

GEOSCIENCE DEPARTMENT

SPRING 2010 NEWSLETTER

UNIVERSITY OF NEVADA LAS VEGAS

The 5th Annual GeoSymposium

Showcasing Student Research, Building Connections



Michael Wells presents the opening remarks to kick off the event

Students visually present their research during the poster session



Jaclyn Carrington discusses her poster with Sean Mulcahy



Left to Right: Bob Stewart (ExxonMobil), Vicki Meyers (GeoSymposium Chair), and Gary Johnson (BLM)

Nice day for a hike: James Thompson on Saturday's field trip



Andrew Hanson, Bob Stewart, Josh Bonde, and Gary Johnson discuss the geology found at Red Rock Canyon National Conservation Area

The UNLV Department of Geoscience hosted the 5th Annual GeoSymposium on April 15-17th, with speakers, student oral and poster presentations, and a field trip to Red Rock Canyon National Conservation Area on the final day. The symposium was an entirely student organized event designed to provide Geoscience graduate and undergraduate students the opportunity to present their original research to industry, civic, and government professionals, as well as academic experts.

Seminar speaker, Adolph Yonkee of Weber State University (Utah) kicked off the event on Thursday afternoon with his presentation entitled *Evolution of Curved Mountain Belts: Up Around the Bend in the Wyoming Salient, Sevier Fold-Thrust Belt*. Friday's day-long technical sessions were held in the Blasco Event Wing of the UNLV Foundation Building on campus. Participants enjoyed morning refreshments, courtesy of Barrick Gold Exploration. An addition to the GeoSymposium this year was the attendance of thirty Centennial High School students accompanied by their Geoscience teacher, Jenelle Hopkins. The students attended the morning keynote talk, listened to and judged morning oral presentations, and participated as poster judges before touring the Geoscience Department. The high school students enjoyed the opportunity to interact with UNLV students, attend a conference, and tour UNLV facilities.

Students were encouraged and inspired by the morning keynote speaker, Bob Stewart, Global Geoscience Recruiting Supervisor from ExxonMobil Exploration Company, whose talk was entitled *Petroleum Systems in Space and Time*. The day was filled with ten oral presentations and thirty-two posters representing the current research of our graduate and undergraduate students in topics relating to economic geology, hydrology, petroleum geology, paleontology, paleoclimate, structural geology, sedimentology, volcanology, planetary geology, and GIS technologies. The morning oral and poster sessions were followed by a tasty outdoor Texas Style BBQ lunch on the Foundation patio, generously sponsored by ExxonMobil. A second round of oral and poster presentations succeeded the luncheon. The day's presentations concluded with a keynote address by Gary Johnson, BLM Nevada Deputy State Director of Mineral Management, with his talk entitled *BLM Nevada Minerals Overview*.

Awards for the day's presentations were selected by a panel of confidential judges in five categories: Graduate Oral, Graduate Poster, Graduate GEOL 795 Poster, Graduate GIS Poster, and Undergraduate Presentation. Graduate student awards were donated analyses in one of three Geoscience labs: EMIL, NIGL, or ESAL. The undergraduate winner was awarded a cash prize courtesy of Barrick Gold Exploration. The 2010 GeoSymposium award winners were Adam Zeiza for Graduate Oral; James Thompson for Graduate Poster; Jonathan Carter for Graduate GEOL 795 Poster; *Continued, Page 3*

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Letter from the Chair

Michael Wells, Ph.D.



Greetings from the UNLV Geoscience Department! I hope this newsletter finds you doing well despite these challenging economic times. I wish to share some of the challenges that we have faced in the past year, with a take away message that despite these circumstances, UNLV Geoscience continues to thrive (as you will see in these pages), and that the need for Geoscientists in our society has never been greater.

When I wrote to you last spring, UNLV was facing a possible devastating 54% budget cut as proposed by our Governor. Through great efforts, solidarity, and activism by our alumni and friends, students, staff, and faculty on behalf of higher education in Nevada, our voices were heard by our legislature and the blow was softened to a budget cut of 24%. And then came this year, with an additional proposed cut of 10% that was whittled down to 6.9% in a special session of our legislature. At UNLV, these additional cuts to an already lean University are quite serious and will be accomplished by the elimination of academic programs and departments (this is underway and ongoing). For the first time in the history of the Geoscience Department, we have had to justify our existence by demonstrating our value to the University, rather than relying on the quality of our programs. This ongoing exercise carries a silver lining as it provides an opportunity for self-reflection and recognition of our strengths and weaknesses, and we will come out of this a strengthened department.

The Department of Geosciences' focus over the past 10 years has been strengthening graduate programs, faculty and student productivity, and building research infrastructure; we have made great strides forward in all of these areas. For example, for the first time, we have graduated sufficient doctoral students to qualify for national ranking of our graduate program by US News and World Report. In our first-ever national ranking, we were ranked 89th this spring in graduate Earth Science programs. While this may not be as high of a ranking as we would like, or as high as we deserve, this is an excellent first ranking, considering our PhD program was established only 10 years ago. Our student and faculty scholarship, and the diversity of department research, has reached a new high and is solidifying our regional and national reputation. A key part of this success is our excellent students, and we are very proud of our students and their significant research accomplishments. The 5th Annual Geosymposium event showcased some of the really top-notch and exciting research that is being undertaken by our undergraduate, Masters, and PhD students.

While keeping our engagement in research strong, we are now focusing on other ways to increase our value to the University beyond the quality of our degree programs, scholarship, and external funding. This includes increasing enrollment in our undergraduate general education science classes (towards this goal we have recently added classes in Global Warming and Planetary Geology), revision of our undergraduate BS degree curricula, and more general efforts to increase the size of our BS degree programs. Towards these goals, many initiatives are currently underway, including increased outreach with K-12 and community colleges, and we are confident in being successful in raising our value to the University. As none of us are trained in marketing, these are new hats for many of us to be wearing!

At this point, you may be asking, "is the budget and the department's reaction to it all you have to talk about?" Actually, no, there is a lot more going on! Three of our research labs, the Las Vegas Isotope Science Laboratory (LVIS), the Environmental Soil Analysis Laboratory (ESAL), and the X-ray Fluorescence/X-ray Diffraction Laboratory (XXL) now have new homes in the new Science and Engineering Building (SEB). The laboratory moves, while frightening whenever mass spectrometers and other analytical equipment are moved, went smoothly and the labs are now fully operational. We anticipate the Nevada Isotope Geochronology Laboratory (NIGL) and the Electron Microscopy and Imaging Laboratory (EMIL) to move to the SEB in the next several months. Libby Haurath also has set up her new Geochemistry laboratory in the SEB and is currently

Continued, Page 3

GeoSymposium, Continued

Chris Adcock for Graduate GIS Poster; and Jason Cornell for Undergraduate Oral/Poster Presentation.



Award Winners, left to right:

Jonathan Carter (Graduate GEOL 795 Poster): *Paleoseismicity of the Stateline Fault, Southern Nevada*; Adam Zeiza (Graduate Oral): *Carbonate Cycles and Stacking Patterns of the Furongian Carbonate Platform in Central Nevada and Western Utah, Western US: Implications for Autocyclicity Under Supergreenhouse Climate*; James Thompson (Graduate Poster): *Tectonic Development in the White Pine Range and East-Central Nevada*; Chris Adcock (Graduate GIS Poster): *Water, Water Anywhere?*; Jason Cornell (Undergraduate Presentation): *Phosphate Mobility in a Mars Analog Environment*

After the awards and closing ceremonies, guests and presenters moved to the Lilly Fong Geoscience Building for a reception and silent auction. This event provided an opportunity for guests and students to network while bidding on rock, mineral, and fossil specimens, as well as enjoying some refreshments courtesy of Barrick Gold Exploration. The auction was a fun way to build relationships between students and professionals, and the money raised from the sale of these donated items will help support next year's GeoSymposium.

A field trip to Red Rock Canyon National Conservation Area on Saturday concluded the event. Red Rocks, as the area is commonly called, is located approximately 15 miles west of Las Vegas, and is known for its spectacular red Aztec sandstone peaks and walls, as well as Paleozoic rocks. The group began by stopping at the newly erected visitor center, followed by a student guided tour to the Sandstone Quarry, and a hike to the Keystone Thrust Fault.

The success of this year's GeoSymposium event was the result of volunteered time, labor, ideas, and the combined efforts of many students. The generosity in contributions of silent auction items and financial support from many organizations, including the Department of Geoscience and individual donations, made this event possible. The GeoSymposium committee extends heartfelt gratitude and appreciation to all who contributed to the success of the 5th Annual GeoSymposium!

For information on how you can donate gifts of goods, services, or financial support to the 6th Annual GeoSymposium, please contact the UNLV Department of Geoscience at (702)895-3262.

Article & Photos by Vicki Meyers and Jordan Armstrong

Committee Members

Chair: Vicki Meyers • **Faculty Advisor:** Andrew Hanson • **Abstracts with Programs:** Laura Eaton, Corinne Griffing, Valerie Tu, Lora Griffin • **Correspondance and Fundraising:** Aubrey Shirk, Vicki Meyers • **Facilities and Catering:** Vicki Meyers, Aubrey Shirk, Mandy Williams • **Field Trip:** Josh Bonde, Jason Norgan • **Guest Speaker Search:** Michael Giallorenzo • **Silent Auction:** James Thompson, Julie Baumeister, Jonathan Baker • **Symposium Set-Up:** Pasquale Delvecchio, Lora Griffin, Joseph Asante • **Web Page:** Jordan Armstrong, Becki Huntoon • **Additional Volunteers:** Andrew Miller, Bobby Henry, Brian Aillaud, Carl Swenberg, Carla Eichler, Jeevan Jayakody, John Meyer, Jordan Drew, Kelly Robertson, LaOde Ahdyar, May Sas, Nick Downs, Stephen Paplinski, Swapan Sahoo, Tim Howell, Yuki Agulia

Letter from the Chair, Continued

undertaking experiments on the kinetics of mineral dissolution. Pamela Burnley has installed her piston-cylinder press in a new Rock Deformation laboratory in the Tech Building, and we have a new student research room, conference room, and are planning a new microscopy teaching-laboratory, in Lilly Fong. Two of the SEB inhabitants deserve special mention: Ganqing Jiang (GQ) has been promoted to Associate Professor with tenure, and Brenda Buck has been promoted to Full Professor. Congratulations to Ganqing and Brenda!

It is an interesting time to be in Geoscience. While many aspects of the economy are sluggish and state-funded educational institutions are widely in financial trouble, research-funding availability in Geoscience fields has increased under the new administration and the industrial job market is exceptionally good. Increased demands for metals, in particular rare earth metals used in environmental (green) technologies, and a robust demand for hydrocarbons have kept job opportunities in the extractive industries strong. At the same time, resource sustainability, environmental protection, and natural disaster prevention awareness are growing international concerns, and a Geoscience-literate workforce is needed to address these challenges of the future. Many of these issues are going to require an increased engagement of scientists with the general public and politicians such that geoscientists can better guide public policy and lessen misperceptions, and misconceptions abound! For example, in a recent poll published by the Las Vegas Review Journal, 55% of Nevadans believe global warming is "unproven and subject to debate," and 35% consider it "a scientifically established reality". Compare this with 89%* of actively publishing Earth Scientists who answered yes to "Do you think human activity is a significant contributing factor in changing mean global temperatures?" (8% answered I don't know; 3%, no). Certainly we have our work cut out for us!

As always, we love to hear from our alumni and friends, so please stay in touch. You can update your contact information by using the enclosed form or emailing the department at geodept@unlv.edu. We will be having a UNLV Geosciences alumni reception at the National GSA Meeting in the fall. You are all invited, and I hope to see you in Denver!

*Doran & Zimmerman, 2009, Examining the Scientific Consensus on Climate Change, EOS.

In Memorium - Anne Fenton Wyman



Anne Fenton Wyman, a beloved and iconic figure on the UNLV campus, and the founding member of the UNLV Geoscience Department, passed away on June 23, 2009, in Boulder City, Nevada. Anne devoted 28 years to the Geoscience Department, retiring in 1994. During her tenure, the Geoscience faculty grew from one (herself) to twelve, with the addition of a Master of Science program and twelve graduate assistants. Mineralogy was Anne's favorite subject.

Anne taught mineralogy for many years, and together with her husband, Dick, established an endowed scholarship, the Anne Fenton Wyman Scholarship, for students who excel in the study of mineralogy. Anne also inaugurated and built the mineralogy collection, an extensive collection of mineral specimens used by students and faculty. A portion of this material is on display in the first floor lobby of the Lilly Fong Geoscience Building.

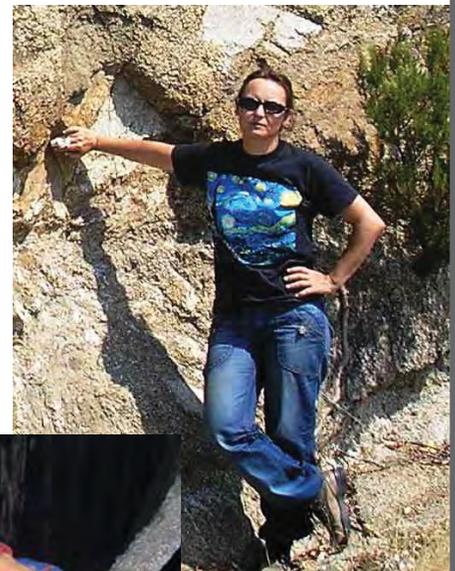
Tribute gifts in memory of Anne may be directed to the Anne Fenton Wyman Scholarship and sent to: UNLV Foundation, 4505 S. Maryland Parkway, Box 451006, Las Vegas, NV 89154-1006. Gifts can also be made online at <http://foundation.unlv.edu/give.html>. Select the link for the College of Sciences. Under "designation" please select "Anne Fenton Wyman Scholarship." Anne's name should be entered at the very bottom of the screen under "Tribute Information."

Welcome Guest Researchers

Dr. Safak Altunkaynak is an Associate Professor in the Department of Geology at Istanbul Technical University (Turkey); she is visiting the Geoscience Department at UNLV to collaborate on research with Drs. Michael Wells and Sean Mulcahy. This research collaboration will involve thermobarometry and geochronology studies on post-collisional magmatic and metamorphic rocks of western Anatolia, Turkey. Dr. Altunkaynak's research interests in the petrology and geodynamics of post-collisional magmatism in Turkey, the Aegean region, and Caucasus have her currently working on research projects involving 1) Cenozoic crustal evolution and mantle dynamics of post-collisional magmatism in western Turkey; 2) volcanic-plutonic connections; 3) the geochemistry of Cenozoic volcanism in the Lesser Caucasus (Azerbaijan) and the peri-Arabian region; and 4) syn-extensional granitoids in the Menderes core complex. *By Safak Altunkaynak*

Dr. Gokhan Demirela is a PhD student and research assistant in the Department of Geological Engineering at Ankara University, Turkey. His PhD study deals with the classification and genetic problems of carbonate hosted Pb-Zn deposits in Triassic metamorphic rock sequences of NW Turkey. During his stay at UNLV, Gokhan will carry out fluid inclusions and EPMA studies with Drs. Jean Cline and Haroldo Lledo.

By Gokhan Demirela



Above: Dr. Safak Altunkaynak
Left: Gokhan Demirela and Sinan Akiska at an underground mine in Canakkale, Turkey

PACROFI

Pan-American Current Research on Fluid Inclusions

We are excited to announce that the tenth Pan-American Current Research on Fluid Inclusions (PACROFI) conference will be held on the UNLV campus from June 7th through June 10th, 2010. The conference will feature the research of academic, industry, and government professionals who use fluid and/or melt inclusions to unravel the evolution of geologic systems. An optional pre-meeting field trip to explore the world famous Carlin-Type gold deposits of northern Nevada will kick off this event. An optional post-meeting field trip will offer participants the chance to explore the chemical and physical links between the Wilson Ridge Pluton and the River Mountains volcanic area in the Colorado River Extensional Corridor. For more information, we invite you to visit the PACROFI web page: <http://geoscience.unlv.edu/PACROFI2010.html>



Spotlight on Students



Kelly Robertson, PhD Student (By Kelly Robertson)

Last summer, I decided to make a radical change from studying magmatic systems and try my hand at being a petroleum geologist. I worked as an intern for ExxonMobil Development Company (EMDC) in Houston, TX. My project, under the advisement of two very knowledgeable and patient mentors, was to re-assess the possibility of developing a small reserve located in offshore Angola. I worked with world-class high resolution seismic data to map the deposit and build geologic models which allowed me to make volume and recovery estimates for the reserve. The intern program was a wonderful learning opportunity that allowed me to meet Exxon scientists and executives from across the company, as well as other student interns from across the world. There were intern events set up throughout the summer, including dinners, field trips, and even baseball games. It wasn't all just fun and games though, we were all given very involved, real projects that weren't just practice exercises. We had to present our results to our work groups, mentors, managers, and sometimes even executives. Overall, my internship was a fantastic learning experience that I would recommend to any student interested in, or simply curious about, the petroleum industry.

Aaron Bell, PhD Student

By Adam Simon

Geoscience PhD student, Aaron Bell, and faculty member, Adam Simon, have published in *Geochimica et Cosmochimica Acta* the results of a study which sheds light on the evolution of ore deposits rich in platinum and palladium, two metals vital to sustainability efforts such as the manufacture of fuel cells and solar panels. They performed experiments at high pressure and temperature to simulate the evolution of magma chambers that are thought to evolve platinum- and palladium-rich aqueous fluids which ascend and precipitate the metals in small volumes of the magma chamber, resulting in the concentration of both metals increasing by five orders of magnitude to economic grades. The results will improve predictive techniques for the discovery of new deposits, required for future development of sustainable technology.



Lindsey Clark, BS 2009

By Adam Simon

“The NSF-EPSCoR Summer Scholarship program helped me get a head start in research, and I had a fun summer while I was at it!”

Lindsey Clark, BS Geology alumna 2009, participated in the summer 2009 NSF-EPSCoR-funded research experience for undergraduates at UNLV. Lindsey worked with Geoscience Assistant Research Professor, Sean Mulcahy, PhD student, Kelly Robertson, and Assistant Professor, Adam Simon, on a project designed to constrain the temperature and pressure history of rocks collected from Mutnovsky Volcano, Kamchatka, Russia. Lindsey successfully combined her undergraduate training in optical mineralogy and petrology with new training in electron beam analyses to quantify the composition of pyroxenes, and use these chemical data to constrain magma evolution. The results will be used by the UNLV group to constrain element recycling in volcanic arcs. The program culminated in an opportunity for participants to present their summer research; Lindsey was awarded Outstanding Poster for her work!

Lindsey writes: “Receiving the NSF-EPSCoR Summer Scholarship opened the door for me to do independent research, which offers great experience for future graduate school research. The funding from the scholarship gave me the

Continued, Page 6



Lindsey Clark, Continued

opportunity to spend my summer doing research instead of working. Once a week, the program offered a short class on different topics that could potentially help students in future research, applying to graduate school, and career opportunities. Through the program, we toured the Nevada Test Site and got to go behind the scenes to see the workings at Siegfried & Roy's Secret Garden and Dolphin Habitat. The NSF-EPSCoR Summer Scholarship program helped me get a head start in research, and I had a fun summer while I was at it."

Lindsey is preparing to start graduate school with a focus on economic geology. The Geoscience Department actively promotes hands-on research experiences for our undergraduate students, and we are proud of Lindsey's accomplishments.

Lindsey Clark has been awarded a \$9,000 International Graduate Research Fellowship from the Society of Economic Geology, arguably the most prestigious mining and engineering organization on Earth. Lindsey was accepted into the graduate program at several tier one universities; however, after visiting other campuses, she has chosen to use the fellowship to pursue a MS in Geology with UNLV Faculty, Jean Cline and Adam Simon, owing to their recognition as the leaders of one of the top mining geology programs in the world. Her graduate research will focus on the evolution of Earth's largest molybdenum mine in Central NV.

Standing at the rim of the 1,600 foot deep Goldstrike open pit gold mine near Carlin, Nevada



Metallic Ore Deposits Students Explore Working Mines

By Adam Simon



1,000 feet deep in the Goldstrike gold mine of Nevada, North America's largest underground gold mine

Faculty members, Jean Cline and Adam Simon, took their Metallic Ore Deposits class on a tour of several world-class mines in central and northern Nevada during the Fall 2009 semester. Nevada is a major player in the global mining industry, producing ~6.5% of the total global supply of gold, and is an important producer of copper, silver, and molybdenum. Mining is the second largest employer in Nevada, and Cline and Simon have built strategic partnerships with several mining companies who fund research at UNLV. The field trip was designed to introduce the students to the practical aspects of mining and also to forge important contacts with potential employers. UNLV Geoscience alumni can be found at a number of mines throughout NV, and at least one undergraduate has interned at a working mine in each of the past five years. The Fall 2009 course included 15 undergraduate and 2 graduate students and focused on the formation of metallic ore deposits. The students toured the Mt. Hope molybdenum mine located near Eureka, NV, and the Goldstrike open pit and underground gold mines near Carlin, NV. Ms. Kati Gibler, UNLV M.S. alumna, led our tour at the Mt. Hope mine and gave the students incredible insight into how someone transitions from a student to a mining geologist. This deposit is currently in the final permitting stage and, when opened, will be the largest molybdenum mine on Earth, with an estimated reserve of 1.03 billion pounds of molybdenum. Our tour of the Goldstrike underground mine was perhaps the highlight of the trip. After a safety presentation (and test), the group climbed into an elevator and descended almost two thousand feet below surface level to visit North America's largest working underground gold mine. This is definitely not a trip for the claustrophobic! But our students loved it. They were notably impressed by the ability of the mining geologists to map underground with a flashlight.

The Earth and Beyond: Department Offering New Course in Planetary Science

By Scott Nowicki

Planetary science is making its way into the curriculum with a new course offering at the introductory level starting in the Fall of 2010. "Moon and Mars" is a new course under development, and is getting support in a number of ways. Late last year, a curriculum development grant was awarded by the Nevada Space Grant Consortium to Scott Nowicki, the goal of which is to develop new teaching materials for use at the undergraduate level. With a focus on current missions to our nearby planetary neighbors, a major theme will be planetary analog sites in the Mojave and Colorado Plateau. In order to pull this off, Scott has enlisted the help of a handful of students interested in an independent study in Martian analogs. Geology majors, Valerie Tu and Eden Espino, both signed up and are currently hard at work to develop the datasets and test two sites for applicability in studying Mars. Valerie is working on ventifacts and associated materials in a number of locations in the Mojave desert, and Eden is studying the Grabens in Canyonlands National Park. In addition, a new freshman geology major is also working on the project as a "virtual rover". David Bloomfield is collecting visible and thermal imagery as well as hand samples everywhere the team is studying. On the most recent trip to the Mojave National Preserve, Valerie Tu led the investigation while David collected panoramic imagery at every interesting location. Although the team was in some of the windiest places in the US, the weather was surprisingly calm, and ideal for field work. The observations will be used to determine the types of surface materials that dominate the region and hold clues to finding similar surfaces on Mars. Eden Espino will be investigating the surface expression of the spectacularly-faulted Graben region after school gets out this summer. Lora Griffin will be joining this excursion to investigate inverted ancient river channels just south of Green River, UT. The results from these studies will provide not only new science, but a way for students in the 100-level course to visualize how geologists conduct field work, make the case for similarities with Mars, and plan for lander missions to other planets.

On the flows of Amboy Crater, CA: May Sas, Valerie Tu, David Bloomfield, and Scott Nowicki



May Sas, Valerie Tu, and David Bloomfield investigate ventifacts on Garnet Hill outside of Palm Springs, CA



Thank You To Our Department Support Staff!

Pictured left to right:

Administrative Assistant II

Kathryn Birgy

Accounts Manager

Liz Smith

Office Manager

Maria Figueroa

Student Worker

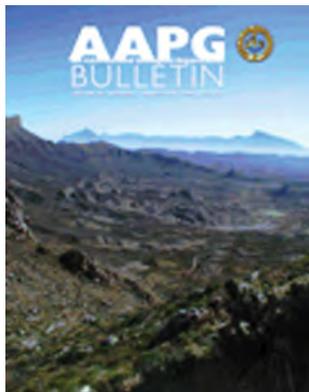
Rainee Tiske

Student Worker (not pictured)

Joy Valdivia

Spotlight on Faculty Research

First Demonstrated Hydrocarbon Migration Adjacent to Salt Structure



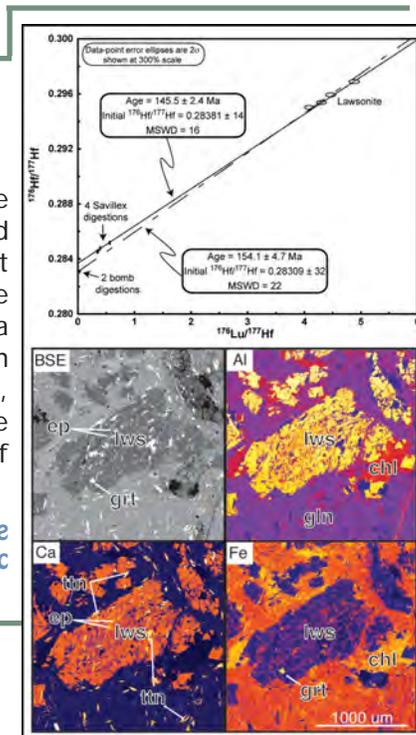
The migration habits of hydrocarbons along structures created by mobile salt (diapirs, salt walls, welds, etc.) are key to exploration success but are very poorly understood. Former UNLV Geoscience M.S. student, Sam Hudson, and his advisor, Dr. Andrew Hanson, published the lead article in the March 2010 issue of the *American Association of Petroleum Geologists Bulletin* related to Sam's thesis research. Using molecular organic geochemistry (biomarkers), they documented the first known occurrence of migrated hydrocarbons adjacent to an exposed salt structure. Their study focused on a weld that crops out in La Popa basin, Mexico, shown in the cover photo for the volume (photo by Hanson, shown on left). Their results provide important new information on how salt structures influence hydrocarbon accumulations. By *Andrew Hanson*

Andrew Hanson, Associate Professor, has been with the UNLV Geoscience Department since 2000. Andrew specializes in sedimentation and tectonics, basin analysis, organic geochemistry, and petroleum geology

First Application of Lu-Hf Geochronology to Dating Lawsonite and Subduction Zone Metamorphism

Blueschist and eclogite facies rocks exposed at the Earth's surface mark the location of ancient subduction zones, where one lithospheric plate has descended beneath another. Geoscience faculty member, Sean Mulcahy, and colleagues at Washington State University published a new method for dating such rocks in the journal *Geology*. They applied Lu-Hf decay scheme to the mineral lawsonite, a critical index mineral of subduction zone metamorphism. They determined an age of 145.5 ± 2.4 Ma for lawsonite blueschist from the Franciscan Complex, CA, the type lawsonite locality. The method provides a powerful tool to investigate processes and timescales of subduction zone processes and the geodynamics of convergent margins. By *Sean Mulcahy*

Sean Mulcahy, Assistant Research Professor, has been with the UNLV Geoscience Department since 2008. Sean's research focuses on structural geology, metamorphic petrology, geochronology, and tectonics



Studying Basalt and Olivine Weathering in the Arctic Mars Analog Environment of Svalbard



Geoscience faculty member, Elisabeth (Libby) Hausrath, and colleagues, in a recent paper in the journal *Astrobiology*, studied basalt and olivine weathering in the arctic Mars analog environment Svalbard. They deployed CheMin, a miniaturized XRD scheduled to fly to Mars on the Mars Science Laboratory, and successfully detected olivine and weathering products in the field. Biological impacts were analyzed by XPS in samples buried for one year, and in long-term weathered samples, the relative dissolution rates of basalt glass and olivine were correlated to temperature, suggesting a relevant marker of different aqueous conditions on Mars. By *Libby Hausrath*

Libby Hausrath, Assistant Professor, has been with the UNLV Geoscience Department since 2009. Libby specializes in soil-forming processes, water-rock interaction, chemical weathering, Mars geochemistry, astrobiology, and geomicrobiology



Geoscience Faculty take in the geology of the White Mountains, CA, during their annual Faculty Retreat (September 2009)

Standing, left to right: Terry Spell, Ganqing Jiang, Andrew Hanson, Sean Mulcahy, Adam Simon, Pamela Burnley, Rod Metcalf, Michael Wells, Mike Nicholl, Libby Hausrath; Sitting, left to right: Scott Nowicki, Steve Rowland, Gene Smith, Zhongbo Yu

Dr. Kreamer Goes to Washington... and Iraq!

By *Dave Kreamer*

Dave Kreamer was in Washington, DC several times in the last year. He was invited to the National Academy of Sciences to address the International Hydrologic Programme of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), about international cooperation in water and sanitation programs in the developing world. On another visit, Dave was asked to give testimony before Congress concerning the effect of uranium mining in the Grand Canyon. In the 1990's, Dave and his research group discovered high uranium concentrations in Horn Creek Spring water, below Orphan Uranium Mine on the Rim. These concentrations were over three times the U.S. Environmental Protection Agency's limit (MCL), prompting a Superfund cleanup on the canyon's rim that discovered high uranium concentrations in soils around the old mine site, and cost about 15 million dollars. Dave's testimony is in the Congressional Record.



Dave visits the Nation's Capitol

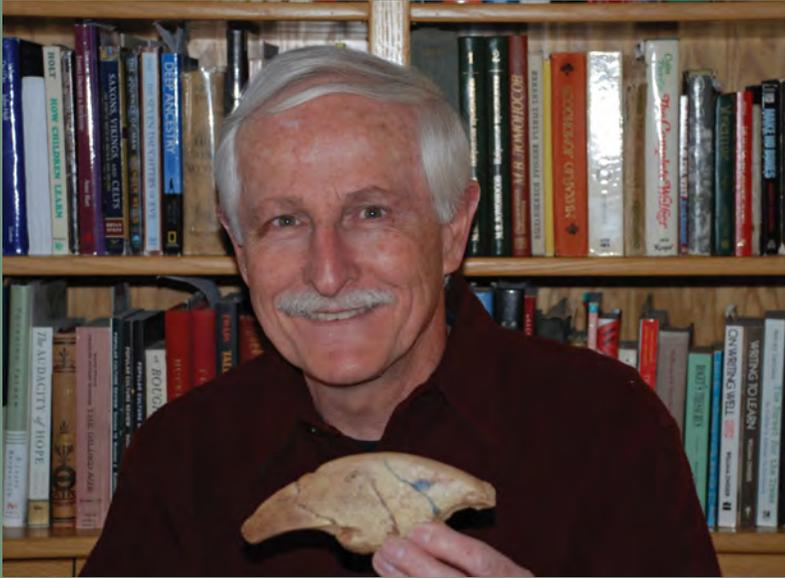


Dave dons his protective gear in Iraq

Dave Kreamer, Professor of Geology, has been with the UNLV Geoscience Department since 1990. Dave's research focuses on hydrogeology, and contaminant transport by groundwater

Dave Kreamer presented a 5-day water quality short course in Baghdad, Iraq in this last year. The presentation was to the Iraqi Ministry of the Environment as part of a U.S. State Department sponsored program, through the U.S. Civilian Research and Development Foundation. Part of the purpose of the program is to take former weapons scientists, or people who could become weapons scientists, and train them to become effective environmental scientists. Water quality measuring equipment, obtained for and demonstrated during the short course, was donated to the Ministry.

Steve Rowland Explores the Connection Between Thomas Jefferson's Religion, His Birth Order, and His Difficulty Accepting the Concept of Extinction



When he's not working on fossils, Dr. Steve Rowland researches the history of geology. Lately, he's been looking into Thomas Jefferson's views on extinction. Dr. Rowland's research on Jefferson was recently published as a chapter in the Geological Society of America's *Memoir 203: The Revolution in Geology from the Renaissance to the Enlightenment*. Here is a brief summary of Dr. Rowland's chapter. If you would like to read more, Dr. Rowland would happily send you a pdf or a hard copy of the entire chapter. Contact him at steve.rowland@unlv.edu

President John F. Kennedy once hosted a dinner for Nobel laureates, and he quipped: "There has never been a greater concentration of intellectual power here at the White House since Thomas Jefferson dined alone." This quote nicely captures Jefferson's reputation as a brilliant intellect, so it's a surprise to learn that he had a very difficult time accepting a concept that everyone accepts today - the idea that species of animals and plants sometimes become extinct.

The concept of extinction was legitimized by French anatomist Georges Cuvier in the early nineteenth century. It is well known that Jefferson and others did not immediately embrace the idea, but the strength and duration of Jefferson's resistance, compared to his contemporaries, has not previously been examined in detail. Cuvier had studied the bones of large mammals, such as mastodons and giant ground sloths, and he argued that these animals must be extinct. Dinosaurs had not yet been discovered, so dinosaur fossils did not play a role in the establishment of extinction as a recurring phenomenon. Prior to the work of Cuvier, most people believed that all animals and plants had existed since the time of the Creation, more or less as they appear today, and they believed that nature is complete and perfect. That was how Jefferson viewed the world throughout his life.

Extinction as a recurring natural phenomenon was not compatible with this "completeness-of-nature" worldview, but Cuvier's publications persuaded many American and European intellectuals that extinction was real. By about 1810 the completeness-of-nature worldview had lost most of its former adherents. For some

Americans the acceptance of extinction coincided with the return of the Lewis and Clark expedition in 1806. Prior to that time it was easy to imagine that mastodons and giant ground sloths were living in the unexplored American wilderness. President Jefferson, in fact, instructed Meriwether Lewis to be on the lookout for such animals. When Lewis and Clark returned from the Louisiana Territory without seeing mastodons and giant sloths, it was hard to argue that they were not extinct. However, in spite of Lewis and Clark's disappointing news, Jefferson continued to hold out. Dr. Rowland cites a letter written by Jefferson in 1818, in which he wrote: "It might be doubted whether any particular species of animals or vegetables which ever did exist, has ceased to exist." By 1818, except for Jefferson and some biblical literalists, nearly everyone had come around to the idea that species do indeed become extinct, and the completeness-of-nature worldview was dead. Five years later, two days before his eightieth birthday, Jefferson finally acknowledged the occurrence of extinction—in rare cases—in a letter to John Adams. But even then, Jefferson did not abandon his completeness-of-nature worldview.

Dr. Rowland proposes two factors to explain Jefferson's protracted resistance to the concept of extinction, and his inability to relinquish his obsolete worldview. One factor was Jefferson's strong religious and emotional commitment to the completeness-of-nature worldview, and the fact that he had aggressively argued against extinction in two of his publications. As a young man, Jefferson had rejected Christianity, but he remained devoutly religious throughout his life. Certainly one factor that contributed to Jefferson's difficulty with

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Playing Around With Geology

By Denise Honn

Denise Honn is a Ph.D. student working with Dr. Gene Smith on her research project, *Linking a Volcanic-Plutonic System in the River Mountains and Wilson Ridge Pluton.*

The Playground

The Bureau of Land Management (BLM) has created a new National Conservation Area (NCA) in the northern McCullough Mountains. This new park, the Sloan Canyon NCA, is right on the southern edge of the city of Henderson. The main goal of the park is to preserve the high concentration of petroglyphs in Sloan Canyon, but the NCA also offers spectacular Miocene volcanic terrains. There are five distinct volcanic centers including a classic caldera, stratovolcano, lava flows, domes, and cinder cones. You can find everything from basaltic bombs to dacitic ash-flow tuffs within a short hike. The NCA is a volcanologist's playground. So, how can we share this spectacular volcanic landscape with the public? How can we get the public to understand the importance of the geology? How do we get the public to connect with the Park so that they will actively want to protect it?

The Sloan Canyon NCA Geology Travelling Trunk project aims to help answer these questions. The Travelling trunk is a series of geology lesson plans with examples of rocks and landforms from the NCA. The goal of the trunk is to bring the spectacular volcanic geology of the NCA to Clark County middle school classrooms, teaching basic geology lessons by highlighting NCA volcanism.

The Parents

The Geology Travelling Trunk project has three parents: UNLV, BLM, and Clark County teachers. As a Research Assistant, I have a contract with the BLM to help with the interpretation of the Sloan Canyon NCA geology. My personal goals for this project are to find funding for geoscience in the NCA and to increase public awareness in the local geology. The BLM's goal for this project is conservation. They have focused on the interpretation of the geology as a way to get the public connected to the NCA through curiosity and understanding. If people feel a personal connection with the NCA, they will want to protect it. Clark County middle school teachers see the Travelling Trunk as an

opportunity to teach earth science in a new and engaging way.

Playground Equipment

The Travelling Trunk includes everything a teacher would need to teach introductory geology. With the input of the BLM and Clark County teachers, I have created 11 lesson plans and activities including (1) geologic time, (2) tectonic plate motions, (3) tectonic plate interactions, (4) the rock cycle, (5) mineral identification, (6) rock identification, (7) volcanoes, (8) volcanoes of Sloan Canyon NCA, (9) faults and folds, (10) stratigraphy, and (11) geologic maps. Each lesson begins with lists of the teaching objectives and the Nevada State Teaching Standards that are covered. These lists are designed to help teachers decide which lessons they want to teach. The lessons can be taught individually or as part of a series. Detailed teacher Background sections review basic geology and include supplemental information about the NCA. The activities begin with the question: "what do YOU think?" Students are asked to brainstorm on an idea. For example, "Why do some volcanoes erupt with a huge explosion, throwing ash miles into the atmosphere, and others just quietly pour lava out onto their flanks?" The goal of these student-led discussions is to interest students in the topic so that they become actively engaged in the lesson. The teacher does not give them the answers, but leads them in the right direction so students can come to their own conclusions. Teachers use examples from the NCA in order to help lead them in the right direction.

Play Dates

I am not a middle school teacher. I do not know what concepts are appropriate and interesting to middle school students. In order to figure this out, I talked to middle school teachers, read through the Nevada State Teaching Standards, talked to more teachers, and talked to parents of middle school students. Afterwards, I realized that I was asking the wrong people. If I want to know what interests middle school students and how to teach them different concepts, I should ask them directly.

Continued, Page 12

Steve Rowland, Continued

the concept of extinction was his unshakable belief in a benevolent, providential God who would not have created a species and then allowed it to go extinct.

Dr. Rowland suggests that a surprising second factor was Jefferson's birth order. Other studies have shown that birth order is a strong predictor of a person's receptivity to radical ideas, both political and scientific. Jefferson was the eldest son in his family, and his father died when Thomas was fourteen years old, requiring him to take on adult responsibilities. Firstborn children tend to identify closely with their parents and authority, resulting in distinctive personality traits, including a resistance to radical ideas. One birth-order study examined over four hundred people in the nineteenth century and their views about Darwin's theory of evolution. Laterborns, it turned out, were over four times more likely to accept Darwin's ideas than were firstborns. Dr. Rowland proposes that Jefferson's experiences as an eldest son contributed significantly to his personality traits, including his resistance to a new worldview.

This birth-order phenomenon does not mean that laterborns are inherently better scientists than are firstborns. However, scientists who are firstborns are much more likely to make breakthroughs of a technical nature than to propose a radical new idea. James Watson and Francis Crick, for example, who received the Nobel Prize for discovering the structure of DNA, were both firstborns. Dr. Rowland suggests that Thomas Jefferson was a Watson-and-Crick-type scientist. He was very clever at inventing gadgets and improving the designs of other people's inventions, but he had no flair for bold new scientific ideas. With respect to Jefferson's role in the American Revolution and his authorship of the Declaration of Independence, he was skillfully adapting ideas of the European Enlightenment to the American political landscape, but he was not developing radical new ideas of his own.

If there is a moral to this story, it is that a person's fundamental worldview is usually lithified early in his or her life, and it very rarely changes, even in the face of evidence that it is wrong. Whether it be extinction, evolution, UFOs, or anthropogenic climate change, once a person is certain that a phenomenon does or does not occur, it's a herculean task to get them to view the world differently, even if they dine alone at the White House. It's not about the evidence, it's all about the worldview. *By Steve Rowland*

Denise Honn, Continued

Kathe Brenner, a fifth grade teacher at Solomon Schecter Day School, agreed to let me use her class of fifth graders as a test group. I have been taking one lesson at a time to her classroom to try it out. This has been my favorite part of the project. I have to admit I probably learn

more from these play dates than the students do. I am always amazed at how much interests them and how excited they get about difficult concepts.

During my first visit to Kathe's class, we went through the lesson on volcanoes. The main objective of this lesson is to understand how the shape and explosiveness of a volcano is related to the composition of the magma and its viscosity. These are concepts that I didn't fully understand until I took a graduate level course in volcanology, so I thought I might be going over their heads. I couldn't have been more wrong. Student curiosity and questioning lead me to an impromptu demonstration on the polymerization of magmas and how viscosity is affected by network formers and breakers.

I had groups of four students hold hands to form "network chains" and try to move around the classroom. The "chains" were difficult to move around with chairs, desks, and other "chains" in the way. I then used "network formers" to link the chains together. These longer chains are very hard to move around (very viscous). Then "network breakers" (like water and carbon dioxide) shortened the chains down to two students each. These short chains are really easy to move around (low viscosity). Impromptu demonstrations like this really help me find out what students find interesting and what the lesson plans are missing.

I have learned several key things from my play dates with Kathe's class: (1) Students like to get their hands dirty. Being actively involved with the lesson keeps them engaged and focused. Even if it's as simple as doing long division on the white board. (2) Students are interested in the same things that interest me. I get excited talking about my favorite topics, and students pay more attention when I share my energy. (3) Fifth graders are smart. It is better to tell them the whole complicated story than try to simplify concepts. (4) Students learn by doing, asking their own questions, and coming to their own conclusions. They don't learn from lectures. Everything that I learn from the experiences with Kathe's class I try to incorporate into the lesson plans. I want to make the trunk as useful to teachers as possible.

Playing Well With Others

The next step for the Travelling Trunk project is to see if the updated lessons will work well in larger public school classrooms. Will I need more materials? Will it be harder to work with a larger group? Will I need an assistant? The final step will be to put the Trunk in practice with teachers leading the lessons instead of me. I will be in close contact with the first few teachers so that I can get feedback on what extra information they may need. I am also in the process of designing an assessment plan. I want to know what teachers and students think of the Trunk so that I can make it better.

Working on the Sloan Canyon NCA Travelling Trunk project has taught me that work can feel more like playtime if you let yourself enjoy it.

Haroldo Lledo Bids Farewell After Four Years With The Department

By Haroldo Lledo



Hi, I am Haroldo Lledo, a post-doctoral scholar that has been working at UNLV for the past 4 years. Time has gone fast and, after almost 10 years in the USA, I feel the need to reconnect with my family, friends, and my beloved country, Chile. First, let me say that it has been a great experience for me and my family to live in the USA, and I am very grateful to Binghamton University, where I received my PhD, and to UNLV. On the professional side, being a post-doc at UNLV was a great experience because it not only allowed me to continue doing

research, but also gave me the opportunity to teach, and share a few things with some of you - mostly Lora Griffin and Valerie Tu, and lately with international visitor Gökham Demirela, and international visiting researcher Safak Altunkaynak, both from Turkey.

When I first arrived at UNLV, I started work on a research project about the origin of the low sulfidation epithermal deposits of the Searchlight mining district and their genetic link with an underlying granitic pluton. In parallel, I participated in the initial stages of the Walking Box Ranch project, a long lived project directed by Professor Jean Cline, that soon will become a multidisciplinary research station that will be used by the entire UNLV community. Just before I came to UNLV, I participated in NSF-funded expedition 309 of the Integrated Ocean Drilling Project (IODP) to drill and investigate a complete section of the oceanic crust. This group effort resulted in a very exciting *Science* publication in which I was lucky to be included. At UNLV, I worked on samples that I collected onboard the ship, and my research proposal was awarded ~\$26,000. Subsequently, Professor Jean Cline and I finalized a two-year research project on the Searchlight mining district, in which we studied low sulfidation epithermal systems. I really appreciate the experienced input of Professor Jean Cline who has been a great advisor. From this work, we published several GSA abstracts, one abstract for the XIX ECROFI meeting in Bern, Switzerland, and one *Economic Geology* article that will be coming up soon. Before the end of this project, Professor Jean Cline and I submitted a research proposal to the USGS to study melt inclusions within the Searchlight pluton to better understand the pluton evolution, metal budgets, and the link with the mineralization. I am proud to say that this project was awarded the amount of ~\$112,000. I also conducted a field trip for the Geological Society of Nevada in which we visited the most important deposits of the Searchlight mining district and a few easy access outcrops of the Searchlight pluton. During these 4 years, I was also given the opportunity to be one of the Electron Microprobe laboratory managers in conjunction with Ph.D. student, Aaron Bell, for about 6 months to fill the void left by a departing lab manager. Since Dr. Adam Simon was congratulated for our work, it just seems fair to say that we did a good job, and I am glad to see that the probe lab is now in the expert care of Dr. Sean Mulcahy. Currently, I am working on fluid inclusions from the Turquoise Ridge deposit in northern Nevada, which is part of a bigger project related to the ore fluid pathways in Carlin gold deposits, in the largest gold district in the USA.

I am especially thankful to Professor Jean Cline who shared her extensive knowledge and taught me immensely about ore deposits, fluid inclusions, writing techniques, and life in general. I want to thank Professors Michael Nicholl and Kim Johnson who provided me advice when needed. I want to thank Dr. Clay Crow for his help with all the research equipment, and Maria, Liz, Kathryn, and all the student workers for their help with the administrative paperwork. I want to thank all the professors that shared their precious time with me and had their doors open, and all the students who shared a word with me.

Well, it is time to say good-bye, good luck to you all. Thanks for everything!



Alumni News

By Andrew Hanson

In late December, 2009, several alumni of the Geoscience Department met with Dr. Andrew Hanson in Houston, Texas. Andrew was visiting collaborators in Houston at the time and made arrangements to meet with alumni while there. Although a few alumni were unable to attend, many made it to the function which was held at Beaver's Restaurant near downtown Houston. Those who were able to attend are pictured to the left, and include (first row, from left to right): Danielle Sherrett-Czarnomski (formerly Danielle Villa; BS-2003, MS at UNR), Robyn Howley (ABD), April Azouz (MS-2006), Nate Suurmeyer (MS-2007), Tonia Arriola (BS, MS-2008), Ernesto Moran (BS, MS-2007), Jenn Barth (BS-2007), Lauren Izzo (non-geology UNLV bach-

elor's degree), Mike Howell (MS-2009), Kim Johnson-Howell (former Faculty-in-Residence), Darlene McEwan Zybala (MS-2005); (back row, from left to right): Ilsa Schiefelbein Kircher (MS-2002), Holly Langrock Novak (MS-1995), Sam Hudson (MS-2004; PhD-University of Utah), Jonathan Zybala (MS-2004), and Andrew Hanson. Other alumni that are currently living in Houston but were unable to attend include Sandra Saldana (BS, ABT New Mexico Technical Institute), Aaron Hirsch (ABT), Shelley Zaragoza (BS, MS-2007), Peter Druschke (MS, PhD-2009), and Michelle Williams Warner (MS-2003). The majority of the alumni in Houston are employed by ExxonMobil; other employers include the University of Houston Graduate Program (Jenn), ConocoPhillips (Sam), Noble Energy (Sandra), Royal Dutch Shell (Nate), and ENI Petroleum (Michelle). It was great seeing all of our former students, and some of them even had exciting news! Kim and Mike were expecting their second child, and Ilsa is currently working in Lagos, Nigeria, but she happened to be in Houston for training. If we missed you, please let us know of your whereabouts - you never know when someone from the Department may be in your town to host a get together!

Congratulations Graduate Degree Recipients: Spring 2009 - Spring 2010

- **Aillaud, Brian, 2010.** *Using Fluid Inclusions to Trace Formative Fluid Evolution at the Verde and Pancho Porphyry Au Deposits of the Refugio District, Chile* [MS Thesis]. Advisor: Adam Simon
- **Bell, Aaron, 2010.** *An Experimental Investigation of Chemical Mass Transfer Processes in Crystallizing, Hydrous Silicate Magmas: The Genesis of Ore Deposits and Metasomatic Fluids* [PhD Dissertation]. Advisor: Adam Simon
- **Druschke, Peter, 2009.** *The Sheep Pass Formation, a Record of Late Cretaceous and Paleogene Extension Within the Sevier Hinterland, East-Central Nevada* [PhD Dissertation]. Advisor: Andrew Hanson
- **Forrester, Steven, 2009.** *Provenance of the Miocene-Pliocene Muddy Creek Formation near Mesquite, Nevada* [MS Thesis]. Advisor: Andrew Hanson
- **Howell, Mike, 2009.** *Mineralogy and Micromorphology of an Atacama Desert Soil, Chile: A Model for Hyperarid Soil Genesis* [MS Thesis]. Advisor: Brenda Buck
- **Howley, Robyn, 2009.** *Sequence and Chemostratigraphy of the Middle Cambrian Succession in Nevada and Utah* [PhD Dissertation]. Advisor: Ganqing Jiang
- **Kosmidis, Paul, 2009.** *Sequence and Chemostratigraphic Study Across the Basal Eureka Quartzite Unconformity in the Great Basin, Nevada: Implications for the Origin of the Late Middle Ordovician Carbon Isotope Excursion* [MS Thesis]. Advisor: Ganqing Jiang
- **Magill, Meaghan, 2009.** *Geoelectrical Response of Surfactant Solutions in a Quartzitic Sand Analog Aquifer* [MS Thesis]. Advisor: Dave Kreamer
- **Maglio, Steve, 2009.** *In Situ Element Quantification in the Hydrothermal Diamond Anvil Cell Using Synchrotron X-Ray Fluorescence with Applications Toward Subduction Zone Processes* [MS Thesis]. Advisor: Adam Simon
- **Nie, Wenming, 2009.** *Effects of Plant Water Uptake and Micro-Topography on Water Flow and Solute Transport in Arid Soils* [MS Thesis]. Advisor: Zhongbo Yu
- **Pan, Feng, 2009.** *Uncertainty, Sensitivity, and Geostatistical Studies of Flow and Contaminant Transport in Heterogeneous Unsaturated Zone* [PhD Dissertation]. Advisor: Zhongbo Yu
- **Robins, Colin, 2010.** *Phyllosilicate Mineralogy, $^{40}\text{Ar}/^{39}\text{Ar}$ Geochronology, and Genesis of Petrocalcic Soils in the Southwest U.S.A* [PhD Dissertation]. Advisor: Brenda Buck
- **Tibbetts, Ashley, 2010.** *Petrogenesis of the Greenwater Range, Comparison to the Crater Flat Volcanic Field, and Implications for Hazard Assessment* [MS Thesis]. Advisor: Gene Smith

Dear Alumni and Friends:

We would like to take this opportunity to thank those of you who have supported the Geoscience Department since our last newsletter, and in previous years. In these difficult budgetary times, the UNLV Geoscience Department is, more than ever, reliant on our alumni and friends to help us sustain our strong teaching and research activities, and embrace emerging opportunities. Alumni, parents, employees, and friends have supported the Geoscience Department through gifts to specific scholarships, attendance at campus events, and contributions to building funds. Your gifts to academic and student-centered programs have made the difference in transforming the Geoscience Department into a top rate institution of geological research and advancement; students and scholars from around the world come to the UNLV Geoscience Department to discover the past, shape the present, and create the future. We cannot thank you enough for helping to make this possible.

Our department values the ongoing relationships we have with many of you and we will continue to provide you with opportunities to be interconnected. Please write or email and tell us about your latest accomplishments and adventures. We also invite you to visit us here on campus, as we would love to see you and show you what is new in the department. While many of the faces here have changed over time, you would find some recognizable denizens of the Lilly Fong Geoscience building, and certainly, a recognizable community of colleagues.

For more information on how your gift can help the Department, please contact:

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You can also visit the Geoscience Department website for further information: <http://geoscience.unlv.edu/supportgeoscience.htm>

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Many THANKS for your past and continuing support!

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We look forward to hearing from you!