UNIVERSITY OF WYOMING
Department of Geology and Geophysics

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PROFILE

Inside

GEOLOGY & GEOPHYSICS

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FROM THE DEPARTMENT HEAD

Greetings from the Department Head's office—a site that I occupy but don't call home. This fall brings a brand new administration to the University of Wyoming, including a new president, vice president, and many new deans as well. As such we are in uncharted administrative waters, but I must say the new Dean of Arts and Sciences has been very supportive of the Department. In addition, the new Dean of Engineering and Applied Sciences has actively engaged with our department as well. As a result we are formulating new courses for engineering students and more of our faculty are developing projects with faculty in both Petroleum and Civil Engineering.

As of this fall, we have a new faculty member in our geophysics group. **Dario Grana**, who recently graduated from Stanford University, comes to us through the auspices of the School of Energy Research. His background includes a stint working for ENI Exploration and Production Company in Italy and his specialty is in mathematical modeling for reservoir characterization. His position is split with the Department of Petroleum and Chemical Engineering. With this hire and another new hire coming this spring, the size of our geophysics group has greatly expanded over the past few years.

Some of you may be aware that over the past few years the Department's main lecture hall, room 216, had been derelict related to handicap access issues. Those of you of a certain generation know this room as where Sam Knight, and others, taught his classes. I am pleased to say that, thanks to funding from the University, the lecture hall has been entirely renovated. The only remnant from Knight's era are the wooden chairs, designed before the term *ergonomic* had been invented. This reminds me, are you aware that you can download a movie of Sam Knight lecturing on the geology of Wyoming? Links to that lecture are found at the end of this letter. If you can't access the movie, just let me know and I can send it to you on a DVD.

We are still in the planning stages of an alumni event at next spring's national meeting of the AAPG in Houston. At the moment we are planning a stand-alone event the Friday or Saturday evening before the meeting starts. We will be sending out invitations in early spring, but we have found that some names have fallen off our radar. So please, if you live around the Houston area and/or plan to attend AAPG, I'd be much obliged if you let me know so we are sure you receive an invitation.

Lastly, I want to thank all of you who have donated to the Department during the past year. The generosity of our donors has made us the envy of the College of Arts & Sciences. The money is primarily used to support student activities—field trips, student research and/or enhancements to our course offerings. Please know how much we are obliged to you all.

For access to Sam Knight's lecture, go to http://www.uwyo.edu/ahc/collections/digital.html. Once there find where the *Digital Collections website* is highlighted, click on it and then type in "Samuel Knight talk" in the search box. ❖

UW'S HOLBROOK RECEIVES OCEANOGRAPHY HONOR

University of Wyoming Professor **Steve Holbrook** has received one of the Oceanography Society's most prestigious honors.

Holbrook, UW Department of Geology and Geophysics faculty member, is the 2013 recipient of the Walter Munk Award for Distinguished Research in Oceanography Related to Sound and the Sea.

The Oceanography Society has presented this award every two years since 1993 to recognize significant original contributions to the understanding of physical ocean processes related to sound in the sea; significant original contributions to the application of acoustic methods to that understanding; and outstanding service that fosters research in ocean science and instrumentation.

A media release from the Oceanography Society calls Holbrook "the father of the new field of 'seismic oceanography.'"

"His use of low-frequency seismic reflection profiling to image the water column has provided quantitative and novel insights into the structure and dynamics of internal waves, eddies and mixing processes," the release says. "With his innate and relentless curiosity, he has provided unprecedented views of the internal workings of the ocean. His generous collegiality has also been a stimulus to the formation of an interdisciplinary seismic oceanography community."

During the course of his career, Holbrook has studied topics as varied as continental breakup, volcanism and continental growth, physical oceanography and methane hydrates—on research cruises in such far-flung places as Greenland, Iceland, Norway, Newfoundland, Alaska, Costa Rica and New Zealand.

Seismic oceanography, which he developed, is considered a new type of research in the world of seismology. Holbrook was elected a Fellow of the American Geophysical Union in 2012.

Holbrook played a key role in securing a five-year, $20 million grant award from the National Science Foundation to UW's Experimental Program to Stimulate Competitive Research (EPSCoR). The grant, the largest in UW's 126-year history, will support wide-ranging research of regional water issues. As part of the grant, the Wyoming Center for Environmental Hydrology and Geophysics (WyCEHG), a multidisciplinary center, was established at UW in July 2012. Holbrook is serving as co-director of the center.

The Munk Award is presented jointly by the Oceanography Society, the Office of Naval Research and the Office of the Oceanographer of the Navy. Holbrook will receive the award during the 166th meeting of Acoustical Society of America in San Francisco in December, and he will also be recognized during the Ocean Sciences Meeting in Honolulu, Hawaii, in February. He will give presentations at both meetings.

Professor Steve Holbrook is the 2013 recipient the Walter Munk Award for Distinguished Research in Oceanography Related to Sound and the Sea from the Oceanography Society. (UW Photo)

The Oceanography Society was founded in 1988 to disseminate knowledge of oceanography and its application through research and education, to promote communication among oceanographers, and to provide a constituency for consensus-building across all the disciplines of the field. ❖

UW'S RANDI MARTINSEN PRESIDENT-ELECT OF WORLD'S LARGEST INTERNATIONAL GEOLOGICAL ASSOCIATION

Members of the American Association of Petroleum Geologists (AAPG) have chosen University of Wyoming Senior Lecturer **Randi Martinsen** as the organization's incoming president-elect. She will assume the president-elect position July 1 and the president's position July 1, 2014.

Martinsen is the first UW Department of Geology and Geophysics faculty member and only the second woman to serve as president of the 37,000-member organization, the world's largest international geological association. She says, as president, she will emphasize that AAPG is critically important to advancing applied geoscience.

"I want AAPG to continue to foster and educate young geoscientists so that our global societies can prosper and young people around the world can have the fulfilling experience I have

had," Martinsen says. "This is a scientifically exciting time in the petroleum industry, and high-quality continuing education is vital to maintaining our highly competent workforce."

AAPG's top function, she says, is to be the go-to place for innovative technical information via publications, conferences and other continuing-education activities and, most importantly, through mentoring young professionals.

"It is important that we mentor the next generation and share with them our scientific and treasure-hunting skills," Martinsen says." I want to provide young geoscientists everywhere with the opportunities I had. I believe AAPG will prosper from the infusion of a global population of younger geoscientists."

Her enthusiasm and passion for her profession are obvious.

"I'm very proud of being a petroleum geoscientist, and I want to promote awareness of our highly technical profession as well as our crucial role in providing the energy that fosters society's well-being," she says. "The public needs to better understand our energy problems/choices and the associated benefits/costs of various energy policy options. AAPG also has a role to play ensuring that obtaining our global energy needs are met in an environmentally sustainable manner."

As president-elect and president, Martinsen will travel extensively—both domestically and internationally—promoting the AAPG and the importance of petroleum geoscience to society.

Senior Lecturer Randi Martinsen will lead the 37,000 members of the American Association of Petroleum Geologists. (UW Photo)

Martinsen has held numerous AAPG positions, including treasurer, since joining the organization in 1973. In 2009, she received the AAPG Distinguished Service Award. She created and has chaired the Rocky Mountain Rendezvous of Geoscience Students and Employers (RMR) for the past 12 years. The RMR is a job fair sponsored by the AAPG and the Society of Exploration Geophysicists, and hosted by UW's Department of Geology and Geophysics and the School of Energy Resources. Last year, 25 companies and more than 350 students from across the United States attended the UW event.

A UW faculty member since 1981, Martinsen received a Bachelor of Science degree (1971) in earth and space science at State University of New York-Stony Brook and a Master of Science degree (1975) in geology at Northern Arizona. ❖

UW RESEARCHER'S TECHNIQUES HELP SOLVE MARTIAN METEORITES MYSTERY

A University of Wyoming research professor has helped solve the question of how old Mars meteorites are and when volcanism actually occurred on the red planet.

Kevin Chamberlain, a research professor in UW's Department of Geology and Geophysics, used newly developed mineral-dating techniques he created to determine the age of volcanism on Mars at 200 million years ago, as well as the timing of a large-impact event 22 million years ago that launched rocks off the surface of Mars. The rocks eventually fell to Earth as meteorites.

Chamberlain is one of seven co-writers of a research paper, titled "Solving the Martian Meteorite Age Conundrum Using Micro-Baddeleyite and 'Launch-Generated Zircon'," that was published in today's issue of Nature, an international weekly journal of science that publishes peer-reviewed research in all fields of science and technology.

"The combination of techniques allowed us to determine the magmatic age of the lava on Mars as well as the time that the sample was launched into space by a bolide impact," Chamberlain says. "Our results also solved an ongoing debate about the age of magmatism that most Martian meteorites appear to have sampled."

New frontiers

Chamberlain developed the new dating technique at UW with **Norbert Swoboda-Colberg**, a lab technician in the UW Department of Geology and Geophysics, and **Susan Swapp**, a senior research scientist, also in geology and geophysics.

The dating technique required the use of a specialized instrument called a secondary ionization mass spectrometer or SIMS, of which only three exist in North America, Chamberlain says. The instrument analyzes a mineral sample by excavating microscopic pits (about 1 micron deep by 20 microns in diameter) in the rock sample and analyzing the isotopic compositions of the excavated material. For scale, the diameter of a human hair is roughly 100 microns, Chamberlain says.

Using a SIMS instrument at UCLA, Chamberlain analyzed 18 different crystals of the minerals baddeleyite and zircon. All 18 were found within a 20-millimeter square (roughly three-fourths of an inch) region of a polished surface of the meteorite. Both minerals are major reservoirs for uranium in meteorites.

The large crystals are each less than 15 microns in length, too small to separate physically from the rock. The new dating technique locates the grains using electron beam imaging instruments, and then analyzes them in-situ without needing to break the rock apart.

Using the mass spectrometer, Chamberlain measured the ratio of lead to uranium, which allowed him to calculate the age of the meteorite grains.

"We solve the (age) conundrum by determining the degree of shock-induced strain within the crystals, using in-situ electron nanobeam instruments at the University of Western Ontario," he says. "By combining microstructural analysis with uranium/lead isotopic measurements in the same crystals, we established both the age that the rock formed and the time it was launched off the surface of Mars."

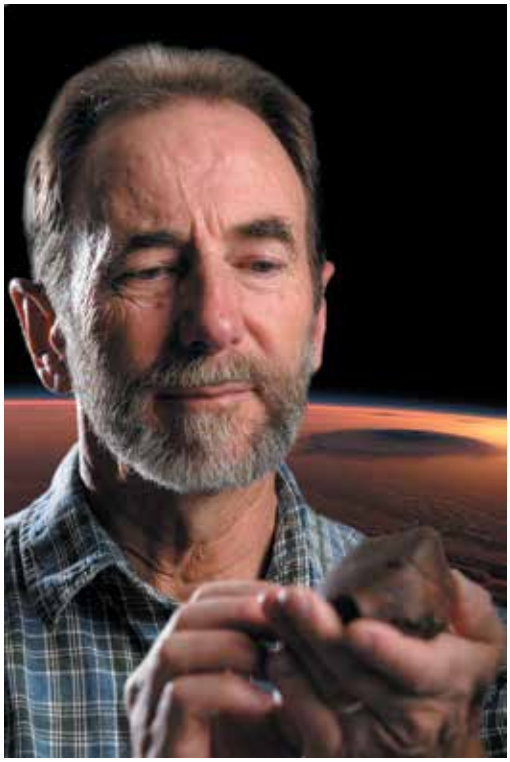
Chamberlain says both techniques are relatively non-destructive, which made their use ideal for meteorite samples. Outside of the excavated pit, the rest of the sample remained intact.

The project was partially funded through a faculty research grant Chamberlain obtained from the Wyoming NASA Space Grant Consortium. Meteorite samples were loaned by the Royal Ontario Museum in Toronto. Scientists from UW, the University of Western Ontario, UCLA and the Royal Ontario Museum collaborated on the project.

Mars attacks

To date, 65 samples of Martian meteorites have been discovered on Earth. Many were found in either Antarctica or the Sahara Desert, Chamberlain says. In those two places, there are broad plains with no mountains above the ice or sand—which means that, if any rock is found on those surfaces, it had to come from space, Chamberlain explains. There are many different types of meteorites, but these 65 have bits of Martian atmosphere trapped within them, he says.

"The 65 samples are basaltic compositions," he says, noting it's the same material found on the ocean floor or on the surface of the moon. "The fact that they're (meteorites) all so similar in composition begs the question, because a lot of



Research Professor Kevin Chamberlain is a co-author of a paper that appeared in *Nature*. Chamberlain used newly developed mineral-dating techniques he created to determine the age of volcanism on Mars at 200 million years ago, as well as the timing of a large-impact event 22 million years ago that launched rocks off the surface of Mars. (UW Photo)

Mars is not basaltic. NASA's rovers are looking at sandstones for evidence of water and streams, for example. The surface of Mars has a lot of variety."

However, the large volcano on Mars is basaltic in nature. Other researchers have speculated that many of the Martian meteorites were a result of a few large bolide impacts on a lava flow on the flanks of that volcano.

The 200-million-year age of volcanism from these newest research findings challenges previous research methods that interpret the ages of ejected igneous crust from Mars to be as old as 4 billion years, which would mean that the planet's volcano would have been extinct for a long time, Chamberlain says.

"The eruption formed the lava. Rocks crystallized and formed during the volcanic eruption," he says. "If we can determine when the rocks crystallized from the lava, we are dating one of the eruptions of the volcano. Having evidence that Mars was geologically active fairly recently is a pretty big deal."

Chamberlain says the timing of the large-impact event is between 22 million and 2 million years ago.

"It (the meteorite) hit Mars hard enough that part of the planet's surface escaped and entered interplanetary space," he says. "During millions of years, some of it's been caught by the Earth's gravity."

Chamberlain presented results of the group's research at an invited talk at the Goldschmidt 2012 International Geochemistry Conference in Montreal last summer, and at UW's Department of Physics and Astronomy colloquium this past spring.

"We plan to apply these techniques to additional meteorites from Mars, the moon and several asteroids to gain a better understanding of the evolution of the solar system," he says.

For a look at a video of the research—provided by Desmond Moser from the University of Western Ontario, the paper's lead author—go to http://communications.uwo.ca/media/agepuzzle/. ❖

UW GEOSCIENCE STUDENTS IN DEMAND AT ROCKY MOUNTAIN RENDEZVOUS JOB FAIR

Growing up in Houston, Texas, **Karen Aydinian** remembers her father, a petroleum geologist, working with few female geoscientists in what was then a predominantly male business. Today, about one-half of such geologists in the industry are women, she says.

Aydinian, a University of Wyoming master's student in geology, is likely to soon join those growing ranks.

She was interviewed for jobs by eight petroleum or oil and gas companies during the Rocky Mountain Rendezvous (RMR) Job Fair, which took place Sept. 27-30 at the University of Wyoming Conference Center and Hilton Garden Inn. The 12th annual fair drew recruiters—many of them UW graduates themselves—from 23 petroleum companies and roughly 375 geoscience students nationwide from 80 colleges and universities. Of that total, 44 were UW students, according to Randi Martinsen, a senior lecturer in geology and geophysics, and the event's founder and coordinator.

The UW Department of Geology and Geophysics and the School of Energy Resources (SER) were co-hosts of the event. The RMR is one of five regional job fairs and is sponsored by the American Association of Geologists (AAPG) and the Society of Exploration Geophysicists (SEG).

"I'm a fracture specialist, and they are hard to find," says Aydinian, who already has three internships with oil and gas companies on her resume. "Basically, I look at natural fractures in the earth and analyze the state of stress. It's crucial for companies involved in hydraulic fracturing. You want the fractures to go in an orientation where the oil and gas will flow up into the well."

In addition to her promising job prospects, Aydinian also placed second in the job fair's poster contest and took home $600.

Garnering face time

Like Aydinian, a number of UW students secured multiple interviews.

Ryan Armstrong, a first-year master's student in geology at UW, was hopeful he would secure an internship after he interviewed with Chevron, ExxonMobil and Marathon.

"I think my biggest strength is that I actually did a double major in geology and physics," the Fort Wayne, Ind., native says of his undergraduate days at Colorado College that included field work in all of his geology courses.

From his interviews, Armstrong said companies appear to have projects they need completed or help with, but no one available to take on these projects. That's why they are looking to interns for help, he says.

Ryan Herz-Thyhsen, a UW graduate student in geology and geophysics from Media, Pa., says he took the approach to just be himself and not oversell his qualifications during his interviews with Anadarko, ExxonMobil and Marathon.

Charles Nye, a UW graduate student majoring in geology, says his plan was to emphasize his communication skills and his ability to complete projects. He also was aware to be flexible, and not be over-prepared with his answers.

"That could result in a person ending up in a company and culture where they don't fit," says Nye, of Laramie. "These companies will be making an investment. They want to hire a good person as well as a good geologist."

Tom McClurg, a geologist with ConocoPhillips who received his master's in geology from UW in 1990, says that is true. During interviews, McClurg describes what it's like working for a larger oil company, where there may be many layers of approval for projects; or a smaller company, where there may be a little more freedom. The candidates can then make informed decisions on what size of company is a better fit for their personality.

He adds that ConocoPhillips has more resources than smaller companies and provides job opportunities overseas in addition to North America.

Finding strong candidates

Like other recruiters, Mark Olson says he finds good candidates at the RMR because most geology students in Wyoming and the Rocky Mountain region have had field experience due to the geology available for study. Olson is manager of sedimentology and stratigraphy at ConocoPhillips.

"We look for candidates with field experience," says Olson, who received his bachelor's and master's degrees in geology from UW in 1996 and 1999, respectively. "We can teach them how to use the software, the tools and the gas industry. We can't teach them fundamental geology."

"We are quite successful here. This is one of our high-profile recruiting events," says Kurt Tollestrup, a senior geophysicist with BP America and a 2000 UW graduate. "There is no

graduate department in the country that has 200 students to choose from in one locale. That's the beauty of the RMR."

Aydinian says it was inspiring to see many of the recruiters were young women. Margie Kloska, a geological adviser for Hess Corporation, was a prime example.

Kloska, who spent the last seven years working as a geologist in Malaysia and Indonesia, as well as managing exploration for Hess in Indonesia, says this was her first time recruiting at the RMR.

"We love coming to UW. The students are well rounded in their skill outside the classroom, and the level of education in the department is very high," says Kloska, who received her master's degree in geophysics from UW in 1999. "I use all of my coursework in my job."

Hess interviewed 18 students, including Nye, at the RMR. In all, Kloska says Hess will look at about 1,300 students—including those interviewed at other job fairs and during visits to universities—to fill 10 available slots.

During his interview, Nye says he provided examples of situations in the lab or field, including those that involved safety, and how he handled them.

"The recruiters asked me to tell them about a situation," Nye says. "They wanted a story, not a list. With the details that fill a story, recruiters get a less canned response."

In addition to on-site job interviews, the four-day event included a vendor expo, receptions, short courses, student poster presentations that included cash prizes; and field trips, including an Anadarko oil rig tour and a visit to the Niobrara Formation, a major shale oil area in northern Colorado and southern Wyoming. ❖

DEPARTMENT NOTES

At the start of the Fall 2013 semester, Associate Professor **Mike Cheadle** and Professor **Barbara John** led a team of eight undergraduate and graduate students from UW that helped direct a remotely-operated submarine while it explored the Caribbean seafloor via satellite link (see http://www.nautiluslive.org). The remotely operated submarine, '*Hercules*', is part of the Sea Research Foundation and Ocean Exploration Trust led by Dr. Robert Ballard—the explorer who found the Titanic. The team's mission was to explore the poorly understood, mid-Cayman spreading ridge in the Caribbean Sea using remotely operated submarines, and to record the operations via live video feeds through the website for the world to share.

The team was charged with running the geology program associated with the cruise from more than 2,000 miles away on dry land at the UW campus in Laramie. The team had real time, 24/7 communications with the team piloting *Hercules* from the *R/V Nautilus*, and had tasks including planning dives, directing rock sampling and recording key observations.

"This was a totally new mode of research for us in Wyoming," says Barbara John. "Yet everyone involved jumped right in, got the methods down quickly, helped coordinate and stand watches, and proved to be outstanding collaborators with research scientists and crew on the ship and dispersed biologists and chemists across the U.S., U.K., and Mexico."

Austin Heller, an undergraduate at the Department, commented, "Awesome! I must say, this is the most exciting end to a summer and start of a school year I have ever had."

Assistant Professor **Cliff Riebe** has recently received three National Science Foundation grants in the amount of $527,410 to fund two research projects and one international workshop.

The first grant, titled "Southern Sierra Critical Zone Observatory," is part of a $5 million, multi-institutional, cross-disciplinary study of weathering and the hydrologic cycle in California's most prominent mountain range, the Sierra Nevada. This will help support the work of graduate student **Heather Rogers** (PhD).

The second grant, titled "Collaborative Research: Spatial variability in eroded sediment size and geomorphic processes inferred from detrital thermochronometry and cosmogenic nuclides," will support groundbreaking work on combining cosmogenic nuclides and detrital thermochronometry. This will help support the work of PhD student **Claire Lukens**.

The third grant, titled "NSF Workshop: Drilling, Sampling and Imaging the Depths of the Critical Zone," supported an international workshop in Denver, Colorado, from October 24–26. Outcomes from two of the three grants will leverage contributions from the new Wyoming Center for Environmental Hydrology and Geophysics (WyCEHG).

Associate Professor **Kenneth W. W. Sims** recently had three articles published in the journals *Acta Geophysica*, *Earth and Planetary Science Letters*, and *Geochemistry, Geophysics, Geosystems*.

In September, Associate Professor Kenneth W. W. Sims also received a National Science Foundation grant in the amount of $209,078 to fund a research project titled, "Collaborative Research: U and Th decay series dating of seafloor hydrothermal deposits." Funds will support the PhD studies of graduate student **Caroline Lo Ré** (PhD) and the analytical work required to: 1) assess the efficacy of the method by testing major assumptions and 2) simultaneously apply findings to better constrain the time-scales of multiple hydrothermal vent fields. Study samples are from the Trans-Atlantic Geotraverse (TAG) and fields in the Lau and Manus Basins.

Associate Professor **Ye Zhang** had a busy year giving six invited research talks. Three were at UW, two at the Colorado School of Mines, and one at the Lost Alamos National Laboratory in New Mexico.

Zhang and her research group also presented two talks and three posters at this year's annual AGU conference in San Francisco, California.

Graduate student **John Calder** (PhD candidate), recently won the *Edward S. Deevey Award* for Outstanding Student Presentation in Paleoecology at the 2013 Annual Meeting of the Ecological Society of America in Minneapolis, Minnesota earlier this month. His presentation focused on the study of effects of climate change on the history of forest fires in the Park Range, northern Colorado, and highlights increased widespread burning during warmer and drier periods than the 20th century.

In April, graduate student **Justin LaForge** (MS candidate) received the AAPG Foundation Weimer Family Grant for his research project titled, "Macro- and Microstructural Investigation of a Low-Angle Normal Fault System in Crystalline Rocks."

In November, graduate student **Jeremiah Marsicek** (PhD candidate), along with his advisor Associate Professor **Bryan Shuman**, had an article published in the journal *Quaternary Science Reviews* titled, "Moisture and temperature changes associated with the mid-Holocene Tsuga decline in the northeastern United States." ❖

ALUMNI NEWS

Alumnus **Thomas L. Adams** (BS, 2004) reports that as of June 1, 2013, he is the new Curator of Paleontology and Geology at the Witte Museum in San Antonio, Texas. Thomas received his PhD from Southern Methodist University in December, 2011.

Alumnus **John B. Branney** (BS, 1977) recently retired from the oil and gas industry after a 34 year career. John's second career as an author just began with his recently released prehistoric thriller titled *Shadows on the Trail*. John describes the book "as an 11,000 year old odyssey from Texas to the Rocky Mountains in a similar vein as Lonesome Dove, but without the horses…cattle…or guns." John can be found on LinkedIn, Facebook, Twitter, and his Shadows on the Trail blog at http://johnbbranney3.blogspot.com.

Alumna **Kellen "Kelly" Hughes** (BS, 1995) was recently hired as a Senior Research Technician for Corning, Inc. in Corning, New York, a position where she has worked on temporary basis for nearly five years. She works in the Surface Energetics and Durability Lab supporting research within the company and its customers. Gorilla Glass is just one of the products that she has helped qualify using a variety of chemicals. Kelly also gets to interact with many people of different cultures and has learned so much from them. She hope to continue with Corning, Inc. for a long, long time.

Alumnus **Donald P. McGookey** (MS, 1952) writes that after living in Midland, Texas for 31 delightful years, him and his family have moved to San Antonio where he is still active in trying to find oil. He also has a steady schedule of PowerPoint lectures to clubs and all levels of schools.

Alumnus **Albert L. Richardson** (MA, 1950) is now retired after 38 years working in oil exploration in the Rocky Mountain area. He is currently living in Bradenton, Florida. His recently published memoir, *Hill County Young'un*, is about his life growing up during the Great Depression on a farm in West Virginia, his military service, and college life on the G.I. bill. The memoir is available on amazon.com.

Albert also shares the following quote: "Old geologists don't just fade away—they just go somewhere and write memoirs!"

On May 1st, 2013, alumna **Lesley (Cunningham) Urasky** (BS, 1990 and MS, 1993) received the Arch Coal Teacher Achievement Award. The Arch Coal Foundation honors 10 Wyoming teachers annually for their contribution to Wyoming's future. Lesley currently works as a High School Science Teacher at Rawlins High School, Carbon County School District No. 1.

Alumnus **David Weichman** (MS, 1988) is currently working in Brisbane, Australia as an exploration and development geologist for ConocoPhillips.

Obituaries:

Alumnus **John S. King** (PhD, 1963) passed away on March 15, 2013 in his Town of Tonawanda home. He was 85.

Dr. King worked from 1959 to 1963 at the University of Wyoming, where he earned a doctorate in geology.

He went to work at the University of Buffalo's (UB) department of geology in 1963. He worked there 33 years, directing the geology summer field camp for 27 years.

Concurrently, he worked with the National Aeronautics and Space Administration, creating maps of Mars and Mercury and directing a NASA intern program for more than 20 years.

Throughout his career, he wrote papers on geology. A former department chairman at UB, he retired in 1996 and held the title of professor emeritus.

Dr. King enjoyed photography, painting and studying the geology of the West—always with a dog at his side. In his will, he made a generous bequest to the Department. A plaque has been erected in the Department's mineralogy lab in his memory.

Alumnus **Edwin (Ned) Noble** (PhD, 1961) passed away on January 3, 2013 in Virginia. He was 90.

Noble was chair of the Geology Department at the University of North Dakota from 1969 to 1978. He was assistant state geologist from 1965 to 1969 and state geologist from 1969 to 1978. He also served as editor of the Association of American State Geologists from 1971 to 1978.

After serving with the First Infantry Division during World War II, he studied at the University of New Mexico and received his doctorate in geology from UW. After leaving North Dakota, he went to work for the United States Geological Survey in Reston, Virginia. He received the survey's Meritorious Service Award in 1991 for his work in Pakistan on an energy resource program.

Noble is survived by his wife, Polly, sons, Bill and Jonathan and daughter, Mary. ❖

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Students from the Rocky Mountain Field Trip examining the cross section of a fossil travertine dome at Hot Springs State Park, Thermopolis, Wyoming. Photo by Barb Viette.