will pick the bottom for you. Do what you think is best and tell me about it afterwards." A letter dated April 19, 1934, said, "I am not quite so pessimistic about the future of the U.S. as are some here. I still believe that there is money to be made in stocks. At the same time I agree with you that we should have a savings account. One of the guaranteed sort. The chance of making some money in the market is the one bright spot for me in the future and maybe that is why I am optimistic. I'll admit that when I stop to think of the future I sometimes get a sinking feeling in the pit of my stomach. I am going on forty and all I can see ahead of me is a series of three-year jobs in a foreign country with a month or two with my family in between times. It is certainly not a pleasant outlook. You are good at handling our money and I am in favor of some speculation."

Life in the field could be pretty exciting at times. Letter Number 35, dated April 28, 1934, from Ceibalitos, gives the following account of a trip. "I had planned leaving for Lumbreras Friday but didn't because the car I had arranged for did not arrive. It didn't come in fact, until Monday and I left for Lumbreras Tuesday. We got on the wrong road and went fifteen miles out of our way. In the afternoon we rode all over on mules and had a look at

the geology and came back here Thursday. It began to rain and the wind blew just after we had left Lumberas and believe me, that was some ride. Our car is not so hot. It is a 1929 Ford without a top or windshield and it has no brakes. However, I enjoyed tearing along with the rain blowing into my face. Ordinary people don't normally experience such things. And as we tore along I was really happy and glad to be alive. Of course when we got here we were quite cold. On our way one of the wheels came off the car and went rolling off into the 'monte'. After that we stopped every few miles to make sure the wheels were fastened on tight."

certainly cause a lot of damage. Wherever they pass, they leave the country bare."



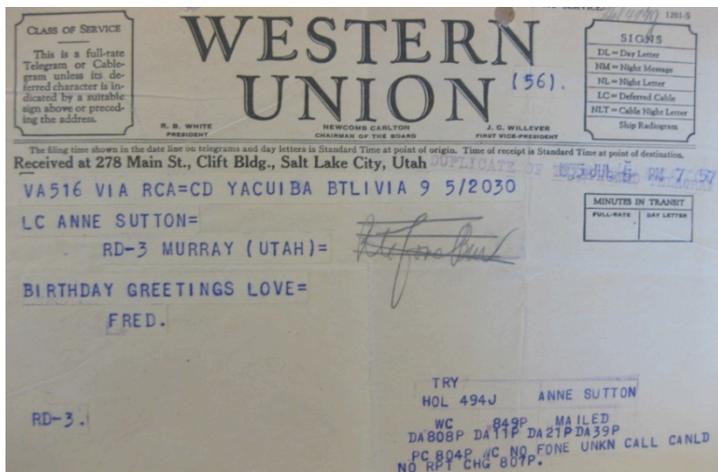
A postcard from Frederick Sutton to Marta when she was four shows waves crashing in a lake in Argentina.

Geological tasks could be frustrating. He writes, "My present assignment now is quite an easy one from the standpoint of physical exertion. The hills are very low and we climb them without even sweating. This condition however has its drawbacks and I can't find as many rock exposures as I need. Almost everything is covered in a thick mantle of soil. As a result I am forced to dig pits down to bed rock. I have three crews of two men each on that work now and have ordered more picks and shovels from Tartagal so I can start some more crews." In a later letter he says they now have twelve pits dug in order to get the information they need.

Frederick Sutton's letters are full of longing for his family, but between the ages of two and nine, Marta can only recall seeing her father three times, when he was able to come home on foreign leave. "Then," she says, "Life was always exciting and wonderful."

Marta summarized the next few years as, "After twelve or more years in South America, Frederick Sutton was loaned by his company to Standard Vacuum. He was joined by geologist Marvin G. Weller from the University of Chicago, and they went to China together to spend over a year in the Gobi Desert and Outer Mongolia. As a result of their exploration trip, they told the Chinese where they should drill for oil. As it turned out, their advice was right on the button and the Chinese found oil. It was a big help to them during World War II. The Panay incident happened while the pair was in China and it greatly delayed their departure. The Japanese had attacked China and in the process an American gun boat on the Yangtze River was sunk. The Japanese said it was an error, but the American flag was clearly flying when the boat was fired upon. We were all so grateful to see them home safely.

Marta's father spent the rest of his career in Venezuela where he was given a house so his family could join him at last. His final years with Lago/Creole Petroleum were spent in the Caracas office where he was considered an



Birthdays could be pretty curtailed for the families of field geologists in 1930.

There was time to talk about local fauna, too. In his letter Number 38, he has been moved to another area. He writes, "The trouble here is that nothing of importance ever happens. But I might tell you about the grasshoppers. They came yesterday, from the north, millions and millions of them. They apparently settled here for the night and left again today, and now there is not a trace of them. Yesterday and this morning while riding to and from work, they enveloped me in clouds until I was ready to swear. Of course, they are harmless, but it isn't pleasant to have them fly in your face or get inside your shirt. They are reddish-brown in color and the ground had that color as far as we could see. When viewing them in flight a short distance away, they looked exactly like immense billows of slowly moving red smoke that obscured everything it passed. And the resultant noise of the moving wings of those millions of grasshoppers made a dull, steady roar as of wind. There is a certain bird which subsists on a diet of grasshoppers and which accompanies them on their flight. These birds drift lazily along and when they feel the need of sustenance, they snap a grasshopper out of the air and devour it en route. When I came back to camp at noon, I was totally covered all over with grasshopper droppings, so you can imagine how plentiful they were in the air overhead. They make a picturesque sight but they

authority on the Maracaibo Oil Basin. Marta only lived a few years with both her parents even after they were together because she had to return to the States for school.

Now she says, "I treasure my father's letters. I used to guess a lot about what he did, but now I know for sure that he waded through a lot of muddy streams and dealt with quite a few unruly mules. His company cars got stuck in the mud a lot. He rode horses, and camels too. He learned about lampeaguas, the large snakes that one could use for making shoes or belts. He mapped all kinds of places, cut trails through the bush or brush and climbed many hills and mountains. He supervised a lot of the locals and peons too on various jobs. He also studied structures and samples in detail and determined a lot of well locations. And, of course, he continuously wrote love letters to my mother. This was all while she reared me and my sister, took care of the house she and my father had built in Holladay, and planted a vegetable garden. And in turn, she wrote love letters back to him."

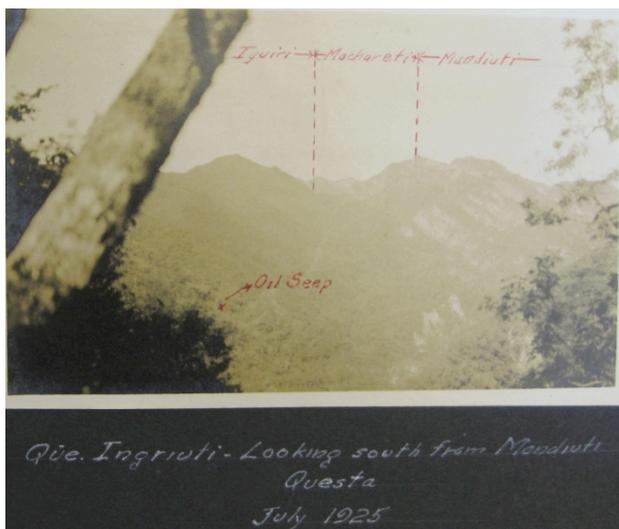


Photo of an oil seep in Bolivia sent to his family in 1925.

Her mother also played the stock market. Marta says, "She told me once that whenever FDR would give one of his fireside chats, she would spend all the money she could raise on buying stocks the day before his talk. The market always went up after this. So she would then put in an order and sell everything the next day after his talk."

One of the geologists whom Frederick Sutton knew and with whom he worked in Argentina had a young son born a few years before Marta. She had never met him in South America, but about twenty years later, shortly after her father had died, young Austin Weeks looked up Marta's mother. He was a geologist, and his first job had taken him to Salt Lake City. A year later, Austin and Marta Sutton were married. Austin's father, Lewis, (after losing his wife as Marta's mother had lost Frederick) would someday marry Marta's mother. Marta concluded, "The University of Wisconsin has a geology building

named after Lewis Weeks, so I think that's why the computer I might have given to Utah morphed into this building in memory of my father. But it was indirectly because of Lewis Weeks that I was able to do this."

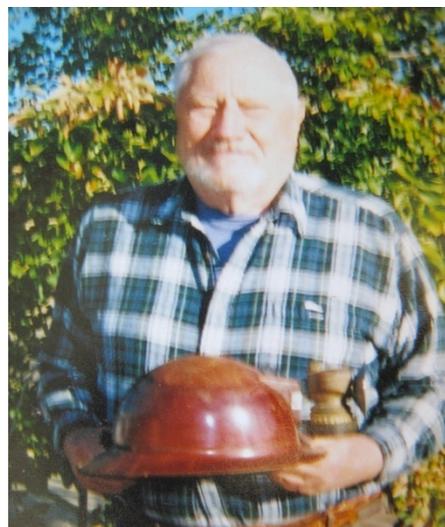
Blast From the Past

In our "Blast From the Past" series, we take pleasure in giving our Geology and Geophysics community a look at another alumnus, this time one whose education was the prelude to an unexpected career.

Ken Larsen's Career Exemplifies the Strength and Flexibility of an Earth Science Education

Ken Larsen's interest in earth science dates from early childhood, when he discovered large plates of mica and hornblende in the glacial deposits on his grandfather's farm in Massachusetts. This fascination persisted throughout his growing years, so it was understandable that when college time arrived he would apply at the University of Utah's College of Mines and Mineral Industries to study geophysics.

Field trips still loom large in Ken's memory. Dean Armand J. Eardley took the petroleum geology class to Rifle, Colorado, with a stop to see the gilsonite deposits near Vernal, Utah. Windblown gilsonite on his skin stained his bed sheets for several weeks in spite of repeated washings. Professor Stanley Jerome took his mining geology class to Park City, where the mine provided them with a miner's hat and a carbide lamp (shone in the picture) and high rubber boots, the latter so they could wade against the strong current of mine water that came to their knees.



Ken Larsen with a 1950s vintage miner's helmet.

Geology field camp, headed by Professor Norm Williams, was "poorly sited," on a mud flat. He remembers, "The University issued us wooden army cots that started on top of the ground each night, then

sank into the mud so that we had to pull them up each morning and put them back on top of the mud.” While an undergraduate, he had several opportunities to work in industry, first as a part-time draftsman for American Smelting and Refining Company (ASARCO), mostly hand-coloring claim maps. From this exposure came a bid from ASARCO’s sole mining geophysicist to explore glacial deposits in Washington for hidden sulfide deposits.

In his senior year, “greetings” from his draft board informed him that he’d soon be called to duty (during the Korean conflict) because his geophysics major – as opposed to an engineering major – was not vital to the national defense. His letter to the board protesting that geophysics was equally important and valuable did not convince them, so he switched to geological engineering. Flexibility, he learned, is important. Upon graduation in 1953 with a B.S. in Mining Engineering, Ken worked for Anaconda as a mining engineer at the Darwin Mine on the edge of Death Valley. But after six months prices for lead and zinc were declining and mines were being shut down throughout the Southwest. With unemployment facing him, he followed another early interest, when he had worked in gardens of wealthy estates in Massachusetts. He applied to the Department of Landscape Architecture and City Planning at Harvard. He felt that, “Although I would no longer be able to analyze minerals and map ore deposits, I would still be working with the earth.” He graduated with a Master of Landscape Architecture in 1956, and went into practice as a consultant in Albuquerque, where he remained for thirty years.

He feels that his experience at the University of Utah has been invaluable in studying soils and locating buildings – even cities – in the right places. “Much opportunity can be gained from the study of Earth sciences. A student can never know where he or she will eventually end up, but a creative mind that can apply scientific principles is in great demand in this complex society.”

Alumni and Friends Expand Their Horizons – and Ours

We look forward to hearing from all of you, and we’re always amazed at the venues our alumni continue to explore. Come see our beautiful new Sutton Building and all the useful amenities we can now take advantage of. If you can’t make it to Salt Lake City, at least drop us a line.

Dedicated Collectors Contribute Knowledge and Petrified Wood

Ruth Beatie Jenkins, known to her friends as Ruthie, is a unique woman and a valued friend of our department. She was interested in a career as a violinist and played with symphonies while still a teen-ager, but once she

married David Jenkins, the family hobby of rock collecting took over.



Ruth Jenkins and only a portion of her fine petrified wood collection.

They focused their collecting, and Ruthie became a self-educated paleobotanist with a deep knowledge of petrified wood. She shares her knowledge with professional paleobotanists and rock enthusiasts all over the world, and she has become a great resource to our department. Ruthie has helped us identify many of our petrified wood specimens that previously had no information on taxonomy or localities. Over a period of some fifty years, Ruthie and her late husband David collected petrified wood, many that are polished full rounds, from all over the world but mostly from our intermountain area. Ruthie proudly displays her curated specimens (with specific taxonomy, formation names, and localities) in her home. At 85, Ruthie maintains an astonishing level of activity, continuing to collect in the field as she did with her husband. It is not unusual to find Ruthie and fellow collectors at various locations in Utah, Wyoming or Oregon, with pick in hand down in a four-foot hole, digging a petrified log or a limb.



Alumni Pat and Judy Inkley Beatie with petrified wood collection promised to GG for display and research.

Ruthie's younger brother, Patrick "Pat" Beatie (B.A. Political Science 1970) and his wife Judy Inkley Beatie (who studied Music at the "U" from 1963-64) began collecting petrified wood seven years ago at Ruthie's urging and under her tutelage; they have now collected all over the western U.S. together with Ruthie, and have pulled together their own collection of approximately four hundred beautiful specimens. They are in the process of turning over their collection to the University of Utah for display in the new Sutton building.

GSA Meeting

During the Fall 2008 GSA meeting, we had an alumni reunion that included the following folks below (not sure everyone signed in, but hope we got most of you). It is fun to catch up, and be sure to join us for the next 2009 alumni GSA function in Portland if you are able.

Jessica Ali-Adeeb	Doug Hollett
Prof. John Bartley	Greg Lord
Gabe & Brenda Bowen	Kevin Mahan
Susan Beck	Michael Manship
Jake Benner	Michelle Mary
Julie Bernier	Pam Melroy
Janae Wallace Boyer	Larell Nielson
Larry Braile	Mark Novak
Roger Congdon	Prof. Kip Solomon
Ben Davis	Michael Stearns
Katrina Settles Denasquo	Leif Tapanilla
Prof. Tony Ekdale	Roy Van Arsdale
Sherie Harding	Steve Vanderhoven
Matt Heumann	George Zandt

Others seen at GSA but didn't make it to the reunion include Jackie Huntoon, Ron Blakey, and Victor Heilweil.

AWG Auction and Wine Tasting Marks Twentieth Anniversary

The twentieth annual AWG auction and wine tasting hosted another successful party for members and friends of the Department. This year it was estimated that 150 people attended, bid on 150 different auction items, drank 100 bottles of wine, and donated \$3,200 for scholarships.

Alumni Check In

1960's Graduates

David Duke (Ph.D. 1962) enjoys life in Park City, and is often spotted at the home Utah football games.

John F. Shroder (Ph.D. 1967) has taken on new responsibilities as Assistant Dean of International Studies at University of Nebraska at Omaha. He still manages to squeeze in research and society efforts on geoconservation.

Peter B. Stifel (Ph.D. 1964) is currently living in Maryland. He attended the Sutton Building Grand

Opening last spring, his first trip back to campus in over forty years!



Peter with Betsy Bishop in the Peter Stifel Confluence.

1970s Graduates

Edith Allison (M.S. 1979) is Manager of Oil & Natural Gas Exploration Research & Development, working for the Department of Energy in Washington D.C. She is also actively involved in AAPG service.

Ron Blakey (M.S. 1970), Emeritus Professor of Geology at Northern Arizona University, visited SLC for a Utah Geological Association talk that was well attended this fall. He visited the new building and had "deja vu" when he saw the 1968 Canyonlands painting he had done for Hank Goode hanging in our administrative office.



Ron Blakey was pleased to see his painting hanging in our office.

Ron and Wayne Ranney have published a book highlighting the nation's greatest concentration of national parks and monuments. *Ancient Landscapes of the Colorado Plateau* highlights the area's magnificent present through unique views of its fascinating past.

W. Dan Hausel (B.S. 1972, M.S. 1974) accepted early retirement from the Wyoming Geological Survey after a 29-year career that included many new mineral discoveries, the Wyoming Geological Association's Distinguished Service Award, and the AAPG's President's Award, as well as recognition for his excellence in martial arts.

John Dorrier (B.S. 1975) is the CEO & Chairman of Orogen Energy. He splits time between Houston and London, and occasionally is out on a fox hunt.

Margaret Kerr (B.S. 1978) is a regular cross country traveler either in southern California or on the east coast, busy keeping tabs on the family and stopping in Salt Lake City for our Roundtable events.

Matt Mikulich (Ph.D. 1971) has been keeping busy with a major custom-designed woodcarving project, teaching geology class at Regis High School in Denver, and sharing his knowledge of Colorado mining history and methods at local public venues. He recently enjoyed a reunion of retired Chevron colleagues at Jackson Lake Lodge, Wyoming.

Wallie Rasmussen (J.D. 1972) hosted a luncheon at the Petroleum Club in Houston on December 2, 2008, for some of our alumni in the area where Dean Frank Brown gave an update on the progress of the College. Also in attendance were Stirling Pack (CVR Energy and a member of the University of Utah Advisory Board), Marc Croes (El Paso Exploration & Production), Ben Davis (ConocoPhillips), Jenny Joyce (Exxon Mobil) and Andrew Haynes (Shell).

Chuck Williamson (M.S. 1972) is currently Chairman of two companies but has also been making time for a small winery building project in California. Knowing Chuck, we're betting there's a lot more to it than this brief note lets on!

1980s Graduates

Janae Wallace-Boyer (B.S. 1988) had a great month-long trip to Turkey in April 2009 discovering unique geology, especially around the Hisarözü Peninsula, where the Aegean–Anatolian and African tectonic plates meet. The relief is extreme along the coast, contrasting brilliant serpentine-colored mountains against vibrant blue and green-hued sparkling waters of the Mediterranean.



The inland mazes of Cappadocia showed Janae Wallace Boyer a wonderland of hoodoos in basalt-capped tuffs.

Thomas Fassio (B.S. 1982, M.S. 1984) is a consulting geologist for Foothill Resources Inc. He has helped offer data sets for some of our petroleum class modules.

James R. Hollis (M.S. 1988) announced that the ION Geophysical Corporation Board of Directors appointed him as President and Chief Operating Officer. In his new position, he will oversee all operations of the Company, including all business units, sales and manufacturing.

Jackie Huntoon (M.S. 1985) is Dean of the Graduate School at Michigan Tech University, and is active in service as board member of the Geological Society of America, Councilor for the Geological Society of America's Minorities and Women Committee, and a life member of the Society for the Advancement of Chicanos and Native Americans in Science.

Jeff Gentry (B.S. 1984) is always putting together all kinds of interesting plays for Emerald Oil & Mining Co. He serves on our Round Table as well as the advisory board for the Lassonde Center (for new venture development) on campus.

Bereket Haileab (M.S. 1988, Ph.D. 1995) is known as one of the most enthusiastic professors at Carleton College, and he still brings back his students to Utah to use our analytical facilities.

Jerry Knaus (B.S. 1980) is a Senior Manager of Global IT with Jeppesen, a Boeing Subsidiary. As an information technology expert, he established a LinkedIn group to help our alumni stay in touch.

Terry Massoth (M.S. 1982) has been working on underground coal gasification exploration in the western United States and Gulf Coast area, as well as coal exploration in Saskat, Alberta, and British Columbia, Canada. He has had a great time. In 2009 he hopes to do work on coal, ore sand, or shale work in Utah.

Steffen Ochs (M.S. 1988) and his wife Barb hiked over the French Alps from Lake Geneva to Nice on a fantastic trip in the summer of 2008.

Ralph F. Stearley (M.S. 1988) taught introductory geology for Calvin in southwest Montana in summer, 2008. He also taught at the Au Sable Institute at its Whidbey Island, Washington, Campus.

Sean Willett (Ph.D. 1988) moved from a faculty position at the University of Washington to a Professorship at the ETH, Zurich, Switzerland.

Steve Young (B.S. 1984) is working hard for Pipeline Systems Inc. with trips to Chile, Anchorage, and China. He finished his M.B.A. in June, was promoted, and moved to Australia with his family this summer.

1990s Graduates

Dan Barnett (J.D. 1999 and former GG research assistant professor) is an attorney for Parr Brown Gee & Loveless, P.C. He is still running and helped organize a local foot race with fellow runner Prof. John Bartley.

Marshall Bartlett (Ph.D. 2005) has returned to the mainland. Marshall was a faculty member at BYU Hawaii

but now is in a teaching position at Hollins University, a private Liberal Arts College in Roanoke, VA.

Jonathan Caine (Ph.D. 1999) enjoyed a year of travel in 2008 that included trips to China, Mongolia, and Nepal. He was struck by the friendliness of many people, and enjoyed the culture of the cities, as well as the treks through remote country. He continues to enjoy his work at the U.S. Geological Survey.

Rob Harris (Ph.D. 1996) left his Lecturer position at the University of Utah to take a faculty position at Oregon State University, Corvallis, Oregon.

Hans J. Rasmussen (M.S. 1992) was appointed President of Maestro Ventures Ltd., an exploration company focused on the discovery of high value precious and base metal deposits in the eastern Great Basin at Kings Canyon, Utah.

Brian McPherson (Ph.D. 1996) was hired away from New Mexico Technical University in Socorro, New Mexico, to a position as USTAR (Utah Science, Technology, and Research) Professor at the University of Utah.

Tekla Lake Taylor (B.S. 1994) is Vice President at Brown & Caldwell and loves living in Colorado.

Mark Turner (M.S. 1990) is consulting for a small oil company in North Salt Lake, and oversees their drilling program. He sees himself staying quite active until he drills half a dozen dry holes.

Adolph Yonkee (Ph.D. 1990) received the campus-wide Distinguished Presidential Professor award at Weber State University. This award gives him discretionary research money, which he is using to explore new projects in Spain. Adolph has been Department Chair for twelve years at Weber and signed on for another three; so on top of his two NSF grants he is staying very busy!

2000s Graduates

Michelle Coulam Addison (B.S. 2001) works at the University of Utah Department of Music, where she enjoys being involved in music and marching in the U. Alumni Band at Homecoming time. She also is involved with the University's Annual Scholarship Concert.

Todd Ehlers (M.S. 1996, 1997; Ph.D. 2003) has just left his tenured faculty position at the University of Michigan to take up full professorship/chair in Geodynamics and Surface Processes at the Universität Tübingen, in southern Germany. Todd's wife Miriam is from Switzerland. He will maintain an auxiliary appointment at the University of Michigan, since he plans to stay involved in existing collaborative efforts and scientific initiatives here in the U.S.

Andy Henrikson (M.S. 2000) enjoys teaching Earth science and high school physics at Waterford School, a liberal arts college prep school here in Salt Lake City, as well as coaching the Waterford crew (rowing) team.

Lonnie Mercer (B.S. 2001) moved from Salt Lake City to Houston, where he began working for Environmental Resources Management (ERM). He had great experiences in the early stages of his career in the environmental consulting industry. His wife Alisa and he have enjoyed working and living in Houston.

James Pearce, (B.S. 2004) is at BYU working on his M.B.A. in Business. He is still a die-hard Ute football fan.

Shane Spor (B.S. 2001) has been working at Barrick Goldstrike.

In Memoriam

Donald L. Baars died July 7, 2008 in Lawrence, Kansas. He graduated from the University of Utah in 1952 with a degree in geology and later received a Ph.D. from the University of Colorado. He worked in the oil industry and became a professor of geology at Fort Lewis College in Durango, Colorado in 1968. He conducted many river field trips for students and professional geologists on the Colorado Plateau, and was known for his stratigraphic studies in these regions.

Craig Forster, former department research and adjunct faculty member, was first director of the Office of Sustainability with the goal of turning the University of Utah into a greener campus. Forster inspired many with his ideas about environmental impact, an improved campus recycling program, a co-generational energy plant, the campus farmers market, and the teaching of environmental classes. He died in a tragic hiking fall in Zion National Park in November 2009. We will miss his enthusiasm and commitment.



Craig Forster's picture embodies his characteristic enthusiasm.

Alan Ray Hansen died in March 2009, in Folsom, California, and was laid to rest in his childhood home town of Provo, Utah. He received his Ph.D. in Geology from the University of Utah in the 1950s. Alan had a unique way of describing how the geological layers of the earth backed the biblical accounts. He was a successful petroleum geologist and businessman, fond of collecting rocks, gemstones, stamps, coins and marbles.

William San Filippo, 58, died on January 7, 2009, at Duke University Hospital, surrounded by his family. He received a B.S. in physics from Harvey Mudd College, a

M.A. in physics at the University of Texas Dallas and a Ph.D. in geophysics from the University of Utah. He was employed by Geophex of Raleigh.

Donors' Generosity is Vital to Our Mission

If we've failed to list anyone, we apologize. Please know that every one of you is important to us. Just send us an e-mail and we'll make it up in the next issue. These donations listed below cover Sept. 1, 2008 to Sept. 1, 2009.

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SUTTON CELEBRATION PICTURES April 2009

We can't show all the pictures here, but do see more on our website!



*This life-sized stainless steel cast of *Allosaurus fragilis*, from the Cleveland-Lloyd Quarry, was conceived, fabricated, and generously donated by alumnus Jeff Gentry (B.S. 1984 Geological Engineering, B.S. 1984 Geology).*



Visitors enjoyed the buffet, laid out in front of magnificent translucent limestone slabs.



Rock slabs on every floor, attract the attention of Grand Opening visitors. Each is beautiful in their own right.



Cookies in red, white and U reminded buffet goers of the institution housing the new Sutton building.



As crowds gathered for the opening ceremony, they kept an eye on the skies as spring weather threatened a shower.



Dean Frank Brown and Patrick Gathogo have conducted research in geochronology and mapping of stratigraphic layers in Africa that contribute to our understanding on the evolution of early man.

The background of the entire page is a photograph of a tiled floor. The tiles are light-colored, possibly beige or light brown, and are arranged in a grid pattern. Scattered across the floor are numerous dark silhouettes of fish, swimming in various directions. The fish are of various sizes and species, including what appear to be bass and smaller fish. The overall effect is that of a large, open space where many fish are swimming.

Although our new building is completed, we still have many needs. Your gift to the department assists in maintaining and expanding our programs. You can designate a gift to the department to wherever you wish: scholarships, field trips, endowed chairs, new instrumentation, or the general fund. If your company offers matching funds, please let us know. We deeply appreciate your support!

It is every man's obligation to put back into the world at least the equivalent of what he takes out of it.
Albert Einstein

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