



# Down to Earth

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

Fall 2004

## Department's Expanding Horizons: Interdisciplinary Projects Bear Fruit

A year ago we told you about the varied approaches our faculty and students have undertaken to take geology and geophysics beyond the walls of the department. We reported about our role in museum displays, the new interdisciplinary earth science teaching major, and participation in discussions with our colleagues across the university. This year, we can report that our efforts have already resulted in tangible new interdisciplinary projects, as well as bringing increased visibility for the department. In addition, some of the well-established services associated with our department are expanding their scope. We are confident these are just the first of other great things on their way.

Broadly speaking, our efforts to promote interdisciplinary projects are in the areas of continuing scientific research, education of undergraduate and graduate students, and of informing and educating the public, though it's often hard to separate them. Please read on!

### A Multi-University Consortium in Hydrologic Studies

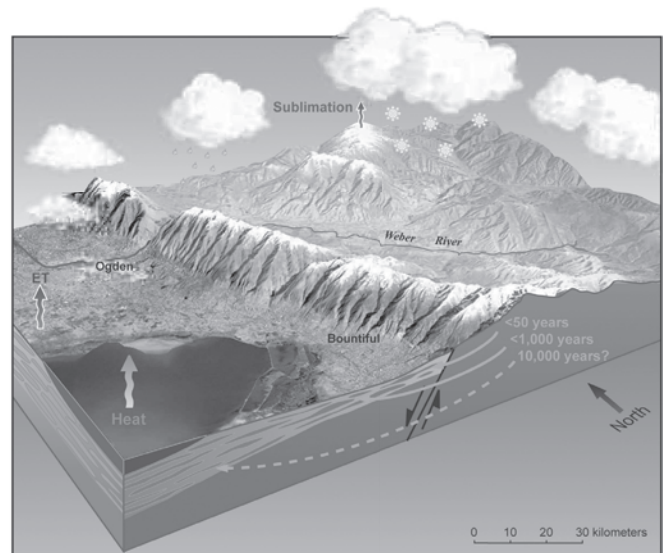
The Consortium of Universities for the Advancement of Hydrologic Science Incorporated (CUAHSI), an organization of more than eighty universities, plans to establish a number of Long-Term Hydrologic Observatories (LTHOs) where research can be conducted on currently compelling – as well as newly emerging – hydrologic problems crucial to our way of life.

Within the Great Salt Lake Basin, the steep gradients in topography and climate, the multiplicity of ecosystems, and the diversity of land uses make it an excellent place to pursue hydrologic research. In addition, it is a closed drainage, presenting the opportunity for quantitative evaluation of the mechanical and chemical components of sedimentation as well as evaporation in a setting large enough to affect atmospheric conditions. The lake itself is a prime study target for its role in preserving hydrologic and climatic signals generated in the contributing watersheds over time. Researchers can recover such historic indicators from sediment cores, using them to help build models that predict how human impact may affect the hydrologic future

of this area. In addition, the presence of a nearby research infrastructure offered by universities along the Wasatch Front offers efficient use of resident experts and already established facilities.

The Great Salt Lake Basin proposal ranked among the top five of the twenty-five LTHO presentations, thanks to the efforts of the Great Salt Lake Hydrologic Observatory design team. Dr. Bill Johnson of our department and Dr. David Tarboton, a member of the Civil Engineering Department at Utah State University, spearheaded the effort which also involved contributions from the University of Utah's Departments of Meteorology, Biology, Geography, Civil Engineering, Mechanical Engineering, and Architecture and Urban Planning. Other contributors are from Weber State University, Brigham Young University, the University of Nevada at Reno, the University of Idaho and Idaho State University, and the University of Iowa. Visit their web site at [www.greatsaltlake.utah.edu](http://www.greatsaltlake.utah.edu). The five proposed LTHOs will entail a minimum of \$10 million for initial capital costs plus \$3 million per year in operational costs. The NSF will fund two this year.

(See other interdisciplinary projects continued on p. 3-4)



Watershed study area for Long-Term Hydrologic Observatories.

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**Message from the Chair**

Fall greetings! It's hard to believe it is time for our annual newsletter again. Several events have propelled us forward in a big way this year. A huge hurdle was getting our geologic engineering program re-accredited by the Accreditation Board for Engineering Teaching (ABET). We are thrilled to say we passed with flying colors and got retroactive accreditation to cover any geologic engineering students who graduated while we were in an appeal process from 2001 through 2003. The best news is that our accreditation is set until the next normal review in 2010. Send some good engineering students our way!



Dr. Marjorie Chan

Last fall we underwent a formal, University-required assessment of our Department. The good news is that again our program is rated as excellent. We are working on some of the review recommendations, and we viewed this as an opportunity to take a hard look at where we are and what we need to do for the future.

A big part of our future will be aligned with the new building that many of you have heard of. We received the majority of funds for a new building through private donation, but there was still a hurdle to overcome in getting the building approved by the state legislature. That approval came early this year and we are now in the programming stage with the architects and hope to soon be in the design stage starting 2005. This is an amazing opportunity to shape our future as we construct a building for the coming generations. In the next two years, there will be ample opportunities for you and our alumni to give and participate in many needed components for our new building. We are planning for this to be an inviting building that can showcase who we are and what we can offer, with state-of-the art facilities, and a vision toward seismic safety and environmental awareness. I can confidently say that you *will* be impressed when you visit our new Sutton Building.

In conjunction with preparations for our move to a new building, our curatorial staff led by Quintin Sahratian has done a fantastic job of clearing out and reorganizing our collections. As some of these samples have seen the first light of day in decades, I have been astounded at how much there is and the quality of what we have (that I never

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knew existed!). I know many of you have collected these fine specimens, and many are truly museum quality. We want to showcase some of these collections and even make them available for research in the new building. So we are well on our way to a new place with new plans. The articles in this newsletter should give you a clear idea of the many directions our science takes, and its role in the future for a sustainable Earth. You are a part of that with us, and the journey will be exciting.

Please continue to keep us posted about what you're doing so we can share news with your friends and colleagues. We look forward to seeing many of you at the fall 2005 Denver meetings where we have alumni events planned. (See our plans in "Alumni News" later in this issue.)

Finally, do take a look at page 26 for our "King TUT" story. If you haven't gotten your Utah Trilobite cup, you're missing out on the cool cup of the year. This makes a unique remembrance or gift, and we want your "King Tut" picture in the next newsletter. See it featured in pictures throughout the newsletter.

Thank you for your continued interest and support of our Department. Stop by and visit us either at alumni functions or back here on the home turf. We wish you the best in the upcoming year.

Marjorie A. Chan  
Professor and Department Chair



*Newly organized department collection.*

## Department's Expanding Horizons (cont'd)

### A Multidisciplinary Research Project in the Field

Dr. Ron Bruhn's T-shirt reads, "Volunteer for Science: U.S. Geological Survey". He got it, he says, when he was part of a USGS team in Alaska, if not exactly a volunteer. "Team" is the keyword here, and the variety of disciplines that make up a modern scientific team can be richly varied indeed. For example, he explains, his own new five year

grant that is part of a \$5 million collaborative research project to work in Alaska's St. Elias range is a case in point. He will work with scientists from nine other universities who have expertise ranging from seismology to climate modeling. As he tries to understand both the tectonics and surface processes, including the spectacular rates of erosion in this glaciated mountain belt, he looks both on and off campus for colleagues skilled in such disparate disciplines as mathematical modeling of mountain building, climatology, glaciology, and marine geophysics. This kind of cooperative effort is a winning scenario for everyone – teaching and research institutions, government agencies, and industry – maximizing the knowledge that can be gained from any given set of earth scientists, their time, their equipment and their expertise.

### A Consortium with the Oil and Gas Industry

The Utah Tomography and Migration/Modeling (UTAM) consortium that Dr. Jerry Schuster has put together showcases another direction that members of our faculty take. His Ph.D. work was quite theoretical, he says, oriented toward developing mathematical algorithms related to seismic simulation of waves in the earth. But working for ARCO gave him an understanding of what the oil, gas and mining industry needed. At first, he focused on understanding why waves propagating through the earth sound different when they impinge on an oil formation than when they impinge on a dry formation. In 1987 he presented his work to numerous oil companies, then proposed a consortium. He was able to put together UTAM in just a year. It has evolved into a collection of twelve sponsors, each contributing \$23,000 a year to his research. His group has become known for coming up with unusually creative solutions to oil field problems. Their latest innovation is interferometric seismic imaging. Says Schuster, "I borrowed an idea from the astronomers." He notes it's engendering a lot of attention, from astrophysicists at Stanford, to applied mathematicians at the University of Minnesota, to SEG and AGU members.

### Partnership with the National Park Service and the U.S. Geological Survey

The spectacular scenery of Yellowstone is just the visible effect of an extraordinarily large, long-lived volcanic system, only two million years old. Seismic unrest still pervades the area. In 2001 the National Park Service, the U.S. Geological Survey and the University of Utah entered into a partnership to form the Yellowstone Volcano Observatory (YVO). Its purpose is to improve collaborative study and monitoring of active geologic processes and hazards in the Yellowstone Basin. Under the direction of Dr. Bob Smith, its main activities are to provide seismic, geodetic, and hydrologic monitoring, to improve scientific understanding of tectonic and magmatic processes, to assess the potential hazards, and to communicate its findings to responsible officials and the public. Learn more about it at <http://volcanoes.usgs.gov/yvo/yvo.html>

## Seismology in the Service of Research, Education and Public Interests

When an earthquake of magnitude 2.5 or greater occurs in Utah, a real-time earthquake information system automatically posts its location and size within five minutes to the University of Utah Seismograph Stations (UUSS) web site at [www.quake.utah.edu](http://www.quake.utah.edu). For a shock of magnitude 3.0 or greater in the Wasatch Front area, a "Shake Map" showing the area and intensity of ground movement also appears on the UUSS web site within ten minutes, and the viewer can follow links to the ground-motion data that created it. Dr. Walter Arabasz, director of the UUSS since 1985, remembers that in the 1980s when an earthquake occurred in Utah it took about an hour – with good luck – for the station to produce just the location and magnitude of the quake.



James E. Talmage in the University of Utah Chemistry-Mineralogy Lab, 1902 (photo courtesy of Lehi Hintze).

The UUSS has roots nearly as old and deep as the department itself, tracing its beginning to 1907. Dr. James E. Talmage, first Deseret Professor of Geology and later President of the University, understanding well that Utah's geology posed not only earthquake dangers but also presented a natural laboratory for earthquake research, installed two smoked-paper seismographs in the basement of what is now the Talmage building on Presidents' Circle. Seismographic data have been continuously recorded on campus since then. The UUSS now operates a 203-station seismic network within and outside Utah, together with an earthquake information and research center. Alongside Dr. Arabasz, two other research faculty – Dr. James Pechmann and Dr. Kristine Pankow – are key members of the UUSS team.

The UUSS facilities on campus provide technologically advanced sources for faculty, staff and students. These facilities support Dr. Bob Smith's earthquake studies as part of the Yellowstone Volcano Observatory (YVO). YVO together

with Bob Smith's 17-station GPS network and Dr. Jerry Schuster's research in exploration seismology and tomography all provide important data and facilities for training undergraduate and graduate students in seismology. (See *related stories*.)

While retaining its commitment to academic research and professional education, the UUSS has always been deeply engaged in another mission, that of public service. Perhaps most visibly, it answers media and public inquiries about earthquakes in Utah and its surrounding area, and provides earthquake-related information on its web site.

Other UUSS public-service activities include earthquake education outreach in Utah's kindergarten through twelfth grade schools, providing expert advice to public officials and state agencies on earthquake hazards, helping mining engineers and mine operators deal with seismicity induced by underground coal mining – both in terms of mine safety and ground-shaking hazard to off-site structures and facilities, and involvement in state and national public policy making for earthquake safety.

A partnership between UUSS, the Utah Geological Survey and the Utah Division of Emergency Services and Homeland Security is the underpinning of Utah's state earthquake program. Arabasz is a member and past chair of the Utah Seismic Safety Commission and has been instrumental in shaping the Advanced National Seismic System, an initiative to modernize seismic monitoring nationwide to meet needs for earthquake safety, engineering and Science.

## Data Management Technology for Students

Even in the recent past, groups working in different disciplines such as geology, seismology, geography and climatology produced maps using different reference frames. This often meant that maps could not be directly compared by superposition. Workers had to waste time and resources creating their own methods for reconciling differences. Software is now commonly used to resolve problems of this kind so that maps containing different kinds of data can be superimposed. To better equip the University of Utah's geology and geophysics graduates for their careers, our department's Geographical Information System (GIS) committee recommended that the department invest in a number of licenses for ESRI ArcView, a software package that is currently the industry standard for integrating and manipulating earth data from various sources and disciplines. Julie Willis, a Geology teaching assistant funded by the University at large, builds GIS models for structural geology and engineering students and also teaches a short course on how to use the program.



*Julie Willis (left) and her husband Grant Willis, with Tony Crone and Steve Personius of the USGS on the thrust fault scarp showing a hand dug trench that will be used to date the age of the last earthquake on this large thrust fault. Grant helped Julie in the field as part of her Ph.D. project.*

## Interdisciplinary Collaborations Across Campus

Members of the College of Mines and Earth Sciences and the Colleges of Science and Engineering are currently studying a plan for an interdisciplinary institute that would promote environmentally-based collaborative research projects. Their goal is to initiate such an organization during the 2004-2005 academic year.

Our department has been engaged for a number of years in cross-disciplinary undergraduate programs, such as the new Earth Science Composite Teaching major. In addition, we continue to participate in the NSF-funded graduate program Water, Environment, Science and Technology (WEST), which incorporates participants from the departments of Geology & Geophysics, Meteorology, and Biology.

A year ago, we reported to you on our efforts to develop an Earth Science Composite Teaching major to respond to the large projected increase in the number of students in public education over the next decade and the current shortage of science teachers in Utah, especially in the Earth Sciences. This year we are pleased to announce that the University Board of Trustees has approved the program, and our first majors have already begun this new degree program.

## Earth Science Education Beyond the University

In the course of encouraging multi-disciplinary activity, the National Science Foundation (NSF) now mandates that its grant applicants integrate plans to reach out to the public at large. Good examples include film documentaries that may be aired on the Discovery Channel, or using students from developing countries to do the fieldwork that is being done in their own backyards, geologically speaking. Dr. Ron Bruhn, within the framework of his St. Elias grant, will engage high school students to help in the field. He will also work with local teachers, helping them to develop and

use web resources that will help their students learn about the geology of their own surroundings.

Since 1994, a University of Utah Seismology Station (UUS) outreach program called Earthquake Education Services (EES) has promoted science education, hazard awareness and earthquake preparedness in kindergarten through twelfth grade schools in Utah. Last year its award-winning photographic exhibit circulated through 49 schools as well as five institutions of higher learning, reaching an estimated 20,000 to 30,000 students.



*Aerial view of the Great Salt Lake and the Wasatch front, a focus area of the WEST project described at left.*

## Department Activities

### Geological Engineering Receives Accreditation

The Accreditation Board for Engineering Teaching (ABET) recently notified the College of Mines and Earth Sciences that accreditation of our Geological Engineering degree program has been approved for a six-year period. This milestone is a result of a major commitment by the Department and the College to strengthen the Geological Engineering major by increasing the engineering content of the curriculum while retaining solid earth science instruction and training.

To reach program goals, the curriculum has been expanded to include hydrologic, environmental and geotechnical aspects of engineering. The faculty involved in the program has also put in place processes that will track and advise program majors closely and also evaluate the effectiveness of coursework and advising. This challenging program, lying at the interface between earth science and engineering, is an excellent match for students who have an innate interest in earth science as well as the aptitude for engineering methodologies. We see Geological Engineering as a cornerstone of this department, and we will now focus on increasing the number of majors from approximately ten to our goal of forty majors over the next two years.

## Department Upgrades Computer Laboratory

The Geology and Geophysics teaching computer laboratory on the seventh floor of the Browning Building has been significantly upgraded this past summer by a College Computer grant from the University of Utah. All eighteen 1.4 GHz



*Computer lab during renovation.*

32-bit AMD computers in the lab have been replaced by 2.0 GHz 64-bit AMD computers with memory stick access at each terminal. The large heat-emitting CRT monitors have been replaced by much cooler LCD terminals and all processor units have been moved to a separate room to eliminate the heat problems experienced in the old teaching lab.



*New computer lab.*

Importantly, all computers will be linked to a central server to mitigate the many problems we had with stand-alone systems. The basic operating system will be LINUX, with WINDOWS XP operating on top of the LINUX OS through VMware software. There will likely be some bumps on the road this fall as we bring the lab up to full working capability, but in the end the department will possess a state of the art computer teaching lab.

## Career Day Informs and Inspires Students

This year our Career Day, aimed at incoming students, was combined with their general orientation and introduction to the department. Advisory sessions with faculty helped the newcomers choose first year classes and find ad-hoc advisors.

The morning orientation was followed by Margie Chan's "Earth To Mars" lecture, in which she talked about recent research at the University on concretions, fluid flow, and similarities between Utah rocks and those from Mars.

After lunch, Dr. Ron Bruhn started the session on careers in earth science with general thoughts about career options, posing some questions important to anyone making choices that will affect their working lives. He pointed out that everyone should consider such basic points as: How much will I earn? Where can I live? And What will I do every day? We then heard four speakers from various professional sectors talk about their own experiences in the working world. These included Craig Nelson of Western GeoLogic, who spoke about his work in the geotechnical and environmental fields. Pat Lambert, a hydrologist with the U.S. Geological Survey talked about dealing with water resources in the West, and also about his experiences working for a federal agency. Nancy Petersen, a middle school science teacher at Rowland Hall-St. Mark's Academy, described what it's like to work in K-12 education, and drew some amusing analogies between working in a zoo and teaching seventh graders. Finally, Dr. Bob Bereskin, adjunct professor in our department, gave an overview of petroleum industry careers.

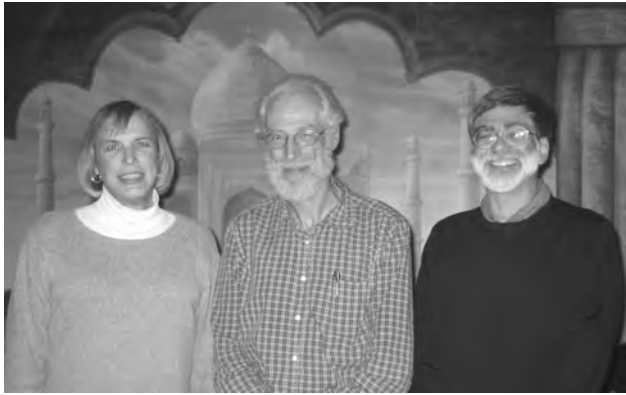
Students then had two break-out sessions: one on academic careers conducted by Dr. John Bartley and one specifically for undergraduates on making decisions about graduate school, with Dr. Barbara Nash. This long but exciting day ended with – what else – a trip to the Pie for pizza. Such carbohydrate-loading was a benefit for the sixteen folks who joined Dr. John Bartley and Dr. John Bowman the following day for a hike to see the Alta stock in Big Cottonwood Canyon just east of the city.

## Earthquakes and Volcanoes to be Presented Online

The Earthquakes and Volcanoes class has been highly popular for a number of years among University undergraduates for fulfilling one of their general education requirements. In Spring of 2004, Dr. Richard Jarrard and Dr. Susan Halgedahl were awarded a teaching grant to develop an online version of this course, to be offered during Spring of 2005. The course focuses on mechanisms that cause earthquakes and volcanoes, two natural phenomena that have great impact on people and climate. In addition, the course presents many case studies of specific volcanic eruptions and earthquakes. Most course material will be available online and will include hundreds of spectacular slide shows and short movies.

## Frontiers Of Science Lectures

This popular series of public lectures, co-sponsored by the College of Science and the College of Mines and Earth Science, brings eminent scientists from around the world to speak each year. Since our 2003 newsletter, two earth scientists have been here.



Barbara Nash, Paul Hoffman (Harvard), and John Bowman

On December 3, 2003, Paul Hoffman of Harvard University's talked about "*Snowball Earth: Testing the Limits of Global Climate Change*." He presented the evidence for the still controversial idea that the entire earth was ice-covered for long periods 600 to 700 million years ago. Each glacial period lasted for millions of years and ended violently under extreme greenhouse conditions. Equally controversial is the related case that these climate shocks may have triggered the evolution of multicellular animal life. These hypotheses challenge long-held assumptions regarding the limits of global change.

Peter B. deMenocal from the Lamont-Doherty Earth Observatory of Columbia University NY spoke on February 18, 2004 about "*African Climatic Changes and Animal Evolution*." He discussed the scientific debate that rages over the question of whether changes in Africa's prehistoric climate strongly influenced the evolution of animals including human ancestors. Environmental theories of African faunal evolution suggest that important evolutionary changes in African mammalian lineages during the Pliocene-Pleistocene interval (the last ca. 5.3 million years) were mediated by changes in African climate.

The first lecture this fall was given by Marjorie A. Chan, the chair of our own department, on September 15, 2004. She titled her talk "Red Rock to Red Planet: From Utah Marbles to Mars Blueberries." Her research into the reasons for the dramatic coloration of the red, yellow and white Jurassic sandstones in Utah's canyon country has also given us clues about the origin of the recently discovered marble-shaped rocks on Mars that are known as hematite concretions and have been nicknamed "blueberries." Utah sandstones contain similar round "marbles" that tell a story of how iron-rich groundwater once flowed through the rocks.

## Distinguished Lecturer Discusses Sustainable Mining

Dr. Robin J. Batterham, Chief Technologist for minerals giant Rio Tinto Limited and Chief Scientist for the Australian government, spoke in January as part of the University of Utah Distinguished Lecture Series. He chose as his topic "Mining in the Future: Sustaining Humanity in an Acceptable Manner."

He noted that since the 1970s there has been unrelenting pressure on corporations to be responsible in environmental matters. At the same time, the relative importance of mining in the investment markets has decreased dramatically, thus increasing the pressure on the mining sector to show returns that compete favorably with other sectors. Now, the focus is turning toward developing sustainable mining frameworks that target the removal of the desired resource with minimal environmental footprint. Dr. Burnham suggests that innovation is, as always, the answer. Broad-ranging alliances will be necessary, from research through supply and into the mines themselves, to maximize productivity and profit in a socially and environmentally responsible manner. Faced with ongoing global restructuring, the mining industry must take an active role in its own evolution.

Margie Chan's lecture covered Red Rock to Red Planet.



Utah marbles from 'golf ball' size down to 'pin-head' size.



Utah concretion marbles, Snow Canyon, UT

## Department Hosts Other Lectures

From time to time we have the great good fortune to be able to hear other visitors to our department. Last year, several industry visitors participated in giving guest lectures for some of our advanced courses. On September 13, 2004, Dr. Peter Allison of the Department of Earth Sciences, Imperial College, London spoke on "Large Sea, Small Tides: the Upper Carboniferous Seaways of Northwest Europe and the USA."

## Guy F. Atkinson Distinguished Lectures

The series of Guy F. Atkinson Distinguished Lecture planned for Fall 2004 is once again notable for providing current insights into disciplines of interest to those in the earth sciences. Here is the schedule:

The Fall 2004 season includes:

- Aug. 26 – Jeffrey Keaton, the AEG Richard H. Jahns Distinguished Lecturer: "Engineering Geology Mapping in the Information Technology Age"
  - Sept. 2 – Joseph Andrade, director of the Utah Science Center: "Beyond the Choir: Effective Science and Technology Awareness via the Utah Science Center"
  - Sept. 9 – Barry Solomon of the Utah Geological Survey: "Earthquake Hazards Scenario for an M7 Earthquake on the Salt Lake City Segment of the Wasatch Fault Zone, Utah"
  - Sept. 16 – Derek Briggs of Department of Geology and Geophysics, Yale University: "Exceptional Fossil Preservation"
  - Sept. 23 – Kevin Perry, Department of Climatology, University of Utah: "Climatic Effects of Aeolian Dust in the Atmosphere"
  - Sept. 30 – Bryan Bracken of Chevron Texaco: "Use of Sequence Stratigraphy to Predict the Subsurface Distribution and Properties of Marginal and Shallow Marine Sandstone Reservoirs"
  - Oct. 14 – James Bay, Department of Civil Engineering, Utah State University: "Shallow Shear-Wave Velocity Profiling with Surface Waves: Applications in Geoscience"
  - Oct. 21 – David Blackwell, Department of Geological Sciences, Southern Methodist University: "Influence of the Thermal Regime on the Plate Tectonic Evolution of North America"
  - Oct. 28 – Michael Jordan, Department of Geology and Geophysics, University of Utah: "Deep Seismic Structure of the Yellowstone Hotspot"
  - Nov. 4 – Barbara Bekins, Birdsall-Dreis Distinguished Lecturer, U.S.G.S.: "Hydrogeology and the Weak Nature of Plate Boundary Faults"
  - Nov. 18 – Susan Bilek (tentative), Department of Earth and Environmental Sciences, New Mexico Tech: "Earthquakes of the Shallow Subduction Zone Environment: Insights from Global to Future Borehole Scales"
  - Dec. 2 – Kip Solomon, NGWA Henry Darcy Distinguished Lecturer, Department of Geology and Geophysics, University of Utah: "Dissolved Gas Tracers in Groundwater"
- The past Spring 2004 lectures included:
- Robert Harris, Department of Geology and Geophysics, University of Utah: "Fluid flow through seamounts: patterns of flux and implications for global mass heat flux"
  - Harvey Miller, Department of Geography, University of Utah: "What are geographic information systems? And where are they going?"
  - David Nobes, University of Canterbury, New Zealand: "Non-invasive mapping of hydrocarbon-contaminated soils in Antarctica"
  - Anjana Khatwa, Department of Geography, University of Utah: "Glaciers processes and motion"
  - Michael Perkins, Department of Geology and Geophysics, University of Utah: "The U of U Western U.S. Tephra database: what is it? How was it assembled? What are its uses?"
  - Peter deMenocal, Lamont-Doherty Earth Observatory, Columbia University: "Holocene climate change and ocean circulation patterns"
  - Fulvio Tonon, Department of Geology and Geophysics, University of Utah: "The new ISRM suggested methods for rock stress measurement"
  - David Tillson, Consulting Geologist, Salt Lake City, Utah: "Geology and politics in siting and licensing nuclear facilities in the U.S.: a historical perspective"
  - Lee Allison, Director, Kansas Geological Survey: "Hutchinson, Kansas gas explosions: solving a geologic mystery"
  - Peter Ortoleva, Department of Chemistry, Indiana University: "The self-organizing planet"
  - Warren Sharp, Berkeley Geochronology Laboratory: "Ur-series dating of Quaternary deposits"
  - Robert Smith, Department of Geology and Geophysics, University of Utah: "Active Tectonics of Yellowstone"
  - David Vaughan, Mineralogical Society of America Distinguished Lecturer: "Minerals, metals and molecules: ore and environmental mineralogy in the 21st century, OR, Mineralogy: a key to sustaining the health of earth and humanity"
  - Andrew Ford, Department of Geography, University of Utah: "Applications of InSAR (radar interferometry) in geology and geophysics"



## PICP Initiative Doing Well

The Petroleum Industry Career Path (PICP) courses are doing well, and several students completed M.S. degrees in petroleum exploration this last year. We are presently implementing a new evaluation and feedback program that will help track our success in meeting the program goals. Our industry recruiters tell us they like this type of programming, and we have made sure that all incoming graduate students hear about the course offerings in our introductory advising sessions. This year, the Petroleum Basin Analysis module has added a field-based emphasis. The students will look at Cretaceous facies near Green River, Utah, with Dr. Cari Johnson, and industry representative Dr. Bryan Bracken from Chevron-Texaco. (We're proud to note he's one of our own alumni!)

We encourage our students to meet with industry representatives whenever they're on campus, not only when it's time to look for a job but earlier, too, to learn something about industry's perspective on what they expect of successful job applicants. Recruiters will be in the department on the following dates:

- Sept. 20, 21, 22 – ConocoPhillips, represented by Craig Murphy and Tiffany Hopkins
- Sept. 22, 23, 24 – ExxonMobil, represented by Tonya Brami
- Sept. 28, 29, 30 – ChevronTexaco, represented by Askel Quintus-Bosz (M.S. 1992) and Bryan Bracken (Ph.D. 1987)
- Oct. 4, 5, 6 – BP, represented by Mark Vandergon and Jean-Paul Van Gestel



*Cory (left, daughter of David Dinter) and friends (Hannah Roberts & Kristina Buckingham) help set up for University Plazafest (see p. 10).*

## Department's Web site Gets a Lift

Our web site has been redesigned from top to bottom and branch by branch. It includes current information about our department, as well as lots of colorful pictures illustrating the many aspects of geology and earth science careers.

Dial in at [www.mines.utah.edu/geo](http://www.mines.utah.edu/geo) and learn about the several undergraduate majors offered by our department, our graduate programs, funding opportunities (including the new WEST program), our Petroleum Industry Career Path (PICP), our faculty, events and news, research facilities, earth science careers. It includes links to many geology web sites, including those featuring Utah geology. Please direct suggestions and questions to Dr. Richard Jarrard and Dr. Susan Halgedahl.



*Dr. Fred Pack and University of Utah geology class in the early 1900's at the north end of the Oquirrh Mountains (photo courtesy of Lehi Hintze).*

## Legislature Approves Planning and Construction Phases of New Building

The 2004 Utah State Legislature, in its session that ended in March, approved the planning and construction of the Frederick Sutton Building for the College of Mines and Earth Sciences. Fred Sutton, a University of Utah graduate in Geology, was noted for mapping Venezuela's Maracaibo Basin. His daughter, Marta Sutton Weeks, is the principal donor for the building.

The new facility will allow the college to consolidate its four departments (Geology and Geophysics, Mining Engineering, Metallurgical Engineering, and Meteorology) into two primary buildings, the Sutton and the adjacent William Browning. At this time, the Geology and Geophysics Department, the largest in the college, will be the principal tenant of the new facility. By moving that department, the other departments will be able to expand in the Browning Building. This is a major step forward for all departments, allowing us to move out of the old Mines Building, which has changed little since it was completed in 1927.

Currently, a study to determine exactly the functional needs of the activities the building will house is underway. This will determine the facility's footprint, size, and configuration. Design should begin in January and will take about a year. The construction phase will run from eighteen months to two years.

## Outreach Projects Spread Earth Science Awareness

### Students and Faculty Reach Out to the Community

Last year's outreach projects were exciting and varied. Our students and faculty enjoyed sharing their passion for the



*Kids do hands-on panning at the Utah Geological Survey.*

earth sciences with local young people, from second graders to high school seniors. Because we hope to inspire the study of science early in children's educations, we go to see young students and also invite them to come to us. Since our Department is committed to expanding the number of students in our classes and especially to increasing the number of departmental majors, we hope by increasing our visibil-

ity in the larger community that when these young people come to the university as students some of them will want to explore the earth sciences seriously.

Most activities in this arena are planned and coordinated by the faculty's outreach committee (Drs. David Dinter, Erich Petersen, Barbara Nash and Marjorie Chan) and presented by an array of dedicated faculty and students. This past year students Riyad and Jessica Ali-Adeeb, Lori Chadwell, Anjanette Marx, Brenda Beitler, and Leif Tapanila put extraordinary efforts into these activities.

For example, ninth graders visiting our department found out about what geologists and geophysicists study and the many exciting professional avenues available to them.

A number of students with a faculty member visited Centerville Junior High classrooms to talk about career opportunities and research possibilities in the earth sciences. Several students volunteered to help shepherd students on a field trip to the Museum of Ancient Life at Thanksgiving Point. Our popular Geology and Geophysics display at the Salt Lake City Avenues Street Fair, with fossils, crystals, posters and literature on Utah earthquake and



*More hands-on panning at the Utah Geological Survey.*

landslide hazards and water and mineral resources, and a prospecting pile of free mineral specimens, attracted more than 700 visitors last year.

Department outreach participants also hosted science class visits to the UU Seismic Stations, provided geology docent training and geologic field exercises for high school and middle school students at Red Butte Garden, spoke on geologic issues at local schools, churches, and scouting functions, judged science fair projects, and staffed Earth Science Week exhibits at the Utah Geological Survey's core laboratory.

A new initiative for 2004-2005 will include earthquake awareness presentations at local high schools.

### Department Reaches Out Across Campus

The Department of Geology & Geophysics received the grand prize for the best display at the August 21 University Plazafest, the fall orientation designed to inform students about departments and offerings across campus. Dr. David Dinter and crew staffed a table replete with glitzy rocks and fossils, and informative brochures. Our first prize was a floral spray with some big fat "U" cookies on sticks.

Outreach representatives also took part in Freshman Orientation while others led incoming freshmen on a geology-oriented hike through Red Butte Garden. We also staffed tables at Science and Engineering Day, Admissions Day, and Transfer Day. On a nearly daily basis we provide in-service informational meetings with University College advising staff, direct contacts with academic advisors in non-science departments. We make our class offerings available through course advertisements and the department website.



*Grand prize for best display.*

An important aspect of our outreach program is the introduction to earth sciences we provide through our highly-rated 1000- and 3000-level general education courses. Each year hundreds of freshmen and sophomores enroll in Earthquakes and Volcanoes, The World of Dinosaurs, Architecture of the Earth, Geology of the National Parks, Geology of Utah, and Natural Disasters. These courses acquaint students with geoscience-related societal issues and career options, and several new majors enter the department through them each year.

A new initiative this year will be to attract more transfer students to our department.

## Faculty Focus

Our faculty members continue to produce fascinating new information across a wide variety of disciplines. It is a testament to their hard work and original thinking that so many have attracted financial support.

**Walter Arabasz:** Directing the University of Utah Seismograph Stations is always challenging because of the scope of what's involved – from people to infrastructure to earthquake monitoring and research to public service and policy making. Refining and expanding a new real-time earthquake information system in Utah (to serve overlapping needs for science, emergency management, and earthquake engineering) continues to be my major commitment. Major, in part, because it involves constant behind-the-scenes work on national, regional, and state committees as part of funding and building an Advanced National Seismic System. Research-wise, I recently submitted two manuscripts to the Bulletin of the Seismological Society of America. The first is on studies of coal-mining-induced seismicity in the Wasatch Plateau and the second is a co-authored paper in which I statistically analyzed aspects of an anomalous increase in seismicity in Utah remotely triggered by a magnitude 7.9 earthquake in Alaska in November 2002.

**John Bartley:** My recent studies are mainly in the Sierra Nevada of California and focus on the structural and magmatic processes by which plutons grow, and on the magnitudes and patterns of Late Cretaceous to Recent tectonic deformation in eastern California. The Summer 2004 field season was productive on both fronts. Detailed geologic and magnetic mapping of granitic plutons in Yosemite and Kings Canyon National Parks is resolving previously unrecognized internal structures of plutons. Structural mapping

in Sequoia National Park north of Mt. Whitney has led to discovery of the Junction Fault Zone, a previously unknown broad zone of normal and strike-slip faults that appears to link well-known seismically active fault zones in the Owens Valley and Kern Canyon.



*John Bowman investigating for tremolite in the Alta aureole.*

**John Bowman:** This has been a busy and stimulating year. I taught four courses; including Unstable Ground, Introduction to Earth Systems, the first half of Earth Materials II, and Geochemical Reaction and Transport. My students and I continued to do research and conduct field work in Alaska and in the Alta Aureole. This work includes three-dimensional x-ray tomography scans of the forsterite marbles. In addition, two undergraduates, Riyad Ali-Adeeb and Anthony Pollington, are exploring the mysteries of tremolite and talc formation, respectively, in the aureole. I am finally finished with my massive tome on modeling the interplay of fluid infiltration rate, diffusion, and reaction rates on the behavior of decarbonation reactions in contact aureoles which is scheduled to appear in the Journal of Metamorphic Geology.

**Frank Brown:** The past year has been a blur, beginning with obtaining legislative approval to erect a new building, the Frederick A. Sutton Building for Geology and Geophysics, helping students complete their M.S. theses (Scott Hynek, and Chad Fuller), reviewing some eighty proposals for the Leakey Foundation, selecting an architect for the new building with coordinators from the State of Utah, completing three major manuscripts, giving lectures not only in classes (Petrography, Geochronology, Historical Geology) but also in Addis Ababa, Ethiopia and Nairobi, Kenya. Over the summer I worked with Patrick Gathogo in his thesis area in northern Kenya, and helped emplace Scott Sampson and his crew in the Cretaceous deposits near Lokitaung, also in northern Kenya, where they successfully collected many kinds of dinosaur fossils.



*Ph.D. Student Patrick Gathago (second from left, back row), Dr. Frank Brown, Dr. Scott Sampson, Joseph Sertich (M.S. Student), Mark Loewen (Ph.D. Student, and Mike Getty (Museum of Natural History) pose with field crew in Lokitaung.*

**Ronald Bruhn:** My students and I continue working on various problems related to active tectonics, tectonic geomorphology and earthquake hazards. We spent several weeks in Alaska working on the regional tectonics and faulting associated with formation of the Alaska Range, and southern Alaska in general. Our work included geomorphic studies and profiling of an active fault just southwest of Mount McKinley, and also a recently ruptured thrust fault that initiated the magnitude 7.9 Denali fault earthquake of November 2002. Our work is also continuing on the subduction and collision tectonics in southern Alaska in the Saint Elias Mountains along the coast. Also, we received a new grant from the Continental Dynamics Program at National Science Foundation for five more years of work in the Saint Elias Mountains. We are also busy working in Utah on several projects about active tectonics.



*Thure Cerling's view of clouds rolling over Table Top Mountain while on sabbatical in South Africa.*

**Thure Cerling:** I am on sabbatical in South Africa for 2004-2005, where I am a Fulbright Fellow in the Archaeology Department at the University of Cape Town. My research group has been working on a variety of things including the mapping and dating of gigantic landslides on Boulder Mountain, studying isotope turnover in large mammals and applying the resultant models to modern and fossil animal behavior, understanding tooth enamel formation using stable isotopes and micro-computer tomography, studying climate change using the stratigraphic record of fossil soils, and using stable isotopes for forensics. Members of the lab have carried out field studies in Australia, China, Kenya, Ethiopia, and Utah. This is my third year of service on the Nuclear Waste Technical Review Board, which evaluates the science and technical issues concerning the radioactive waste repository at Yucca Mountain. This also involves looking at the radioactive waste programs of other countries, including Sweden, Finland, and Spain.

**Marjorie Chan:** This year has been the story of Utah red rocks to Mars the red planet. I have been working on Utah iron concretions with Emeritus professor Bill Parry for the last eight years, but about two years ago I began collaborating with planetary scientists on the possibility of the con-

cretion groundwater model to explain the hematite deposits on Mars. We, with Ph.D. student Brenda Beitler, were well into this research when the Mars Exploration Rover Opportunity sent back pictures of hematite concretions on Mars in February. So, with one article published in the June 17, 2004 issue of Nature, this has been very exciting. We look forward to more discoveries and analog correlations on the horizon.

My other Ph.D. students, Holly Godsey working on the Bonneville Basin and Eric Roberts working on the Cretaceous Kaiparowits Formation, should be finishing very soon!

**David Chapman:** My thermal group added a new Ph.D. student, Mike Davis (M.S. Univ. Hawaii). Our efforts to understand how ground temperatures affect climate change since the onset of industrialization continue. This year we completed re-instrumentation of the Emigrant Pass Climate Observatory and published papers with Marshall Bartlett and Rob Harris on the nature of the energy exchange at the ground-atmosphere interface. We also started a new project to monitor aquifer recharge using Weber River water, with Ph.D. student Paul Gettings, and undergraduate Eric Sahm taking the lead in data collection and analysis. M.S. student Derrick Hasterok, has been working on thermal contributions to elevation of Precambrian cratons.

*Editorial addition submitted by Dave's students: David Chapman has been lost somewhere between the Park Building and the Browning Building for the past year. He will answer to "Dave" or "David" but rarely to "Professor Chapman." If anyone finds him, please contact one of his graduate students in the Thermal Geophysics Research group. We have several pieces of paperwork we need signed.*



*Margie Chan and King Tut cup (see p. 26) at Mount St. Helens, Washington.*

**David Dinter:** I have been using marine geophysical methods to quantify seismic hazards posed by active faults submerged beneath the Great Salt Lake and Utah Lake. I completed a preliminary seismic survey of faults in Utah Lake in Summer, 2004, and similar work in Summer, 2005 will focus on the northern segments of the Great Salt Lake, west of the Promontory Peninsula.

With support from the National Earthquake Hazards Reduction Program and the National Science Foundation, seismologist Dr. James Pechmann and I have collected four hundred kilometers of high-resolution seismic reflection profiles from the south arm of the Great Salt Lake, enabling us to create images of tectonostratigraphic horizons formed by six late Quaternary earthquakes. Radiocarbon dates obtained this year from core samples of the event horizons established the recurrence intervals of major earthquakes on the two southern segments of the Great Salt Lake fault.

I am also involved in field-based studies of Sevier orogenic deformation, metamorphic core complex evolution, and the geologic record of large meteorite impacts.



*Tony Ekdale participated in an AAPG field trip through the Grand Canyon by rubber raft in August of this year. Tony is shown here demonstrating his skill in repairing sandals in the field with duct tape.*

**Tony Ekdale:** I continue to explore possible useful applications of “sonification” in paleontology, that is, representing fossil information using sound signals. I’ve been experimenting on my University of Utah students to see how auditory cues may enhance student learning and fossil identification. I presented some of my research results at the Ichnia 2004 international congress in Argentina this past spring, and I will present some of my work on the uses of sonification in teaching at the GSA national convention in Denver in the fall. Also, I am working with Leif Tapanila on trace fossil evidence of the recovery of marine organism communities immediately following a major extraterrestrial impact event in the Late Devonian in Nevada.

**Sue Halgedahl:** I have continued my lifelong study of the physics that control the behavior of magnetic domains in magnetic minerals of paleomagnetic significance. Very recently, my Master’s student Brian Bollin completed an exhaustive study of domains in magnetite. He was invited to present his results at the last AGU meeting, and an accompanying paper is in preparation. In the same research area, I have written and submitted an invited article entitled

“Magnetic domains” to the Encyclopedia of Geomagnetism and Paleomagnetism.

Rich Jarrard and I have been redesigning our department’s web site, as well as developing a University of Utah Online course on Earthquakes and Volcanoes, funded by a University teaching grant.

**Robert Harris:** I have spent much of 2004 dividing my time between hemispheric reconstructions of surface warming using a combination of borehole and surface air temperatures, and marine hydrology studies off the Pacific coast of Costa Rica. This study and generalizations from it indicates the important role of seamounts in controlling hydrothermal circulation and ventilating the oceanic crust. Techniques from these studies (marine heat flow, and climate change inferred from temperature-depth profiles) will be combined in 2005 to document and reconstruct bottom water temperature variations off the coast of Norway as part of an Integrated Ocean Drilling Program expedition to the North Atlantic.

**Rich Jarrard:** The international Antarctic Drilling program (ANDRILL), a joint project by the U.S. National Science Foundation, New Zealand, Italy and Germany, has received its funding and I was selected to Chair its Scientific Measurements Panel. My other current research involves using light spectroscopy to study marine paleoclimate and oceanic crustal fluid flow.

**Paul Jewell:** For the past year I have been wrapping up projects on Lake Bonneville hydrodynamics and the physical limnology of pit mine lakes. My new projects include digital mapping of Lake Bonneville features, geologic hazards, and applications of GIS to earth science teaching and research. I am also undergoing certification to become an American Board of Engineering and Technology (ABET) evaluator.

**Cari Johnson:** This year I led several field trips of both research and teaching importance to Mongolia and to the American Southwest. At least one field course resulted in gifts to this department of key seismic and well data relevant to the North Slope of Alaska. Work related to my Asian and North American field projects has been presented at several national meetings this last year and associated data will be applied to improved hydrocarbon flow models.

In addition, I taught a new class in Seismic and Sequence Stratigraphy. This short course brought graduate students from several universities in the west to the University of Utah, and included a capstone exercise in petroleum basin evaluation.

**Bill Johnson:** My year was especially good, because I was in Switzerland for the first part. In addition, the Geological Engineering program was re-accredited and we held meetings for development of a campus institute for interdisciplinary research. We remodeled a slick new lab on the first floor of WBB for our new atomic force microscope and total internal reflection fluorescence microscope that will help support our colloid transport research. (Come by for a

demo!) We promoted the Great Salt Lake Basin as a long-term hydrologic observatory (see [www.greatsaltlake.utah.edu](http://www.greatsaltlake.utah.edu)) in close collaboration with Utah State University and other regional universities and research agencies. In addition, my research group has submitted nine manuscripts to scientific journals.

**Barbara Nash :** I continue with my research on the evolution of the Yellowstone hotspot. Student Henny Cathey and I are unraveling the Miocene Cougar Point Tuff in order to understand the birth, maturation and death of a hotspot volcanic center. Also, I did field work in Idaho, Oregon and Washington in the search for the earliest eruptions from the hotspot. In the Department, I head undergraduate advising. My course on Natural Disasters remains popular with students – there's always a waiting list to get in. It's the only course at the University that simultaneously satisfies three graduation requirements: science general education, quantitative intensive, and upper division writing.



*Paul Jewell in the Uintas.*

**Kristine Pankow:** My research interests include studies of earthquake hazards, attenuation and site amplification of seismic waves, earthquake triggering, three-dimensional seismic wave propagation, and studies of crustal structure. Most recently my research has involved studying a series of earthquakes located in Utah that were triggered by the Denali Fault earthquake, which was located in Alaska. I have also been using data recorded by the Advanced National Seismic System to study amplification of seismic waves in the Salt Lake Valley and to study the basin structure. Other ongoing projects include performing detailed analyses of Utah microseismicity, assisting with ongoing development and operation of the Utah Regional Seismic Network, and continuing to develop and maintain Shake-Map in Utah.

**Jim Pechmann:** During the past year I worked on four different research projects: earthquake ground motion studies with Kris Pankow, seismicity in Utah triggered by the 2002 magnitude 7.9 Denali fault, Alaska, earthquake with Kris Pankow and others, crustal imaging using recordings of distant earthquakes with Ph.D. student Jianming Sheng and others, and the paleoseismology of the Great Salt Lake fault with Dave Dinter. Some of this work was presented at three different meetings during the past year and summarized in one published paper and two others submitted for publication. In addition, I supervised some aspects of the University's seismic network operations and served as the primary responder to felt and/or significant earthquakes in the region monitored by the network.

**Erich Petersen:** Together with colleagues Drs. William X. Chavez of New Mexico Tech, and Jeffrey W. Heddenquist of the Colorado School of Mines, I organized an SEG field course on the characteristics of epithermal gold deposits, held in October 2003 in Goldfield, Nevada. The course focused on high-sulfidation deposits. In July I visited the Madison Windpower project in upper New York State. Each of the facility's turbines produces 1.65 MW of power and the utility sells the electricity on the open market through the New York Independent System Operator. The facility contributes significant income and energy to the local community but opponents suggest that the presence of these large wind mills detracts from the historic aspect of the region.

**Peter Roth:** During the last year I have worked on upper Jurassic and lower Cretaceous nannofossil stratigraphy, mostly of Tethyan sections of pelagic limestones with abundant ammonites and calpionellids. I have also resumed work on Quaternary nannoplankton from the South Atlantic, in order to determine changes in water masses during that time period. In addition, I reviewed numerous papers for scientific journals and also evaluated several National Science Foundation proposals.

**Scott Sampson:** During the past academic year, I have been engaged in a major ongoing field project in southern Utah – in particular, Grand Staircase-Escalante National Monument. This project has revealed abundant fossilized remains of previously unknown species of dinosaurs and other vertebrates from the Late Cretaceous (about 75 Ma). We expect to publish the first major papers in 2004.

Also, during the summer of 2004, several of graduate students and I joined Dean Frank Brown and Geology doctoral candidate Patrick Gathogo in northern Kenya to search for remains of Late Cretaceous dinosaurs along the shores of Lake Turkana. This expedition, funded by a University of Utah seed grant, has the potential to recover new and exciting fossil remains from a time period otherwise virtually unrepresented in sub-Saharan Africa.

**Jerry Schuster:** Seoul University invited me to deliver a lecture at their a seismic imaging symposium, and I was also invited to give an interferometric lecture at a special Lithospheric Imaging session at the AGU's San Francisco meeting. Field experiments scheduled for fall include a three-dimensional seismic survey of the Wasatch Fault near Nephi, Utah and optical imaging of stratigraphy in Southern Utah for computer-morphological processing. In addition to research, I have completed my first year as Chief Editor of Geophysics.

**Bob Smith:** This year, Dr. Michael Jordan (Ph.D.- Göttingen University, Germany) and Dr. WuLung Chang (Ph.D.- University of Utah), joined my program as Post Doctoral Associates. Dr. Jordan will focus on optimized tomographic imaging and geodynamic modeling of the Yellowstone hot-

spot. Dr. Chang will work on integrated earthquake hazard research with numerical fault modeling and GPS monitoring. An overall accomplishment has been the discovery of an upper mantle low-velocity body beneath Yellowstone interpreted as a shallow mantle plume. In fall 2003 my group provided high resolution seismic and GPS monitoring of Norris Geyser Basin in Yellowstone National Park, where sudden increases of temperatures of widespread geysers had affected public safety. Another major project was a regional GPS survey of the Wasatch fault.

I have had a busy year chairing the national EarthScope Science and Education Committee, serving on the USGS Scientific Earthquake Advisory Committee, as well as the Southern California Earthquake Research Center science advisory committee. In addition I am coordinating seismic and GPS networks for Yellowstone Volcano Observatory. Just recently, I supervised my sixty-third graduate student to completion.

**Kip Solomon:** This summer involved a lot of traveling, mostly in Europe. In May I spent two weeks in Turkey lecturing and sampling springs in the Aladag National Park. I then spent several days in the Capadocia region where literally thousands of dwellings have been carved into a thick sequence of welded tuff (sleeping in a cave house that was constructed prior to the Roman Empire was 'way cool!')

After Turkey I spent two weeks in and near Vienna collecting samples and working with folks at the International Atomic Energy Agency (IAEA.) Afterwards I met my family in Germany (including my son Jacob who has been in Russia the past two years) and we had a great time touring Germany, Austria, the Czech Republic, and Italy. We even visited Fulvio Tonon's home town. The domestic part of my summer was spent in the lab and in Red Butte Canyon working on my National Science Foundation project. (By the way, locking your keys in your car while it is running and blocking the Canyon road is NOT recommended!)

**Fulvio Tonon:** During the past year, I had the honor to deliver lectures at plenary sessions of two very important conferences which took place at MIT in June. Then, I visited South Africa for the first time as a representative of the US rock mechanics community at the 10<sup>th</sup> ISRM Congress on Rock Mechanics, which is held every four years. In class, I introduced the Clar compass, that allows one to measure discon-

tinuity orientations in one operation.

This summer, besides getting married to Gloria and spending my honeymoon on the "volcanic" island of Madeira (Portugal), I spent a study week in Bristol, UK, where I was invited by W. Hall to study generalized models of uncertainty and their engineering applications. The highlight of the visit was a restricted workshop with other European scholars. Finally, I visited a tunnel construction site in the Dolomites.

**Michael Zhdanov:** In May 2004, the University of Utah and the U.S. Department of Energy's National Energy Technology Laboratory signed a cooperative agreement on the project "Development of New Geophysical Technique for Mineral Exploration and Mineral Discrimination Based on Electromagnetic Methods."

We will begin research and development of new mining exploration technology using multi-partner, multi-national collaboration between the University of Utah, mining companies Kennecott Exploration Company, BHP Billiton World Exploration Inc., Placer Dome Inc., and Phelps Dodge Exploration Company. Zonge Engineering and Research Organization, an equipment manufacturer and service provider to the mining industry, will also take part.

### Professor Emeritus Matthew Nackowski Passes On

Dr. Matt Nackowski, retired from our department since 1980, died in October, 2003. Born and raised in Connecticut, he knew he wanted to go to college but for an immigrant family during the Great Depression it was impossible.

So he worked summers in the Alaskan salmon fisheries, saved his money, and enrolled at the University of California at Berkeley. He joined the U.S. Merchant Marines, spending holiday breaks on lumber ships plying up and down the Pacific Coast. After he graduated from U.C. Berkeley he became a graduate student in mining geology there, but World War II intervened. Mining was classified as a "vital industry," but his Draft Board told him that being a student didn't count; he had to be actively at work in industry. Thus, he and his new wife – the daughter of a professor and straight out of college – went to live in a Nevada mining camp. Kay remembers that, much to the consternation of the mine's management, he quit his job as geologist and hired on as a mucker, working his way up to miner, all to get the experience he believed a mining engineer needed.

After the war he went back to graduate school, getting his Ph.D. in 1952 from the University of Missouri. In 1955 he became a member of the Mining and Geological Engineering Department here at the University of Utah. Colleagues and students



*Fulvio Tonon with friend and colleague Armando Mammino in front of the house where Friedrich Mohs spent his last years (Agordo, Belluno province, Northern Italy).*

remember him as a quiet, demanding, yet patient man. Dr. Bill Parry, himself now an Emeritus member of our department, remembers Matt well as his graduate director, friend, and later his colleague. Says Parry, "Without him, I'd still be working in a Texas oil field." Matt and his wife Kay were friends to his students, and he gave graduate students a key to his office so they'd have access to his library.

He loved his profession and practiced it around the world, teaching in Turkey and Iran during the summers for ten years until the political situation became too unstable. "We took chances," was about all he said. One day he and a group of students, none of them able to swim, were floating down the Euphrates when the steersman lost control. Things were pretty tense until the boat just happened to bump into the shore. Had worse things happened in this place where communications were pretty meager, it would have been hard to find out what had become of them.

He also worked in Burma, Kenya, Brazil and India. His wife, Kay, believes he chose his profession because of his love of travel. He also loved field work. Bill Parry remembers a trip to collect rock samples out in the west desert. In those days, one carried water in canvas bags hung on the outside of your vehicle. The water seeped slowly out, evaporating in the hot desert air, thus keeping the water cool. However, it was a dusty day and soon the bitter, salty dust coated the bag and the salt dissolved, seeping into the water. Bill had asked what he should bring for lunch, but Matt said, "Oh, I'll take care of that." Lunchtime came, and Matt pulled out a can of deviled ham and some soda crackers. Says Bill, "It was a ... difficult ... lunch." On another occasion they had been collecting near Milford, Utah, where Matt dropped by to visit the local priest who was his friend. "Soon," says Bill, "This Mormon boy out of Sanpete County was being offered a beer and he thought, 'Wait a minute. Beer in church?'"

## Geography Colleague Don Currey Dies



Don Currey

Professor Donald Currey, a member of the University of Utah's Geography department for thirty-four years, died this past April, 2004. He left behind many friends in our department as well. He was dedicated to his field and his graduate students, returning from a research trip just two months before his death. Most of his academic life was spent studying Lake

Bonneville, particularly to understanding how it influenced – or was influenced by – climatic fluctuations.

Graduate student Genevieve Atwood, while Utah State Geologist, collaborated with him to research the hazards associated with the Great Salt Lake's changing water levels, using traces left by Lake Bonneville. She remembers how he strove to get students out of the classroom and into

the field, where they were often amazed by an encyclopedic memory that ranged far beyond his field. Genevieve remembers a fellow student once saying, "Who needs Google when you can just google Don?"

His interests overlapped with those of many in our department, and he gave freely of his enthusiasm and expertise to all of us. Dr. Marjorie Chan noted that his contributions greatly expanded our understanding of the Lake's history. "I wonder if there'll ever be anyone else whose understanding about Lake Bonneville reaches the depths his did," she added. "Don was just a really wonderful, unique person."

## Departmental Field Trips

### Geology Summer Field Camp

Senior Earth Science majors under the direction of Dr. David Dinter honed field mapping and technical writing skills at Summer Field Camp, an intellectually and physically demanding course in synthetic problem solving that uses Utah's unparalleled Great Basin mountain ranges as natural laboratories. Two projects, each two weeks in duration, were undertaken this year, both in areas where Mesozoic compressional deformation is overprinted and exposed by Cenozoic Basin and Range extensional structures.



David Dinter and students map recumbent folds in the Raft River Range.

The first project focused on the eastern limit of Sevier thrusting in the Red Hills, a small normal fault-bounded range northwest of Cedar City. The Iron Springs thrust, exposed in the Parowan Gap, juxtaposes oyster coquinas and beach sands representing the western margin of the Cretaceous inland sea over foreland fluvial deposits containing dinosaur tracks and bones, and Sierran ash beds. Thick Tertiary boulder conglomerates and pyroclastic breccias overlap the thrust. For the second project, the class moved paleogeographically westward into the Sevier hinterland, to the Raft River Mountains in Utah's northwest corner. The metamorphic core of this range, exhumed from mid-crustal depths in Miocene time by low-angle normal faulting, contains the oldest rocks in Utah.

Students rose early, mapped ten hours a day in groups



of two or three, then returned to their streamside camps to cook dinner under the no-nonsense guidance of camp manager Shayla Livingston, who occasionally doubled as a merengue instructor. Afterwards, when maps had been inked and colored and field strategies for the next day discussed and settled, most evenings ended with the class arrayed around the campfire, watching the sun set over the Great Basin.

## Teachers in Training Explore Southern Utah

Dr. Erich Petersen and graduate student Junyoung Sung assisted in a teacher training field trip course in Southern Utah. Highlights of the trip included a visit to the new copper mines in Lisbon Valley where trace fossils had been replaced by malachite, and a visit to Goblin Valley. A dozen elementary and secondary school teachers from New Mexico, led by Dr. William X. Chavez, Jr., were learning geology in the field to meet the continuing education component of their certification.



*Students mapping Miocene faults in the Parowan Gap.*

## Soft Rock Trip Heads South

Dr. Margie Chan and the Stratigraphy and Sedimentary Processes students made their annual trip along Utah Highway 6 towards Price and Helper again this last fall. Plenty of sunshine and good weather was most welcome after the initial chilly Thistle landslide stop at 8 AM. The Cretaceous outcrops are real classics that are always worth revisiting.

## Field Trip to Northern Chile Planned

The Society of Economic Geologists Student Chapter (CMES-SEG Student Chapter) plans to run a twelve-day international academia-industry field trip in January 2005. This will be its eighth in a series of award-winning international field trips initiated by the chapter beginning in 1994. Our destination this year is northern Chile and our objective is to examine magmatic-hydrothermal processes at a convergent plate boundary. The northern segment of Chile is characterized by a deep, offshore trench, and a very high (20,000 foot) inboard, active volcanic chain. It is thought that the world-class porphyry copper deposits that occur in the region owe their existence to very long-term subduction processes at this location. The space allocation for industry representatives is almost completely subscribed. CMES students wishing to participate or seeking further information should contact chapter president Junyoung Sung or our advisor Dr. Erich Peterson. You may also enjoy visiting the trip web site at [www.mines.utah.edu/pyrite/chile2005](http://www.mines.utah.edu/pyrite/chile2005).

## Yellowstone and the Tetons Get Star Billing

Dr. Bob Smith recently led two field trips to the Tetons and Yellowstone, including one for a GSA Penrose Conference. He will also lead one to the Tetons in mid-September for the Assistant Secretary of the Interior and the Assistant Director of the USGS.



*Erich Petersen, M.S. student Junyoung Sung, and King Tut mug (see p. 26) enjoy field trip to Southern Utah with teachers in training.*

## New Graduate Students See the Alta Stock

Orientation for this year's new graduate students included an optional Saturday field trip to the Albion Basin in nearby Cottonwood Canyon, led by Dr. John Bartley, Dr. John Bowman, and Dr. Erich Petersen. About a dozen incoming graduate students participated, as well some continuing graduate and undergraduate students. Our goal was to get better acquainted while introducing newcomers to some current research into the spectacular geology of northern Utah.

The focus for the day was the Alta stock and its world-famous contact-metamorphic aureole. A lively and protracted discussion ensued about how to reconcile the two lines of investigation these faculty members follow and what the implications may be for crustal processes at scales ranging from micrometers to kilometers.

## Paleontology Class Travels to Utah's Rich Fossil Sites

Dr. Ekdale continued his long tradition of leading our undergraduate paleontology students on two fossil-collecting field trips during spring semester. The first trip in March headed out toward the San Rafael Swell, where students collected abundant fossil mollusks (ammonites, clams and snails) in Mesozoic rocks and many fossil plants in Cenozoic rocks. Although it was a rather cold night for camping there next to the Navajo Sandstone flatirons in the San Rafael Reef, the group was kept plenty warm by Chef Leif Tapanila's delicious burritos and refried beans. The second trip in April headed west into the House and Confusion Ranges, where students collected a wide variety of fossils in Paleozoic rocks. The abundant trilobites at Antelope Spring, brachiopods at Fossil Mountain, and crinoids at Conger Spring filled everyone's sample bags to overflowing. The group also enjoyed seeing the local animal life, including majestic pronghorns and beautiful mustangs running wild through the field area. The campsite among the junipers at the base of Fossil Mountain was the Great Basin at its best, and Chef Eric Roberts' gourmet hamburgers and s'mores were real crowd pleasers.



University of Utah field trip in 1902 with Prof. James E. Talmage (photo courtesy of Lehi Hintze).

## Earth Materials Students Examine Ground Water Conditions

Dr. Bill Johnson took his Earth Materials class to Red Butte Canyon to perform synoptic measurement of stream flow at several sites along the main stream and tributaries in order to examine groundwater contributions to stream flow. He notes that, "The most significant hazard was mud, although some would probably say my driving." They also went to the American Barrell hazardous waste site to monitor the hydraulic heads within and between the deep and shallow alluvial aquifers in order to determine vertical and lateral hydraulic gradients between the systems. At this site the most significant hazard was trains!

## Antelope Island Trip Illustrates Great Salt Lake's Geology

"Reviews in Earth Science" this year offered an optional half-day field trip to Antelope Island lead by Dr. Erich Petersen. The field trip coincided with study of the Great Salt Lake module and provided the students with a first-hand experience of the lake's geology. The focus of the trip was to judge whether the excellent exposure of the rock record there supports the "Snowball Earth" hypothesis. On Antelope Island, Precambrian glacial deposits, the Mineral Fork Tillite, occur directly over the 3.0 billion year old Farmington Canyon Complex. Deposited directly over the Mineral Fork Tillite is a thin layer of dolomite called "cap carbonates" that contain fine laminations. These carbonates are thought to result from the "hot house" aftermath that follows global glaciation. The participants discussed the geophysical, astronomical, geochemical, stratigraphic and biological evidence for these unusual "snowball" events and the lessons we may draw that speak to current ideas in climate change.



Cari Johnson (center) leads PICP field trip to Book Cliffs.

## And Not to Forget ...

A variety of other field trips associated with classes took place, including geological engineering site visits Dr. Fulvio Tonon, trips to Wasatch Front watersheds with Dr. Kip Solomon, and more. See their activities in "Faculty Focus" in this newsletter.

## Student News

### AAPG Student Chapter Hosts Varied Activities

Brenda Beitler, outgoing president of the AAPG Student Chapter, reports that the Spring 2004 semester was an active and exciting couple of months for the chapter. She notes that it continues to be popular within the department, and once again had a good mix of both academic and social events that were always well attended, bringing undergraduates, graduates, and faculty together.

**Guest Speakers** – The chapter hosted a variety of interesting guest speakers including Jeremy Hourigan from the structure and tectonics group's thermochronology lab at Yale University, Thomas Chidsey, the Petroleum Section Chief for the Utah Geological Survey who discussed petroleum resources in Utah, and Tom Morris, a BYU geology professor who gave a beautifully illustrated talk on the geology of New Zealand. Martha Hayden, President of the Salt Lake AWG chapter, came to talk to us about undergraduate scholarship opportunities.



*Students place their bids at the 3rd Annual AAPG Silent Auction fundraiser.*

**Awards** – In early February the Student Chapter was awarded \$500 from the AAPG Foundation's L. Austin Weeks Undergraduate Grant program. Our student nominee, chapter treasurer James Pearce, was awarded \$500 as well. An AWG Summer Field Camp scholarship went to Anji Marx, our chapter secretary. We are very excited about these acknowledgments of the efforts our Student Chapter has put into having an active and successful club.

**Just for Fun** – In March, about thirty faculty, students, and their families gathered for an evening of fun in the snow at the Wasatch Mountain Club's lodge at Brighton Ski Resort. This event has become an annual tradition that we look forward to continuing.

**Spring Field Trip** – In April, we co-sponsored an overnight field trip with Geo-SAC to explore young volcanics in west-central Utah. The trip was a great success with 18 participants who explored old mine tailings, a massive trilobite quarry, unique sedimentary structures from volcanic explosions into Lake Bonneville, and a variety of volcanic geomorphic structures. The field trip was led by Lori Chadwell, a graduate student actively involved in AAPG, the head of Geo-SAC, and the instructor for the undergraduate general education class, "Earthquakes and Volcanoes" (also known as "Shake and Bake").

**Fundraiser** – We also held our 3rd Annual Silent Auction fundraiser at the Spring G&G Department Awards picnic. This event has come to be a tradition at the picnic, and was again a success. Donations such as books, photos, and rocks from students, faculty, the UGS, AWG, and local businesses, allowed us to raise nearly \$400 to help support future Student Chapter activities. We look forward to another strong year of Student Chapter activities and involvement.

### New Graduate Students Settle In

Welcome to our new graduate students who arrived in the department during spring, summer and fall of this year!

New Doctoral candidates are:

**Matthew Affolter**, Geology  
**Todd Bredbeck**, Geophysics  
**Michael Davis**, Geophysics  
**Sam Hudson**, Geology  
**Virginie Maris**, Geophysics  
**Gregory Nielsen**, Geology  
**Michael Vorkink**, Geology  
**Xiao Xiang**, Geophysics

The new Master's candidates are:

**Stephanie Bear**, Geology  
**Christopher Busch**, Geology  
**Abraham Emond**, Geophysics  
**W. Payton Gardner**, Geology  
**Nancy Harris**, Geophysics  
**Sonja Heuscher**, Geology  
**Stephen Scott Hill**, Geology  
**Sergio Rodriguez**, Geology  
**Joseph Sertich**, Geology  
**Katrina Settles**, Geophysics

## Internships Broaden Graduate Student Experience

Two of our students received internships for summer work with British Petroleum. They were both enthusiastic about their experiences.



*Jessica and Riyad Ali-Adeeb in front of several glaciers including Blackstone Glacier in Blackstone Bay, Gulf of Alaska.*

Jessica Ali-Adeeb reports that she was exposed to a diverse range of the activities that take place in the oil industry. She worked mostly with engineers on two very different drilling operations but was also observed political dynamics at work during team meetings with representatives of the State of Alaska. She feels that her project gave her a lot of room to be creative and independent while she gained geological experience and she says, "This was an incredible opportunity for any scientist."

Bonnie Pickering calls her summer with British Petroleum "the greatest experience of my life." She worked as a geophysicist with the Greater Prudhoe Bay waterflood team in Anchorage, Alaska. Her tasks included interpreting seismic horizons on a large 3D seismic volume, generating structure and isopach maps, and determining well locations for an upcoming drilling program – and not to forget the halibut fishing.

## 2004 Wedding Bells Ring This Summer For Graduate Students

Lori Chadwell and Leif Tapanila - July  
 Derrick Hasterok and Kristine Nielson - July  
 Brenda Beitler and Gabe Bowen - August  
 Alisa Felton and Ian Schofield - August  
 Lindsay Zanno and Bucky Gates - September

Item to note: 8 out of the 10 are current graduate students in our department or recent alums.

## Undergraduate Interns Learn by Doing

The Geology and Geophysics undergraduate internship program provides our students with the opportunity to gain work experience on real geological problems in career environments. Students are supervised by representatives from local companies or institutions, such as the Utah Geological Survey, Petroleum Systems Inc., Energy and Geoscience Institute, Museum of Natural History, and the Bureau of Land Management. Each student works with his or her sponsor on an ongoing project, at the same time earning up to three units of credit per semester. Not only do internships provide valuable experience outside the classroom, but they contribute to the 5000-level electives required for graduation.

Participants express great enthusiasm about their internship experiences, considering them to be high points in their undergraduate careers. Undergraduates wishing to enroll in the program should contact academic coordinators Dr. Susan Halgedahl, Dr. Richard Jarrard, Dr. Fulvio Tonon, or Ms. Kim Atwater.

## Student Presents Research at UROP

Eric Sahn presented his research at the UROP Symposium in the Ray Olpin Union in April. The title of his presentation was "Sustainable Power Development: Can We Solar-Power the Wasatch Front?"



*Eric Lund and Eric Sahn investigate a stretched pebble.*

Anji Marx (B.S. 2004) testimony (unsolicited!) "The U-Geology department is the best and treats its students better than any! I will always praise the U's geology department and professors. They try so hard to help students and really work hard to help them financially. It's kind of sad to think I won't be coming up there this fall, but its also good to move on. I am ever so grateful and will never forget the wonderful time I had at the U."

## Students Celebrate Milestones

### Graduates Honored at 2004 Convocation

Interim President Dr. Loris Betz presided at the University of Utah's Annual Commencement ceremonies held May 7, 2004, in the Huntsman Center. The keynote speaker to the new graduates was Tom Ridge, Secretary of the U.S. Department of Homeland Security.

The College of Earth Sciences and Mines Convocation was held immediately following in the Fine Arts Auditorium with Dean Frank Brown presiding. Andrew Haynes, who received his B.S. degree *cum laude* in Geology, gave the valedictory address for the College. Chris DuRoss, who received his M.S. degree in Geology, was honored with the College's Outstanding Teaching Assistant Award. Following the Convocation ceremony, graduates and their families and friends enjoyed a festive buffet lunch on the patio outside the auditorium.

We are proud to list here our 2003 graduates. They've worked hard and done well.

#### Doctoral Dissertations Defended:

**Wu-Lung Chang**, Geophysics, "GPS Studies of the Wasatch Fault Zone, Utah, with Implications for Fault Behavior and Earthquake Hazard"

**David Handwerker**, Geophysics, "Core- and Log-Based Geophysical Investigations of Neogene Deposition on Continental Margins of the Southern Ocean"

**Victor Heilweil**, Geology, "Recharge to the Navajo Sandstone Aquifer of Southwestern Utah"

**Salah Mehaneh**, Geophysics, "Multidimensional Finite Difference Electromagnetic Modeling and Inversion Based on the Balance Method"

**Ertan Peksen**, Geophysics, "Methods for Interpretation of Tensor Induction Well Logging in Layered Anisotropic Formations"

**Scott Putnam**, Geophysics, "Analysis of Air and Ground Temperatures for Detecting Climate Change"

**Jianming Sheng**, Geophysics, "High Resolution Seismic Tomography and Imaging with Generalized Radon Transform"

**Gregory Waite**, Geophysics, "Upper Mantle Structure of the Yellowstone Hotspot from Teleseismic Body-Wave Velocity Tomography and Shear-Wave Anisotropy"

**Ken Yoshioka**, Geophysics, "Development of Fast Methods of Multi-Transmitter EM Data Inversion for Mineral Exploitation"

**Ge Zhang**, Geophysics, "Multidimensional Electromagnetic Inversion Using the Finite Functions Method"



Paul Kuehne and Andrew Haynes at 2004 Convocation.

#### Masters Theses Presented:

**Brian Bollin**, Geophysics, "Bitter Patterns Observed on Glass-Ceramic Magnetite Crystals: Links Among Local Energy Minimum Domain States, Remanence, and Paleomagnetic Stability"

**Inanui Brodien**, Geology, "New Caledonia Southwestern Exclusive Economic Zone: Structure and Hydrocarbon Potential"

**Christina Brow**, Environmental Engineering, "Deposition of Microspheres in Saturated Porous Media and Simple Shear Systems: A Comparison"

**Maike Buddensiek**, Geophysics, "Colluvial Wedge Imaging Using Traveltime Tomography Along the Wasatch Fault Near Mapleton, Utah"

**Alexey Chernyavskiy**, Geophysics, "Application of the Spectral Lanczos Decomposition Method for Three-Dimensional Inversion of Helicopter-Borne Electromagnetic Data"

**Jeffrey Tyler Dunn**, Geology, "Valiability of Reservoir Properties Along the Teasdale Fault, Utah: Implications for Reservoir Production"

**Christopher DuRoss**, Geology, "Spatila and Temporal Trends of Surface Rupturing on the Nephi Segment of the Wasatch Fault, Utah: Implications for Fault Segmentation and the Recurrence of Paleoeqrthquakes"

**Alisa Felton**, Geology, "Paleowave Indicators and a Model for Tufa Development in the Lake Bonneville Basin, Utah"

**Terry 'Bucky' Gates**, Geology, "The Cleveland-Lloyd Dinosaur Quarry as a Drought-Induced Assemblage: Late Jurassic Morrison Formation, Central Utah"

**Philip Gardner**, Geology, "Hydrogeologic Investigation of Source Waters and Seasonal Transients in Groundwater Conditions at the Scott M. Matheson Wetland Preserve in Moab, Utah"

**Patrick Gathogo**, Geology, "Stratigraphy and Paleoenvironments of the Koobi Fora Formation of the Ileret Area, Northern Kenya"

**Scott Grasse**, Geology, "Emplacement of the North Mountain and Neighboring Plutons as Stacked Laccoliths, Kings Canyon National Park, California"

**Scott Hynek**, Geology, "Middle Eocene Depositional Systems of Western Wyoming"

**Hiroyuki Katayama**, Geophysics, "3-D Interpretation of Airborne EM Data in the Areas with Rough Topography"

**Daniel 'Eli' Ludwig**, Geology, "Numerical Simulation of Tritium Transport in Unsaturated Fractured Sandstone"

**Mary Milner**, Geology, "A Subsurface and Outcrop Interpretation of the Paleocene-Eocene Sequence Boundary, Northwest San Juan Basin, New Mexico"

**Souvik Mukherjee**, Geophysics, "Regularized 3-D Focusing Inversion of Gravity Tensor Data"

**Aaron Lee Norton**, Geology, "Evaluation of an Epithermal Wash for Spring Runoff Storage: Washington County, Utah"

**Anne Parry**, EEGP "Site Characterization and Soil Venting at Hill Air Force Base Utah Test and Training Range - North Chemical Pit Number Four"

**Benjamin Passey**, Geology, "Forward and Inverse Modeling of Intra-Tooth Isotopic Sime-Series Recorded in Tooth Enamel"

**Andrew Rupke**, Geology, "Analysis of Wall-Rock Structures Adjacent to the Silver Zone Plass Pluton, Nevada"

**Ekaterina Tolstaya**, Geophysics, "Compact Three-Dimensional Inversion and Resolution Analysis of Magnetotelluric Data"

**Jacob Umbrico**, Geology, "Hydrocarbon Prospectivity of the Liberian Continental Margin"

**James Weigel**, Geological Engineering, "Fault and Fracture Control on Fluid Flow: Implications for Interbasin Flow"

**Lindsay Zanno**, Geology, "The Pectoral Girdle and Forelimb of the Most Primitive Therizinosauroid (Theropoda, Maniraptora)" with Phylogenetic and Functional Implications"

#### Bachelor of Science Degrees:

**Elizabeth Berg**, Geophysics

**Brian Baziak**, Geology

**Dustin Christianson**, Geology

**Benjamin Davis**, Geology

**Christopher DeKorver**, Geological Engineering

**Stephanie Earls**, Geology

**Heidi Ellefson**, Environmental Earth Science

**Andrew Haynes**, Geology

**Paul Kuehne**, Geology

**Eric Karl Lund**, Geology

**Anjanette Marx**, Geology

**Ammon McDonald**, Geology and Chemistry

**James Pearce**, Geology

**Kevin Radzinski**, Environmental Earth Science

**Jeanne Richter**, Geology

**Dallas Rippey**, Geology

**Randal Stoddard**, Geological Engineering

**Richard Urash**, Geology

#### Outstanding Students Receive Awards

At the Spring 2004 Awards Luncheon, the following were named outstanding in their fields:

**Outstanding Teaching Assistant:** Lori Chadwell

**Outstanding M.S. Candidate:** Phil Gardner

**Outstanding Ph.D. Candidate:** Gregory Waite

Scholarships were presented to the following:

**Ronald Terrill Outstanding GLEN:** Robert Hernandez

**Outstanding GEOL:** Eric Sahn

**Frischknecht:** Jamie Steffensen

**Matthew Mikulich:** Laura Russon

**Gerald Hohmann:** John Naranjo

**Chevron:** Mark Hale

**Ken Cook:** Daniel Smith

**Bullock-Keller:** Eric Sahn, Elaina-Louise Howes, Toshiko Furukawa, Robert Hernandez

**Sedimentary (Honda):** Riyad Ali-Adeeb

**Mineralogical Society:** Jared Singer, Justin Seal, Anthony Pollington, Justin Wreidt, Elizabeth Barrett, Alysen Pedersen

**Dorothy Goode:** Shambraelyn Baker

**Kennecott Scholar:** Laura Russon

**University Continuing + Department:** Marianne Cannon, Tom Hammond, Dylan Peterson

**UGA Field Camp:** Robert Hernandez

**Susan Ekdale AWG Scholar:** Anji Marx

**Cooper Hansen:** Jared Singer, Tom Marston, Marshall Baillie, Orion Rogers, Bethany Pyke, Justin Wriedt, Daniel Ryan Smith, Justin Seal, Anthony Pollington, Elizabeth Barrett, Alysen Pedersen, Michael Fillnow, Adam Williams



Spring 2004 awards luncheon.

## Women in the Geosciences

Not too long ago professional women were unheard of in the earth sciences, and when a few intrepid souls ventured into the field they were not welcomed. Fortunately, that barrier is behind us. Yet in spite of the so-called affirmative action plans undertaken by government, industry and the educational establishment during the late '70s and early '80s, women are still under-represented in the sciences and engineering. With this new series we hope to encourage more young women to pursue careers in the earth sciences and related engineering fields.

### Joan Link Coles

Joan Link Coles was, in 1963, the first woman to receive a Ph.D. in Mineralogy from what was then the Department of Mineralogy in the College of Mines and Mineral Industries. (Geology was then in the college of Letters and Sciences.) She didn't do it to be a pioneer, a ground-breaker, but as she puts it, with a little smile, "A girl's gotta do what a girl's gotta do." So she did.



Joan Coles (third from right) as a student in the field.

She comes from a family of distinguished geologists, no fewer than eight in two generations, most of them Ph.Ds. Her father, Walter Link, was a pioneering petroleum exploration geologist who worked early on for Standard Oil of New Jersey in Latin America and then in Southeast Asia. Joan herself was born in Indonesia. Later, she and her brother remember seeing two active volcanoes from their balcony in Costa Rica.

Her search for intellectual challenge was certainly born in childhood, for she remembers at seven showing her father the list of things she planned to do when she grew up. It was almost all science. Her father said, "You can't do those things because you're a girl." Yet she said to herself, "Why do you say that? I can, too." She loved math, science, reading and Latin, and early on she began beating her brother at chess. In Chess Club

in Junior High School, the advisor looked solemnly at the two girls who'd slid into the back seats to check out the club and said, "Chess is very complicated and difficult. Would you girls like to go visit a different club now?" The other girl slipped away quickly and silently, but Joan stayed. Soon, she was the club champion, but the advisor never gave her a word of praise. Joan was neither intimidated nor discouraged.

Her older brother was already a geology major at the University of Wisconsin when she entered. She began as a chemistry major, where there were two women in a class of a hundred chemistry and engineering majors. She selected this major because she liked chemistry and thought she could and should do challenging things; it was a matter of personal best. But chemistry classes at that time could not explain to her why, for example, carbonate was  $\text{CO}_3$  and sulfate was  $\text{SO}_4$  – it was ascribed to valence, which seemed vague and even inconsistent. She was not satisfied so she changed her major to geology, and in the mineralogy class learned about crystals and crystal systems and found that she had an exceptional sense of dimensionality. When she took the x-ray crystallography class that focused on internal structure and coordination number as a determinant of internal structure, those early questions finally had answers. She says, "It just all seemed so obvious." When asked if she is competitive, she said, "Actually, no." But when she got the top marks in classes, it seemed to put an extra edge on the boys' competitiveness. But she just continued to do what she could do, saying "When the guys are making a big deal about this, what are you going to do?" She graduated half a year early and entered graduate school in geology right away. She had a teaching assistantship, which meant that when summer came and with it the two-month trip Wisconsin's geology students took around western North America, she was at twenty-two the University's designated chaperone for the other three girls in the class. She still smiles about that.

She came to Salt Lake City in 1956 with her husband, Dr. William J. Coles, who had an appointment as an assistant professor in the Mathematics Department, and she soon began taking classes, knowing that the traditional focus



Joan in the Ruby Mountains.

of faculty wives on children, luncheons and bridge would not be personally satisfying. She took structural geology from Dr. Armand Eardley who, according to Dr. Lee Stokes, went to his grave not believing in plate tectonics. Not too surprising, she says, because even in the late '50s and early '60s there was no general consensus about the earth's inner workings, let alone any

understanding at all of its place in the universe. Since her interests were clearly in mineralogy, she chose Dr. James Whelan as her advisor and she enjoyed her dissertational work comparing synthetic apatites. She was able to demonstrate why there is a low occurrence of hydroxylapatite and chlorapatite in nature. She finished her Ph.D. in the fall of 1963, when their third child was about a year old. She had no goal beyond the degree itself, except that she thought she'd like to teach on the college level. When her children were all in school she started looking around. The University did not hire its own graduates, let alone a woman, so she looked elsewhere. A position opened up at Weber State but when she learned that she would be paid the same salary as a man with a bachelor's degree, she said no. Kennecott would have been a good fit for her interests and aptitudes, but at that time they did not hire women as geologists or other professionals. A career in earth science was unlikely.



Joan and Bill Coles enjoy "the wave" of sculpted Jurassic Navajo Sandstone near the Utah-Arizona border.

Always an avid reader across many fields, she assessed her other interests and turned to psychology. Soon she was immersed in another degree program which in 1981 brought her a second Ph.D., this time in clinical psychology. Ironically, by then the College of Mines and Mineral Sciences was, like all of academia, engaged in affirmative action programs and frantically searching for qualified women for its faculty. They offered her a job but she was no longer interested; her mind – and hence her life – had taken another turn and she found a successful career in clinical psychology, retiring in 1997. However, deeply committed to environmental concerns, over the years she used her geological background as a member of the State of Utah's Mined Land Reclamation Committee and also several federal government committees for energy research and development. She also served on the National Research Council's Committee on the Chemistry of Coal Utilization.

Kudos and grateful thanks to Susan Fisher (M.S. 1984) who interviewed and wrote this delightful article on Joan Coles.

## Dr. Picard Enjoys Italian Field Trips

Dr. Duke Picard spent the last third of August at the thirty-second International Geological Congress in Florence, Italy, which this year had an attendance of nearly 7,500. The field trips were what he enjoyed the most.

With about twenty others, he traveled to see some of the Apennine tunneling works along what will be the new high-speed railway (187mph) from Florence to Bologna. More than ninety percent of the fifty-seven-mile route will be underground. The impact of the tunneling on surface and underground water resources has been a major concern.

"On sober introspection," he says he believes "The three-day, post-Congress journey through Tuscany, Umbria, and Marche (the Marches) in central Italy must have been one of the most enjoyable and instructive of field trips." There were few complaints from the participants! The region is mountainous, interspersed with fertile uplands, and the trip's objective was to study the rocks and soils of prominent grape-growing regions. The varieties of grapes, soil types, and bedrocks are numerous. Climates vary greatly, according to the growers, and microclimates may be found on every farm. Everywhere the tour went each town's mayor said a few proud words about the town and its region. Especially interesting was the third day which wound through the Apennines to the Marches, with stops at the medieval village of Serrapetrona, the ancient town of Matelica, founded in 664 B.C., and on down to Ancona on the Adriatic.



Dr. Jim Whelan's obituary in our last newsletter brought reminiscences from several of you. Bill Rinehart (B.S. 1962) sent this photo, taken in the early 1980s at the China Lake Naval Station, CA.



## Blast from the Past: Dr. Lehi Hintze Recalls Pre-WWII Department

Dr. Lehi Hintze, (B.A. '41) now a Professor Emeritus of Geology from Brigham Young University, recently shared memories of life at the University of Utah, and particularly of his undergraduate years in the Geology Department before World War II.



*Lehi Hintze in Stringham's advanced mineralogy lab in 1941.*

His father, Dr. Ferdinand F. Hintze, came here in 1930 to teach petroleum geology and paleontology in the four-man department, eventually becoming chairman. Young Lehi's parents, both University of Utah graduates themselves, enrolled him in the University's Stewart Training School on campus, next door to what is now the Talmage building which then housed the geology and biology departments and the natural sciences museum. He remembers seeing the big smoked-paper seismic recorders that Dr. Talmage had set up on the ground floor. He recalls also that his Dad's 1931 Buick sedan was their field vehicle when they went looking for Eocene horse fossils in the Uinta Basin south of Ouray. One memorable morning in 1934 on the way to school he noticed that cars parked along the street were shaking. It was the Hansel Valley earthquake.

He entered the University of Utah in 1937 as an undergraduate chemistry major but soon turned to geology. In the fall of 1939 he enrolled in introductory class taught by Ray Marsell, and introductory mineralogy, taught by Bronson Stringham. During winter and spring quarters he took historical geology from his father, ores and rocks from Stringham, structural geology from Dr. Hyrum Schneider, and mapping from Marsell. In the latter class, students made a plane-table and alidade map of an area along Foothill Drive at about 21<sup>st</sup> South in Salt Lake City, which was still undeveloped at that time.

He also enrolled in the Reserve Officers' Training Corps (ROTC). Although Hitler's Panzer tank divisions were overrunning Europe by this time, the University's ROTC program still featured horse-drawn field artillery and had a stable for the horses and mules at the south edge of the campus.

In the summer of 1940 he took the six-week field course required by the department for geology majors. There

were thirteen students (none of them women!) in the class. Students first learned to make geologic sketch maps, then did plane table mapping. The main event was a ten-day exercise at Thistle in Spanish Fork Canyon where they lived in the small local motel and ate at its café. In addition to becoming acquainted with the surrounding geology, they examined phosphate beds in Diamond Fork, went into coal mines at Kenilworth; and saw the Flagstaff Limestone quarries at Benny Creek. In his senior year Lehi took advanced historical geology, petrology, geomorphology and surveying drafting, economic geology, and advanced mineralogy. He graduated in the spring of 1941.

During Lehi's undergraduate years, there were about 4,300 students on campus during the fall, winter and spring quarters. The country was emerging from the depression but it still cost only three cents to mail a letter, and gasoline was twelve cents a gallon. He figures that his necessary academic expenses for those four years, from 1937 through 1941, were \$636, \$492 of which were for tuition.

The day after graduation he began his first geology job as a trainee for Seismograph Service Company. After an orientation week in Tulsa, Oklahoma he was assigned to a survey team working in Hays, Kansas. His wage was thirty-five cents an hour to do field surveying, office work, and set out geophones, yielding \$407.50 for a summer's work. But at \$2.50 per week for a room, food expense at about \$1.00 a day, haircuts for forty cents, and Cokes for a nickel, he ended up with a surplus of only \$65. Deciding he needed a better paying job, he returned to the U. of U. in the fall intending to become a geological engineer. But on December 7 Pearl Harbor intervened and he spent the next four years as a lieutenant in the U.S. Army Field Artillery. When he returned, he went on to get a Ph.D. at Columbia and spent a long and fruitful career at Brigham Young University.



*U of U geology students at Step Mountain, a volcanic ring dike in May 1941; Charles Joy, Wally Hansen, Grant Parsons, Ken Keller and Wally Forrester.*

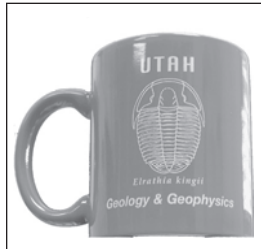
*Lehi's memories range far beyond what we have the space to pass on to you. See his whole story on the department's web site. We hope you enjoy his account as much as we did. Watch for another vintage "Blast from the Past" in our next issue!*

## Department Development

### King TUT Travels With U Geologists

Last Spring, we sent out a letter to our alumni about a special fund raising effort to help us on two fronts: even as we work toward building and equipping our new building, we still need to continue to build endowments and establish faculty chairs. For 2004, We challenged our faculty to help build an endowment to support academic needs, and a majority of our faculty responded positively with tax-deductible donations.

Now we're challenging you! And to commemorate your support, we've prepared a special University of Utah – Geology & Geophysics red mug decorated with arguably the most significant Utah fossil: the *Elrathia kingii* trilobite. We will send one of these mugs to every individual who contributes \$200 or more to our



Department's endowment funds. We'd like to get a photo of you with your mug wherever you are, and have you send it in to us. We'll publish it here in our Department newsletter. This will be our King TUT (Traveling Utah Trilobite) competition and we know you'll enjoy seeing where the U-*Elrathia kingii* travels! For individuals who pledge and donate \$1,000 or more to our endowments, we will send a second, one-of-a-kind, hand-thrown pottery mug with real *Elrathia kingii* impressions. This unique mug is truly a piece of art, designed by one of our own research faculty members.

So—please help us. Send in a donation (see page 31) and join in the fun with King TUT! Your gifts make a tremendous difference to our programs.

A number of other King Tut pictures are spread throughout this issue. See if you can find them all!

### Dr. Stokes' Legacy Lives On

It's been a decade since Dr. William Lee Stokes – Lee to his many friends and colleagues – passed away. During the thirty-three years he taught in our Department, he helped hundreds of students, financially as well as academically, to learn about the Mesozoic world that delighted him most. At heart Lee was a field man, and his professional life followed the pull of the field. In spite of a painful and debilitating illness during his last years, he continued to take his classes and graduate students to the field, though he no longer could sleep on the ground as he had for a lifetime. He showed spirit and dedication that few of us could emulate. Many of you will remember him looking out over the red and gold rocks and proclaiming with contagious conviction, "You can't believe how much work there is to do out here!"

Fittingly, contributions to the Stokes Graduate Fellowship continue to come in from the many who loved him – friends, colleagues in the Department, graduate students, and those who as undergraduates learned their first earth history from him. Recently, his family made a generous contri-

bution to the fund. When those of you who benefited from his deep knowledge of geology as well as his friendship reflect on what he gave us, we hope you'll also remember this Fellowship that honors his memory.

### Gifts to the Department

#### November 2003-September 2004

The Ken Cook Endowment, the Earls Family Endowment for Field Studies, the W. Lee Stokes Endowment, the Harry Goode Graduate Fellowship, the Geology and Geophysics Students Endowments, and the Thermal History Basins received gifts from:

David Bartel	Tim McElvain, Jr.
Frank Brown	B. Ross McNeil
Thure Cerling	William Moore
Marjorie Chan & John Middleton	Barbara Nash
David Chapman	Kristine Pankow
Jing Chen & Hong Mei Li	Jim & Judith Pechmann
ChevronTexaco	Erich Petersen
John Christensen	Sara Lynn Peyton
Richard & June Clawson	Duke Picard
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ExxonMobil	Peggy Reeder
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Melvin Haman	Robert Smith
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John Griswold Foundation	Gary Stone
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Jerry Knaus	Darrell Todd Woodford
Clifford & J.E. Kwan-Gett	Michael Zhdanov
Edward Lafehr	Anonymous donors



Joe Sertich, Patrick Gathogo, Frank Brown, Scott Sampson and Mark Loewen enjoy their Ethiopian coffee in their King Tut Utah mugs.

The Atkinson Distinguished Lecture Series, the Chevron USA Graduate Fellowship, the Orlo Childs Field Studies Fund, the Norma Eardley Program for Women in Geology, the Frischknecht Scholarship in Geophysics, the Mikulich Scholarship in Geophysics, the AAPG Student Chapter, the Dorothy Rice Goode Scholarship, the First Generation Scholarship, the Geologic Research Scholarship, and the Geology and Geophysics Scholarship received gifts from:

AAPG Foundation	Thomas & Kristi Fassio
Jessica M. Ali-Adeeb	Arthur Gallenson
Grant Anderson	Rob & Katherine Harris
Walter Arabasz	John Hayes Family Trust
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The Consortium Research fund received gifts from:

Baker Atlas Logging Services  
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 International Energy Services  
 Norsk Hydro Asa  
 Shell International  
 Sumitomo Metal & Mining

*We hope we have not forgotten anyone on the list of donors. If for some reason we have overlooked you, please let us know.*

## Alumni News

For the last several AAPG and GSA meetings, the University of Utah and Utah State University have been enjoying joint private alumni parties. At the November 2003 GSA meeting, a number of our Utah alum gathered in Seattle, Washington, emerald city of views and seafood. The April 2004 AAPG meeting in Houston had a smaller alumni turnout than the 2003 "home" meeting in Salt Lake City. Nevertheless, we caught up on recent happenings and comings and goings!



*Grant Parsons (B.S. 1942) and Dept. Chair Margie Chan visit in Arcadia, California.*

## See You at the Professional Meetings Fall '04

For your information, here is a listing of several of the national meetings that some of you may be attending:

- Geological Society of America (GSA) – November 7-10, 2004, in Denver, Colorado at the Colorado Convention Center. [www.geosociety.org/meetings/2004/](http://www.geosociety.org/meetings/2004/)

If you're there, please come to our **private alumni party on Monday Nov. 8, from 5:30-7:00 PM in the Mount Elbert room at the Hyatt.**

- Society of Economic Geologists (SEG) – October 10-15, 2004 in Denver, Colorado. [www.seg.org](http://www.seg.org)

If you're going to this one, plan to meet us at the **alumni lunch at noon on October 13, in the Molly Gibson Room at the Holiday Inn, 1450 Glenarm Place** (about 3 blocks NW of Convention Center Hotel). The cost is \$25 per person.

- Society of Vertebrate Paleontology (SVP) - November 3-6, 2004, in Denver, Colorado, at the Adam's Mark hotel. [www.vertpaleo.org/](http://www.vertpaleo.org/)
- American Geophysical Union (AGU) – December 13-17, 2004, in San Francisco, California. [www.agu.org/meetings/fm04/](http://www.agu.org/meetings/fm04/)

A number of our faculty and students will be presenting papers that you may find interesting. Check with your program for familiar names!

Once again you've responded to our request for updates, and once again we're amazed and delighted to hear where you are and what you've been doing. While we don't publish addresses, we keep as many as possible on file. Query us if you see a long-lost friend's name and we'll try to help you get in touch. Keep the news coming!

## Pre-1970s Grads

**Don Runnells** (B.S. 1958), convinced that he wanted to be a geologist by the enthusiasm of Professor Francis Christiansen, received a Ph.D. in 1964 from Harvard University. He has since been Professor and Chair of the Department of Geological Sciences, University of Colorado, Boulder.

**Wilbur Rinehart** (B.S. 1962), is living in San Francisco and enjoys reminiscing of his days in the Department and the Navy.

**Stephen Stouffer** (M.S. Geology 1964) worked with the Utah Highway Department from 1961-1963 doing field work on the original I-70 route across the San Rafael Swell. From 1963-1991 he was a geophysicist for several oil companies based in Casper, Denver, Calgary, Tulsa and Houston. Since 1991 he's been a geophysical consultant in Tulsa, doing both two-dimensional and three-dimensional seismic interpretation as well as prospect development. He fondly remembers geology classes in the old geology building with professors such as Lee Stokes, Richard Threet, Francis Christiansen and Ray Marsell, also geophysics classes with Ken Cook, Ted Algermissen, Joe Berg, etc.

**Robert Garvin** (M.S. Geology 1967) is Senior Geological Consultant for Mak-J Energy Operating Company in Denver, Colorado. Named Rocky Mountain Association of Geologists Explorer of the Year for 2003.

## 1970s Grads

**Michael Reblin** (M.S. 1973) left Unocal in 2000 after 26 years with the company. He spent the last three winters in Alaska as project manager for seismic surveys in the Cook Inlet area.

**George Berry** (B.S. 1972) was awarded the Navy Superior Public Service Award!

**Richard A. Leveille** (B.S. 1977) has been named president of Phelps Dodge Exploration Corp., a subsidiary of Phelps Dodge Corp. He joined Phelps Dodge in 1994 as chief geologist for South America. Since that time he has successfully driven exploration programs in Chile, Brazil and Peru. He was named vice president of exploration in 2000 and vice president and chief geologist in 2001. Besides his degree from our department, he holds a master's degree in geology from the University of Alaska.

## 1980s Grads

**Steven Clawson** (B.S. 1980, M.S. 1981) is technical advisor for Geophysics and Geostatistics in Littleton, Colorado.

**Terry Massoth** (B.S. 1977, M.S. 1982) is still consulting, presently with Paul Anderson, another University of Utah Geology grad, and for AK&M Consulting on an oil and gas project. He is also working on and off for a Calgary-based oil sand resources company. He keeps busy about half to two-thirds time, allowing plenty of time for golf and vacation travel. His work is mostly based out of his Salt Lake City office, doing computer mapping, GIS, literature searches and map research, though he does get to do some foreign exploration work now and again. He is definitely not doing as



Photo taken from SEG Nov. 2003. From left to right, Yonghe Sun, Oleg Portniaguine, Jing Chen, Jerry Schuster, Marc Croes, Bill Johnson, Ruiqing He (current student), Zhiyong Jiang (current student).

much travel as with Utah International or BHP Minerals, but that leaves more time for shoveling all the snow around here! He'll says he'll try to catch a few more geology talks at the U again this year, so perhaps we'll see him then.

**Tom E. McCandless** (B.S. 1978, M.S. 1982), now a Ph.D., is working for Ashton Mining of Canada in Vancouver.

**Mark R. Williams** (B.S. 1977, M.S. 1982) joined Whiting Oil and Gas Corporation in December 1983 as Exploration Geologist, becoming Vice President of Exploration and Development in December 1999. He now has twenty-two years of experience in the oil and natural gas industry and his areas of primary technical expertise are in sequence stratigraphy, seismic interpretation and petroleum economics. Mark also earned an M.S. in geology at the Colorado School of Mines.

**Dale Julander** (M.S. 1983) and **Kelsey Julander** (M.S. 1984) dropped us a note to say that Dale is still with ChevronTexaco in Bakersfield. He is currently the staff formation evaluation specialist for their San Joaquin

Valley business unit which involves providing petrophysical support to all of the asset teams who are managing the seven major oil fields that ChevronTexaco operates there. Kelsey worked for Chevron as a geophysicist for seven years (until 1991) and then left the company when their first child, Allison, was born; they now have two. Kelsey has recently been substitute teaching at the elementary school level and is planning on going to California State University Bakersfield to obtain a teaching credential. They both enjoy hearing about the happenings of the Geology & Geophysics Department there. Dale says, "Best of luck in planning the department's new facility."

**Tom Fassio** (B.S. 1982, M.S. 1984) is doing California oil and gas. Let's hear more, Tom!

**Peggie Gallagher** (M.S. 1984) and **John Isby** (M.S. 1984) recently moved and are living and working in Anchorage, Alaska.

**Phyllis (Jones) Vetter** (B.S. 1984) got her law degree three years later and worked with Van Cott Bagley. She is now an attorney in the University's Office of General Counsel.

**Gail Pankanin Artrip** (B.S. Geological Engineering 1985) is Principal/Senior Engineer at URS Corporation. She has been working in the environmental consulting field for the past fourteen years, after initially starting her career in more the civil and geotechnical realm. Her job is mostly serving industrial clients in Chicago, where there is a lot of Brownfield redevelopment that, due to current favorable interest rates, remains quite active in spite of the economy.

**Lon Abbott** (B.S. Geophysics & Geology, 1986) has a popular geology-oriented book he co-wrote, "Hiking the Grand Canyon's Geology," released in February 2004. He is currently a faculty member at Prescott College in Arizona.

**Dawn Ackerman** (M.S. 1987) is teaching Earth Science and Physical Geology at Sierra College, a two-year college in the foothills of the Sierra Nevada. She works part-time and spends the remainder of her time teaching science in her boys' classes. She and her husband, Dan Gallagher (M.S. 1986) are happy to be skiing again now that the boys are interested too.

**Jim Hollis** (M.S. Geophysics, 1988) is part of the Input/Output Inc. management team, Vice President of the Land Imaging Systems Divi-

sion. Prior to joining I/O, he was general manager of Exploration and Development Solutions for Landmark Graphics.

**Steffen Ochs** (M.S. Geology, 1988) and wife Barbara write that February marked a full year that they have been living in Muscat, Oman, and they are still happy to be here. The only real complaint is that sometimes they wish they had all the spare time they had in New Zealand; work and private life are an order of magnitude busier. They are on the go most of the time and their spare time at home is filled with re-writing a book (an off-road guide to Oman). The benefit is that they get to see many neat places and meet a lot of people.

**Julie Shemeta** (M.S. 1989) says her first job was with Chevron USA in New Orleans, then Unocal Science and Technology in Brea, CA, then on to Unocal Geothermal in Santa Rosa, CA. After that, she took a few years off to have her children, Maddie and Doug. She's now a geophysicist with Pinnacle Technologies in Denver. Most of her work has been related to earthquake seismology and the energy business.

## 1990s Grads

**Jacqueline Bott** (M.S. Geophysics, 1992) took an eight month leave of absence from the California Geological to be with her son Daniel who was born on Halloween 2003. She is now back at work in the Seismic Hazards Mapping Program working on both liquefaction and landslide zone maps for the San Francisco Bay Area. Daniel is now ten months old and thriving and will be taking his first transatlantic flight in two weeks time when they go back to the UK to visit family.

**Kristen Puckett** (B.S. 1993) no longer works for Cyprus-Amax which went belly-up about three or four years ago and was acquired by Phelps Dodge, based in Phoenix. Kris started her own one-person corporation called Kristen Puckett, Inc. and has been a contractor since 1997, working in computer software development, mainly in Oracle.

**Les P. Beard** (Ph.D. Geophysics 1995) is a geophysicist in the Environmental Sciences Division of the Oak Ridge National Laboratory.

**Holly Godsey** (B.S. 1995) with husband Mark, took their toddler Jonah on their first family trip to Switzerland. Holly is the new coordinator for the interdisciplinary WEST program. Holly also hopes to have her Ph.D. dissertation finished very soon!

**Bereket Haileab** (Ph.D. 1995) and family welcomed a new baby girl named Amira Fioir this summer.

**Kristina Leavitt Watabe** (B.S. 1995) is back in Salt Lake City and is a new mom to her 8 month old son.



*Steffen Ochs and wife Barbara in Majlis Cave, the second largest cavern in the world.*



Jessica Ali-Adeeb, with King Tut mug, on the North Slope of Alaska with the Alaska pipeline and the Arctic Ocean behind her.

## 2000s Grads

**Robert Hammond**, (B.S. Geology 2000). He has been working at GeoTek, a geotechnical engineering firm based in Las Vegas, with offices in Nevada, California, Arizona and Idaho. He is currently project geologist/project manager for projects ranging from residential development to large commercial development and public works.

**Shane Spor** (B.S. 2001) works for USStratCom in Bellevue, NE.

**Matt Gregory** (M.S. 2002) and **Jill Krukowski** (M.S. 2002) are busy at ExxonMobil and frequently travel in their work. They just bought a new home in Houston.

**Ian Schofield** (M.S. 2002) and **Alisa Felton** (M.S. 2002) got married in Park City, Utah this summer. Ian works for Kleinfelder and Alisa teaches High School in Park City.

**Greg Waite** (M.S. 2000, Ph.D. 2004) and wife Kay had a baby boy last October. That's what we heard. Where are you guys?

**Natalie Bay** (B.S. Environmental Earth Science 2001) writes that she and her husband **Trent** (B.S. Geological Engineering 2003) are here in Salt Lake City. She is working for an environmental consulting firm and Trent works for Summit County as a water resources engineer. They are excited about purchasing a new home and becoming parents this past summer.

Do you know what Utah's state fossil is?

check out: <http://pioneer.utah.gov/fossil.html> for the answer.

## In Memoriam

### Robert L. Randolph (M.S. 1973) Dies

Bob Randolph, known affectionately to his friends as the Giant Clam, passed away in December 2003. After getting a Bachelor's degree in anthropology specializing in archeology, then a Master's degree from this department in geology specializing in paleontology, he had a long career with the Bureau of Land Management (BLM) and the U.S. Forest service where he became Regional Geologist. In late years he also developed an interest in gemology. Following his death, his family and friends chose to celebrate his life at the Utah Museum of Natural History, which says a lot about what was important to him.

### John K. Hayes (M.S. 1939) Loved Rocks

John Hayes loved rocks and began collecting them as a child, a passion that continued his entire life, passed away in May 2004. Like many field geologists, his interests extended to bird watching, wild flowers, photography and always his maps. After receiving a B.S. in 1938 and an M.S. in mining engineering and geology the following year at the University of Utah, he went on to Stanford for another Master's degree in mining engineering. He then spent 41 years as a mining engineer for U.S. Steel, rising to Chief of Raw Materials Exploration, Western States Division. He maintained a warm association with our department through the years, as shown through his generous gifts.



Marjorie Chan and Frank Brown at the Avenues Street Fair.

Your fellow alumni and colleagues in the Department of Geology and Geophysics would like to hear about your professional accomplishments, job promotions or changes, address changes, or any other news you would like to share. You can also update your information on our website at:  
<http://www.mines.utah.edu/geo/alumni/index.html>.

**Include my news in the next "Down to Earth."**

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*New opportunities to expand our facilities and services come to our attention constantly. Needless to say, there is seldom room in the budget to accommodate them. Gifts from our friends and alumni provide many extras that enhance our students' educations. We appreciate your support.*

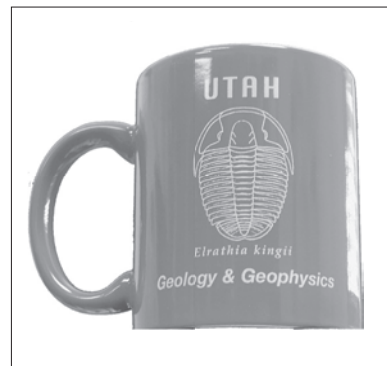
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