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UNIVERSITY OF WYOMING
Department of Geology and Geophysics

SPRING 2009

FROM THE DEPARTMENT HEAD

Art Snoke



As I reflect back on the Spring 2009 semester, I realize that the past semester has been characterized by a variety of accomplishments that represent the hard work of individuals as well as the Department as a whole. On Saturday, May 9th, I participated in the College of Arts and Sciences Commencement when a group of students and their parents, relatives, and friends celebrated the successful completion of a degree in Geology & Geophysics (G&G). Three of our undergraduate students, **Amber Baltes** (Riverton, Wyoming), **Tyler Miller** (Greeley, Colorado), and **Mark Pearson** (Pinedale, Wyoming), were inducted into the Phi Beta Kappa Society, the oldest and most distinguished honorary academic society in the USA. One of our graduate students, **Craig Grimes** (Orrville, Ohio) was recognized by the Graduate School as one of the two recipients of the Outstanding Dissertation Award for 2008 (look for additional information later in the newsletter). His research mentor was **Barbara John**. At the annual College of Arts and Sciences Awards Banquet, an alumnus of the Department, **Chad C. Deaton** (BS, 1976) was among the honorees recognized this year as an Outstanding Alumnus of the College. Chad is presently the Executive Chairman, Chief Executive Officer of Baker-Hughes, Inc. During the past semester, two of our faculty members, **Mark Clementz** and **Bryan Shuman**, were awarded prestigious NSF CAREER Awards (see article in this newsletter). Also, Bryan's tenure as an Associate Professor in our Department was formally approved by the University Trustees in early May.

The spring 2009 semester was also marked by the most successful graduate-student recruitment in the history of the Department. Twenty-six new students will join our Department for the Fall 2009 semester. It is noteworthy that this new graduate-student class is exceptionally diverse in their interests in the geosciences, include 14 males and 12 female geoscientists, and come from many parts of our country and five foreign nations.

This academic year also marked by the successful recruitment of another new faculty member in G&G. In several weeks, **Dr. Kenneth W.W. Sims**, formerly of Woods Hole Oceanographic Institute, will join our Faculty as an Associate Professor in isotope geology. Ken has broad interests in the application of U-series disequilibria, radiogenic isotope geochemistry, and major- and trace-element geochemistry to a variety of fundamental problems in Earth and planetary sciences. **Dr. Eric A. Erslev** has also been appointed as an Adjunct Professor in Structural Geology and Tectonics. Eric will be teaching courses in advanced structural geology and fracture mechanics at UW. Eric also brings a major NSF EarthScope research project to our Department on the structural evolution of the Bighorn Mountains.

Finally, in this newsletter, you will find many interesting articles about the achievements and adventures of our students and Faculty in the Department of G&G. We wish you happy, healthy, and productive summer months, and ask you to stay in touch by sending us a short update on your activities and accomplishments so that we can include them in a future issue of our departmental newsletter. ❖



geology.uwyo.edu



Last December, a total of 13 members from the Department gave a total of 26 presentations at last year's American Geophysical Union (AGU) meeting in San Francisco, Calif.

In March, members of the Department of Geology and Geophysics participated in a CO₂ sequestration workshop that also included representatives from the Wyoming State Geological Survey, Wyoming Department of Environmental Quality and Wyoming Oil and Gas Conservation Commission, ExxonMobil, and U.S. Department of Energy.

Thanks to a one-year \$1.55M award from the U.S. Department of Energy's Office of Fossil Energy National Energy Technology Laboratory (DOE-NETL), the University of Wyoming (UW) Department of Geology and Geophysics is undertaking the geological characterization of the Moxa Arch of western Wyoming in preparation for a possible carbon sequestration demonstration project in that structure. The project began on September 1, 2008. Since that time, 11 groups of researchers at UW and the Wyoming State Geological Survey have been working on various aspects of the project in collaboration with scientists from ExxonMobil. The research groups in the Department of Geology and Geophysics, include Department Head **Art Snoke**, Professors **Carol Frost** and **Jimm Myers**, Associate Professor **John Kaszuba**, Assistant Professor **Ye Zhang** and Associate Lecturer **Erin Campbell-Stone**. These groups presented their interim progress reports at their second quarterly workshop in Laramie, Wyoming on March 26–27, 2009.

Research Professor **Kevin Chamberlain** was recently awarded a \$139,000 NSF grant for a three-year study entitled, "Evaluating the tempo, size, and chemical connectivity of magma batches in a tilted plutonic complex."

The project is a collaboration with Texas Tech University; Chamberlain's contributions will include extremely high-precision U-Pb dates ($\pm 0.02\%$) of individual magma batches. The UW U-Pb geochronology lab is one of only six labs in the United States that is capable of producing such high-precision dates.

In early May, Chamberlain was also an invited participant at the Earth-time IV workshop in Denver, Colo. Earth-time is an international collaboration of geochronologists, paleontologists, and stratigraphers to resolve the geologic time-scale very finely, and apply high-precision ($\pm 0.1\%$) dating techniques to questions of biological evolution, adaptive radiations, extinctions and recoveries, and climate change. The ET IV workshop specifically focused on results of community-wide, inter-laboratory calibration experiments. Forty participants representing 22 U-Pb and ⁴⁰Ar/³⁹Ar labs from around the world attended the event.

In January, Assistant Professor **Mark Clementz** was invited to give a talk entitled, "When whales walked the Earth: new insights into the ecology of Eocene cetaceans from stable isotopes," at the International Conference on Climatic and Biotic Events of the Paleogene in Wellington, New Zealand.

In February, Clementz also gave an invited talk entitled, "When whales got wet: identification of semi-aquatic mammals from the fossil record through stable isotope analysis of tooth enamel," at the University of Oregon.

Professor **Ron Frost** was recently voted as one of the top ten teachers in the College of Arts and Sciences by this year's graduating seniors.

In January, Professor **Steve Holbrook** participated in a meeting in Irvine, Calif., called "Oceanography in 2025." The meeting, which was sponsored by the National Academy of Science and

the Office of Naval Research, brought together 40 scientists to forecast the future of oceanography.

In March, Holbrook presented an invited talk on seismic oceanography at the University of Washington, Seattle, and a keynote address on the same topic at the German Geophysical Society meeting in Kiel, Germany.

In late January, Professor **Neil Humphrey** attended a meeting of a consortium of companies in Stockholm, Sweden that are interested in modeling groundwater flow beneath continental ice sheets, a type of glacial formation that has overrun northern Europe in the past and will occur again within 20,000 years. As an outcome of that meeting, and a previous meeting in Helsinki, Finland in December, 2008, Humphrey has been authorized to start work on an ice drilling project to obtain a water pressure field beneath a fast moving part of the Greenland ice sheet. The work will span four years and will involve the assistance of several Masters and Ph.D. students. The consortium has preliminarily agreed to contribute approximately \$600K to fund the field work.

Associate Professor **Ken Dueker**, Professor **Subhashis Mallick**, and Associate Professor **John Kaszuba** were recently awarded UW School of Energy Resources (SER) grants to fund graduate assistantships for AY2009–2011.

The SER recognizes that an important key for diversifying and sustaining Wyoming's energy economy is in scientific research exploring new frontiers of energy science. To that end, the assistantship is part of supporting research programs that address basic and applied research related to energy.

Geologic sequestration of combustion products from coal-fired power plants will be a critical component of the U.S. carbon management portfolio and a vital step towards enabling Wyoming clean

coal. To date, most geologic carbon sequestration research focuses on sequestering pure CO₂. However, coal combustion generates SO_x, NO_x, and other constituents in addition to CO₂. Comprehensive research and development programs are therefore needed to understand geologic sequestration (co-sequestration) of these multi-component (CO₂-SO_x-NO_x) gas streams.

Associate Professor **Bryan Shuman** recently had six papers accepted for publication. Shuman is the lead author on three: "Holocene lake-level trends in the Rocky Mountains, U.S.A.," in *Quaternary Science Reviews*, documents extensive aridity in the Rocky Mountain region from 7000-4500 years ago; "Woodland-to-Forest Transition during Prolonged Drought in Minnesota after ca. AD 1300" is forthcoming in *Ecology* and examines surprising interactions between vegetation and fire during past droughts; and "Abrupt Climate Change as an Important Agent of Ecological Change in the Northeast U.S. throughout the Past 15,000 Years" also in *Quaternary Science Reviews*, uses a network of data to demonstrate the rapid responsiveness of regional vegetation patterns to century-scale climate changes.

Graduate students working with Shuman led on another three papers: "Evidence of centennial-scale drought from southeastern Massachusetts during the Pleistocene/Holocene transition" in *Quaternary Science Reviews*; "The effects of lake area and volume changes on the surface energy budget of Minnesota's lake-dotted landscape" in the *Journal of Climate*; and "Hydrogen and oxygen isotopic composition of lake water in the western United States" in the *Geological Society of America Bulletin*.

Professor and Department Head **Art Snoke** recently received formal acceptance from the Geological Society of America for publication of his co-edited book titled, "Crustal cross sections from the western North

American Cordillera and elsewhere: Implications for tectonic and petrologic processes." The book will likely be published in late 2009.

Other Department News

After recently receiving a generous state-matched donation, The UW Geological Museum was able to establish The Dodson Family Endowment in the amount of \$100,000. The endowment will fund work by part-time students and former students at the museum. The endowment can also be added to by other parties.

Four staff members from the Department of Geology and Geophysics were recently recognized for their years of service at the annual UW Staff Appreciation Day. They include: Systems Programmer **Jeff Lang**, 5 years; **Diane Gerhart**, 10 years; **Sondra Cawley**, 20 years, and **Allen Tanner**, 25 years.

Obituary: Dr. John M. Murphy (1958–2008)

Dr. **John Mathew Murphy**, 50, died Wednesday, Dec. 10, 2008, at home with his wife in attendance.

Murphy was born April 24, 1958, in San Luis Obispo, California, to James and Dorothy Murphy. He graduated from South Pasadena High School in 1976. He was awarded a Bachelor of Science degree in geology in 1982 from Humboldt State University, in Arcata, California; a master of science degree in geology from the University of Alaska Fairbanks (UAF) in 1989; and a doctorate degree in geology/geochronology from La Trobe University in Melbourne, Australia.

Murphy was a self-employed geological consultant for numerous oil, gas and mining companies operating worldwide and in Alaska, between 1989 and November 2008, with his most recent work conducted

for Fairbanks Gold Mining at the Fort Knox mine and exploration work for Full Metals Mining in southwest Alaska, an area where John had completed his Master of Science thesis. He was a recognized expert in rock age dating using a specialized technique he acquired while completing his doctorate thesis in 1993 as he deciphered the geochronology of Interior Alaska. While at UAF, he was an intern for the State of Alaska, Division of Geology and Geophysical Sciences. From 1994 to 2003, he was a Research Scientist at the University of Wyoming, where he guided and funded several graduate students on fission track age dating.

Murphy was recently hired as Senior Resource Manager for Doyon Lands in Fairbanks. Murphy worked with many geoscientists both in industry and academia and his collaborative works resulted in numerous publications in scientific journals.

Murphy was passionate about everything-geology, politics, skiing, dancing with his wife, music, family, relationships, and just life in general. He taught many how to enjoy life, how to play and have fun.

Murphy is survived by his wife, Laurie Murphy; two daughter's from a previous marriage, Casey Murphy of NY, New York and Danielle Murphy of Golden, Colorado; stepson, Brad Thomsett; stepdaughter, Emily Thomsett, step grandson, Jacob Thomsett House all of Springfield, Missouri; grandmother Mary Warren age 96, of Cambria, California; mother and stepfather, Dorothy and Bob Lucas of Santa Barbara, California; brothers and sisters, Cindy Murphy of Santa Cruz, California; Colleen Murphy of Cambria, California; and James Murphy, Esq. of Rancho Palo Verdes, California. He was preceded in death by brother, Patrick Murphy; and father James A. Murphy. Memorial services were held on December 18th, 2008. ❖

TWO RECEIVE CAREER NSF GRANTS

::: Two CAREER NSF Grants Inject Nearly 1 Million Into UW 'Paleo'-Science Programs :::

Assistant Professor **Mark Clementz** and Associate Professor **Bryan Shuman** each recently received five-year NSF CAREER Awards in the amounts of \$541,000 and \$480,264 respectively. With this injection of resources, both Clementz and Shuman look forward to funding each of their respective research projects in the fields of paleobiology, paleoclimatology, paleoecology, and paleontology.

Paleobiology and Paleontology

The primary goal of Clementz' project is to compare the evolutionary ecology of two groups of marine animals—cetaceans (e.g. whales, dolphins, and porpoises) and sirenians (sea cows, manatees, and dugongs)—in the context of environmental conditions and Cenozoic climate change.

Cetaceans and sirenians are major consumers in nearshore and offshore food webs and play a big role in the structure and composition of these environments today. Their earliest influence on aquatic ecosystems occurred around 50 million years ago, when the first whales and sea cows appeared in the fossil record. Both geochemical and morphological evidence suggest that these groups already had a strong affinity for life in the water. New discoveries of members of each order in India and Pakistan at or shortly after this event have led to a significant accumulation of fossil material documenting most of the critical steps within the transition from terrestrial to marine ecosystems by whales and sea cows. This wealth of collected material makes it now possible to examine the evolution of these groups in a more rigorous, quantitative manner with the promise of new insights into the ecological change and morphological evolution for these groups.



Assistant Professor **Mark Clementz** (L) and Associate Professor **Bryan Shuman** (R).

With the appearance of whales and sea cows in the early Eocene, the evolution and diversification of both groups occurred across major episodes of significant climate change as the Earth moved from the greenhouse conditions of the early Paleogene into the icehouse conditions of the Neogene and today. In order to effectively evaluate the impact that this climate change may have had on the evolution of each, Clementz plans to examine specimens of whales and sea cows as components of marine food webs. This will require not only an understanding of not only diets and trophic positions of individuals or species, but of entire, coeval marine communities.

Key locations across the world, representing well preserved marine

vertebrate fossil accumulations or "bone beds," from the Eocene, Oligocene, and Miocene periods have been identified in Egypt and New Zealand for inclusion in this study. Clementz plans to primarily rely on geochemical analysis of fossil tooth enamel as a proxy for ecological information. This approach will involve the analysis of stable isotopes of calcium, carbon, oxygen, and strontium to define the trophic position, diet, and salinity tolerances of each species examined under this project.

As a result of this research, Clementz hopes to bring a new understanding to marine food webs from these time periods as well as a new definition for the roles of whales and sea cows within them. Clementz also hopes to push an integrative, big-



Clementz and graduate student Stephanie Peek taking a sample of bone material from the base of an Australian Sea Lion skull at the University of Otago Marine Research Center in Dunedin, New Zealand.

picture approach to educate students at all levels on the concepts of evolution, ecology, and climate change. This will be done through a combined effort of field and lab research as well as classroom activities such as theater education, to provide students with multiple methods of mental stimulation and assessment. These efforts will be achieved by incorporating these teaching activities and lessons into the current paleo research program at UW, which will be possible through the assistance of post-doctoral fellows, graduate students, undergraduates, and high school interns. The combined research and teaching efforts are intended to provide an opportunity for students to gain a greater appreciation for scientific thinking as well as a better understanding of the processes shaping the natural world around them.

“Receiving an NSF CAREER Award is an amazing honor that will undoubtedly provide a big boost for the paleontology program at UW,” says Clementz. “I am still stunned by this award and even more so by the fact that the Department of Geology and Geophysics received two of these this

year. This is quite an accomplishment, so Bryan (Shuman) and I have much to celebrate!”

Paleoclimatology and Paleoecology

The primary goal of Shuman’s project is to document the types of interaction and regional differences that can influence regional response to climate change.

Climate change is an ongoing outcome of human activity and regions such as the Rocky Mountains have already experienced significant warming within the past decade. This warming has reduced snowpack and related water runoff, facilitating extensive forest damage from insects and other pathogens, as well as wildfires. Such effects on water and ecosystems are likely to generate substantial societal challenges for decades or longer, but are currently poorly understood and hard to predict. By characterizing past climate changes and their impacts, Shuman hopes to provide further means to place such regional changes in a long-term context and to help anticipate how such impacts on ecosystems—and the goods and services they produce—will continue to develop in the future.

To accomplish this objective, Shuman’s project will study the effects of wildfires, forest parasites, and long-term droughts on vegetation distribution and composition in the Rocky Mountains by studying the effects of climate changes in Colorado over the past 5000 years. Because changes in precipitation, vegetation, and fire regimes in

the Rocky Mountains during the past decade have been dramatic, the project will document these recent changes with repeated photography, and then place the changes in a long-term context via studies of ancient climate changes and their impacts on the forested landscape. Shuman will examine ancient droughts in northern Colorado by detecting and dating paleoshorelines within a network of lakes near the Continental Divide. He then plans to compare these stratigraphic records with fossil pollen and sedimentary charcoal from the lake deposits to study the role of drought in the paleoecological history of the region. The photos and other results will be available through a web-based atlas of environmental change in the region, which will be designed to aid K–12 teachers in understanding and explaining the geography and potential outcomes of climate change.

“The news came two days before Christmas, which was a fantastic present,” says Shuman. “I was stunned reading the e-mail from NSF because they had funded only 3% of the projects and had received double the normal number of proposals this year. I was also especially excited to learn that Mark’s (Clementz) proposal had also been selected. This boost is just what we need to advance our renewed paleoecology-paleoclimate program.” ❖



Hidden Lake, Colorado, is one of the study sites where Shuman is using sedimentary evidence to detect the effects of past droughts, fires, and parasites on the surrounding forests.



Obituary: Keith O. Spencer

Keith Osborn Spencer (B.S. '00), 45, Cheyenne, formerly of Laramie, died Jan. 2, 2009, in an avalanche while ice climbing near Cody, Wyo.

He was born March 14, 1963, in Reno, Nev., the son of John S. and Faith P. Spencer. He attended Reno schools, graduating from Hug High in 1981, and earned degrees in biology and geology from the University of Wyoming.



Alumnus **Keith Spencer**, B.S. '00

He was an avid backpacker, a competitive distance runner and biathlete and an accomplished worldwide alpinist. At the time of his death, he was serving with the Wyoming Air National Guard 153rd Airlift unit.

He is survived by his parents; his brothers, Robert H., J. Peter (Susan) and Eric V. (Anne) Spencer; his nephew, Quinn H. Spencer; and his uncle, Alton Pedersen.

He touched the lives of many people through his adventures and will

be greatly missed by this wide sphere of friends.

Donations can be made in his name to the Mount Everest Foundation online at www.mounteverestfund.org or by posting a check to the Mount Everest Foundation, P.O. Box 123, Lakebay, WA 98349.

Alumni Notes...

Alumnus **Chad C. Deaton** (B.S. '76), who is currently CEO of Baker Hughes Inc., was one of three UW alumni to be recognized as UW College of Arts and Sciences "Outstanding Alumni" for 2009.

Alumnus **Craig Grimes** (Ph.D. '08) recently received the UW Graduate School Outstanding Dissertation Award in Physical Sciences for his dissertation entitled, "Duration, Rates, and Patterns of Crustal Growth at Slow-Spreading Mid-Ocean Ridges: Using Zircon to Investigate the Evolution of In-Situ Ocean Crust."

His dissertation comprises six chapters—three of which were published as articles in the journals *Geology*, *Geochemistry*, *Geophysics & Geosystems - G3*, and *Contributions to Mineralogy and Petrology*—and discusses different aspects of the geochronology and geochemistry of the mineral zircon hosted by rocks from the seafloor, leading to ideas regarding the formation and growth of the Earth's ocean crust.

Grimes came to the University of Wyoming having completed a B.S. in geology from Ohio State University in June 2003 and is now a post-doctoral researcher in his beloved mid-west, at the University of Wisconsin.

Alumnus **Walter A. "Bill" Sullivan** (Ph.D. '07)—who now works as an Assistant Professor at Colby College in Waterville, Maine—recently received the first Journal of Structural Geology Student Author of the Year Award for 2008 in recognition of his Ph.D. dissertation titled, "Significance of transport-parallel strain variations in part of the Raft River shear zone, Raft River Mountains, Utah, USA."

Update from Alumni **Adam VanHolland** (M.S. '05) and **Jenifer Bolin** (B.S. '05)

I wanted to send an update on what Jen and I have been doing recently. A lot has happened since we left Laramie in 2005. We moved to Denver to take oil industry jobs, bought a house in Evergreen, and were married in August 2008.

We quickly got tired of the hustle and bustle of Denver and just recently (about a month ago) moved to Anchorage, Alaska! Jen took a job with Schlumberger and I took a job with BP here in Alaska. We love it so far, have bought a house, and are settling in nicely. I just wanted to send a note because I thought some folks there might be interested, particularly **Art Snoke**, **Randi Martinsen**, **Mike Cheadle**, **Carol Pribyl**, and **Sondra Cawley**. We hope everyone is doing well! ❖

GATHERING NEWS!

Please take a minute to fill out the Alumni News Form insert and let your fellow UW Geology and Geophysics grads know what you're up to. Where you are. Who you've become.



You may also e-mail updates to ggeditor@uwyo.edu

PUBLISHING MILESTONE

::: Rocky Mountain Geology Celebrates 10th year :::

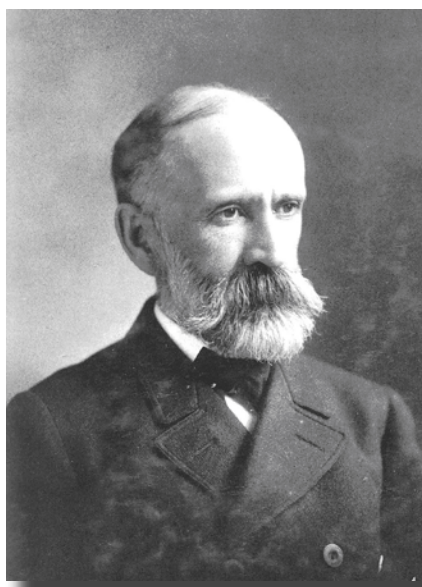
The scientific journal *Rocky Mountain Geology* (RMG), published by the University of Wyoming's Department of Geology and Geophysics, celebrated its tenth year with the publishing of its fall 2008 issue, Volume 43, No. 2 (2008). The issue is available both in print and on-line.

In addition to four original research articles, the latest issue includes a historical profile of Rocky Mountain geologist Israel Cook Russell. Full content information and instructions for subscription or purchase are available on the journal's Web site, <http://pubs.gg.uwyo.edu/RMG.htm>. All issues also are available for download at <http://rmg.geoscienceworld.org>.

"We are excited and proud to be celebrating Rocky Mountain Geology's 10-year publishing milestone," says **Brendon Orr**, Managing Editor and editorial board member.

"Ever since RMG and 29 other leading scientific journals successfully cooperated as founders in the millennium launch of *Geoscienceworld.org* (GSW), we have experienced a

dramatic rise both in the visibility of the journal and in the number of submissions of original research articles," says Orr. "As on-line usage of RMG's content continues to increase, we expect a bright future for the journal."

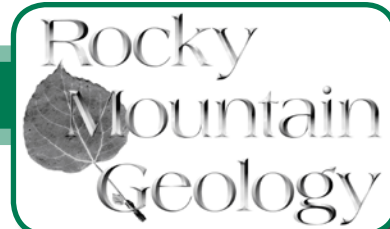


Israel Cook Russell

GSW is a nonprofit corporation formed by a group of leading organizations dedicated to making geoscientific research and related information more easily and economically available via the internet. Its on-line service (www.geoscienceworld.org) includes peer-reviewed articles and other materials with linked reference lists from over forty high-impact journals across a broad range of disciplines in the geosciences.

In 1998, RMG was wholly redesigned from its predecessor journal, *Contributions to Geology*. 'Contributions' published 31 two-issue volumes and four Special Papers from 1962 to 1998.

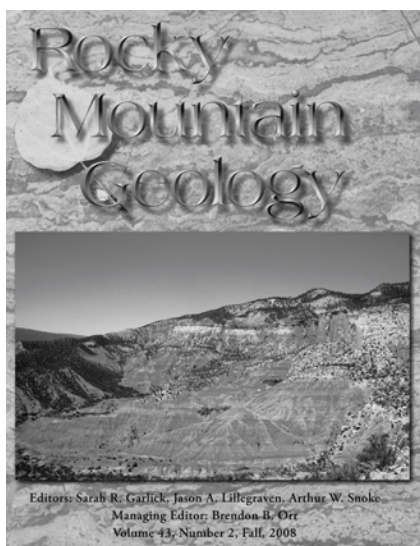
"Researchers across the globe having interests in geological evolution of North America's Rocky Mountain region have come to recognize RMG as a valuable resource for brand-new,



primary information," commented Co-editor and UW emeritus professor **Jason A. Lillegraven**.

Arthur W. Snoke, Editor-in-Chief of RMG and Head of the Department of Geology and Geophysics, added the following comments: "*Rocky Mountain Geology* fills an important niche in the realm of geoscience journals by providing a forum for high-quality regional studies on any aspect of geological and geophysical research in the Rocky Mountains and environs. This peer-reviewed, internationally distributed scientific journal stands as the premier example of a regionally oriented, geoscience-based professional journal published in the United States."

For more information about *Rocky Mountain Geology*, please visit the journal's Web site at <http://pubs.gg.uwyo.edu/RMG.htm>. ♦



Cover for RMG Vol. 43, No. 2

Coming up!

AAPG

June 7–10, 2009
Denver, Colorado
www.aapg.org

**AAPG Rocky Mountain
Rendezvous**

October 2–5, 2009
aapg.gg.uwyo.edu/RockyMtnRendezvous

GSA

October 18–21, 2009
Portland, Oregon
www.geosociety.org

AGU

2009 Fall Meeting
December 14–18, 2009
San Francisco, California
www.agu.org

STUDENT NEWS



This spring, undergraduate students **Amber Baltes**, **Tyler Miller**, and **Mark Pearson**, were inducted into the UW Chapter of the Phi Beta Kappa (PBK) Society. The PBK is the oldest and most prestigious honorary academic society in the United States. Only about 10 percent of the nation's institutions of higher learning have Phi Beta Kappa chapters and only about 10 percent of the arts and sciences graduates of these distinguished institutions are selected for Phi Beta Kappa membership.

The ideal Phi Beta Kappan has demonstrated intellectual integrity, tolerance for other views, and a broad range of academic interests. Each year, about one college senior in a hundred, nationwide, is invited to join PBK.

Membership in PBK shows commitment to the liberal arts and sciences, and to freedom of inquiry and expression — and it provides a competitive edge in the marketplace. Potential employers regularly contact the national office of Phi Beta Kappa to confirm the membership of job seekers who have listed Phi Beta Kappa among their credentials.

In late November, graduate students **Sharon Bywater** (M.S.) and **Dan Jones** (Ph.D.) received cash awards for having the best student papers in a recent competition sponsored by the Colorado Scientific Society.

Jones received the \$500 first-place award for his paper, "A refined interpretation of the Medicine Bow orogeny, southeastern Wyoming: Implications for regional tectonics and crustal growth."

Bywater earned \$250 for her second-place paper, "Late Miocene through Pliocene evolution of the

Angastaco basin (NW Argentina): Implications for the tectono-climate evolution of the Eastern Cordillera in the late Cenozoic."

Founded in 1882, the Colorado Scientific Society promotes knowledge, the understanding of science, and its application to human needs, focusing primarily on earth science, but welcoming members with interests in all fields of science. Current members include representatives from many earth-science organizations, including federal and state government agencies, universities throughout the region, private industry and individuals.

In early May, undergraduate seniors and Wyoming natives **Curtis Chopping** and **Sarah Stacy** presented the results of both of their research during a special technical session focused on undergraduate research at the Geological Society of America Rocky Mountain Section Meeting in Orem, Utah. Their poster titles were, "Using a Natural Analogue to Examine Geologic Carbon Sequestration" and "Structural Evidence for Juxtaposition of two Archean Terranes in the Teton Range, Western Wyoming," respectively.

Chopping has been working with Associate Professor **John Kaszuba** this year, building an experimental geochemistry laboratory as well as performing research in the field of geologic carbon sequestration. He will begin graduate work with Kaszuba this summer to continue his research on geologic carbon sequestration.

Stacy has been working with Senior Research Scientist **Susan Swapp**, Professors **Barbara John**, **Carol Frost**, and **Ron Frost** on

an analysis of structural geological features from the Teton Range. This study is part of a larger study being conducted by Professors Carol Frost and Ron Frost and Susan Swapp. Stacy assisted with field work in the Teton mountain range last summer and the current project has grown from that work. Stacy's work has been supported by an EPSCoR grant during the spring, 2009 semester, and she has also received an EPSCoR grant to support her continuing research efforts during the coming summer.

During the month of March, graduate student **Will Fortin** (Ph.D.) participated in a seismic oceanography research cruise in the Adriatic Sea, along with researchers from the U.S. Naval Research Laboratory and Durham University, U.K. An interview with Fortin about the cruise can be found on page 10.

Graduate students **Liz Hajek**, **Jonathan Hoffman**, **Genevieve Mathers**, **Amanda Moyer**, **Josh Stachnik**, **Stephanie Peek**, **Dan Sturgis**, **John Trimble**, and **Zhu Zhang**, recently presented their research findings at the seventh annual University of Wyoming Graduate Student Symposium—a two-day event sponsored by the UW Graduate School. The student's research findings were presented as both oral and poster presentations and are available for viewing and download at <http://geology.uwyo.edu/?q=node/189>.

In early May, graduate student **Jason Mailloux** (Ph.D.) completed his internship working for the petrophysical group of ConocoPhillips in Houston, Texas. The internship, which began in January, found Mailloux working to



Undergraduate senior **Curtis Chopping** and Associate Professor **John Kaszuba** looking at ore samples from the Madison Limestone, a natural analogue for sequestering carbon dioxide. Chopping, who plans to obtain an M.S. degree in geology after graduating this spring, will be the first member of his family to earn a college degree.

understand the petrophysics of gas hydrates for a future test-well that will be drilled in 2010. Mailloux also incorporated all of the known indicators of gas hydrates into a computer program to determine if they were present in a given well log.

In late March, graduate student **Jacob Marson** (M.S.) and undergraduate student **Nik Gribb** earned second place during the Society of Exploration Geophysicists (SEG) Knowledge Bowl competition in Denver, Colo. The competition preceded the annual 3D Seismic Symposium co-hosted by the Rocky Mountain Association

of Geologists and the Denver Geophysical Society. In addition to Marson and Gribb, undergraduate student **Mark Moyer** and Senior Lecturer **Randi Martinsen** attended the 3D Seismic Symposium.

In June, graduate students **Fred McLaughlin** (M.S.) and **Scott**



SME Scholarship Recipients (L to R): **Brandy Talbot** (not pictured), Geology; Eric McDonald, Mechanical Engineering; **Paul Pribyl**, Geology; Ben Jones, Petroleum Engineering.

Quillinan (M.S.) will be giving presentations at this year's Annual AAPG Convention and Exhibition in Denver, Colo. The presentations will focus on CBM produced water and a new isotopic tracer to determine water-to-gas ratios and are respectively titled, "Sr and C Isotopic Analysis of Waters Produced from Coalbeds, Atlantic Rim Wyoming: Predictive Tools for Optimizing Coalbed Natural Gas Production," and "Stable Isotope techniques for Coalbed Aquifer Characterization; Powder River Basin, Wyoming."

Undergraduate student **Paul Pribyl** was recently awarded a Wyoming EPSCoR

Fellowship for the spring 2009 semester. The fellowship includes a stipend in the amount of \$700 that will aid in Pribyl's research project with Associate Professor **Bryan Shuman**. Pribyl also received funding from EPSCoR for the summer and a NASA grant for next year.

The Wyoming Section of SME (Society for Mining Engineers) has elected to award the Coates, Wolff, Russell, & Swank Memorial Mining Industry Scholarships to four UW undergraduate students—including two from the Department of Geology and Geophysics—for the 2008/2009 academic year in the amount of \$1,500. Undergraduates **Paul Pribyl** and **Brandy Talbot** received the *Ken Coates Memorial Scholarship* and the *Arch Swank Memorial Scholarship* respectively. The scholarships are intended for students studying geology or engineering and preference is given to those intending to work in mining. ❖

STUDENT PROFILE



::: Will Fortin—An Adriatic Cruise and Some Fine Italian Cuisine :::

During the month of March, graduate student **Will Fortin** (Ph.D.) participated in a seismic oceanography research cruise in the Adriatic Sea, along with researchers from the U.S. Naval Research Laboratory, the Istituto di Scienze Marine, Italy, and Durham University, U.K. The cruise—Fortin's second during his time at the Department—involved the search for cold, dense water that formed during the winter of 2008 in the northern end of the Adriatic. Fortin and the other researchers used oceanographic measurement to identify the deep water and then shot seismic lines to better constrain the area of water. Following is an interview with Fortin where he shares his experiences from the cruise, the similarities and differences to a previous cruise, the knowledge that he gained, and how he plans to apply the experience to his ongoing research interests.

Question: Before we get to the cruise, let's touch on your academic background. You got a B.S. in physics and philosophy from Denison University, Ohio; what sparked your interest in geophysics, specifically seismology? And how does a philosopher approach this field of science differently, if at all?

Answer: I really enjoyed my undergraduate experience; being able to study two very different fields was really great because when I inevitably got stuck in one I had the other to turn to. I was fortunate enough to do a couple summers of physics research and one summer of philosophy research in which I wrote a paper examining the philosophical implications of some modern physics experiments; I've always been interested in interdisciplinary fields of work. It was this interest in interdisciplinary studies that first drew my attention to geophysics. I had a roommate in college who was a geology major and was interested by the things he talked about and, let's face it, the travel sounded great as well.

Somewhere in my early junior year I thought about doing geophysics but couldn't have fit in all the classes with both majors, so I stuck with physics. When it came to my senior year, I was sitting around one

day and realized I really liked programming and doing physics. When I looked into opportunities in graduate school, geophysics fit my bill of interests remarkably well. What drew me to Wyoming was the project I am currently working on. I've continued my tradition of interdisciplinary work now in the field of seismic oceanography, crossing seismology with oceanography. It is a fun challenge to be learning about two different fields and make connections between them. I like to think that my background in philosophy allows me to communicate my ideas to a person in either seismology or oceanography; I can start with a premise, work through an argument, and draw conclusions. However, scientific writing is very different from philosophical writing and I have developed a tendency to be "thorough."

Tell us a little about the recent cruise you went on. The size and name of the ship? Your experiences with other researchers on the ship? What was a typical day like?

I was on the *R/V Urania*, an Italian ship with a length of 61 m and a beam of 11 m. Some people might think that two weeks aboard a ship that size would be cramped, but the *Urania* was really a pleasure to be aboard. The layout of the ship allowed plenty of elbow room with good lab space, meeting space, and cabin space. However, my favorite place on the ship was out on the deck which was a little over 200 square meters. I watched many



Above: Fortin next to a turbulence probe—an oceanographic instrument that measures turbulence in the water as it falls. **Left, facing page: The *Urania*** in the cruises departure port of Bari. **Right, facing page: Fortin** on back deck holding XBT (eXpendable BathyThermographs) launcher that measures temperature and depth.

sunrises and sunsets over the sea from there, including one sunrise with dolphins.

The other researchers onboard were a mix of Italians, British, and Americans. Everyone was really great and it was quite an experience to be aboard a ship with so many different interests that were so compromising and focused on accomplishing the goals of the cruise. If something needed to get done, it was never difficult to find people who wanted to help. Everyone not only wanted to know what was going on but also how and why. This interest in all facets of the cruise made for great discussions and daily seminars.

My typical day started a bit before 4 AM and ended around 9 PM. I would typically get up early and monitor data acquisition and deploy instruments. Meals were always important on the ship, the Italian style and quality of food did not suffer despite being at sea. Breakfast was at 7:30 and was when most people woke for the day. I was glad to be up early to



have some quiet time and also to watch the sunrise before things got busier. The bulk of the day I would work on data processing, read, or ride the exercise bike. Lunch, as with every meal, deserves a special mention. Like dinner, it was a seated, served, four-course meal complete with fresh bread, tablecloth, and wine. What the cook could do with pasta was unreal!

Did you get a chance to interact with the ship's crew? If so, what was that like?

The crew kept quite busy, like everyone on the ship, but were exceptionally friendly despite the language barrier. My Italian was as bad as Aldo's English but we managed to teach each other some words and phrases on the 4 AM-8 AM shifts and get some good laughs out of our mutual butchering of language. Also, the first mate makes a killer limoncello and the captain can bake a darn good cake.

What experiences stand out about the cruise? Any highlights?

Did I mention the food? Seriously though, looking back now, the thing that made the biggest impression was everyone's genuine interest in what we were doing despite coming from many different fields. It was great to be part of a group of people so willing to compromise to accomplish collective goals of a bigger project. Another major highlight was staying up all night doing turbulence probe measurements and watching the full moon rise, move across the sky, and set. And the food.

The cruise ended in Italy and you spent your spring break in the country? Do you have any stories to share about your time in "The House of Pizza?"

How long you got? I made a whirlwind tour of Italy, visiting Bari (our port town), Naples, Rome, Florence, Parma and Milan.

I went to Naples for pizza, Rome for the architecture, Florence for art, Parma for food, and Milan for fashion. Italy is a remarkable country of many interests, all of which they do well. Every stop I made left an impression on me and provided me with lifelong memories, but if I had to come up with my top three experiences, I would have to recommend visiting and climbing the Duomo in Florence, napping on the sun-warmed rocks at the Vatican, and treating yourself to a nice dinner in Parma. Okay, give me a fourth—sitting on some piazza somewhere and watching people with a bottle of wine and a new friend.

How does the Adriatic cruise compare to the previous cruise you went on near Costa Rica?

The two trips were remarkably different in terms of both work and lifestyle aboard. In Costa Rica the focus was firmly on doing seismology with the oceanographic measurements being taken with expendable instruments that we would deploy as we collected seismic data. On the Adriatic cruise we were looking for a package of water in the sea formed by sinking cold water. This second cruise was a lot more flexible as we would switch back and forth between conducting oceanographic measurements and collecting seismic data.

When thinking about differences in living aboard the two ships a lot of differences stem from how long each cruise was. The Costa Rica cruise was two one-month trips while the Adriatic cruise was a much shorter two-week voyage. Off Costa Rica it was really easy to get into a routine since we were on the ship for so long and we were constantly shooting seismic data. In the Adriatic, we were frequently changing plans on our hunt for our target package of water. Every morning I'd have to see what changes we had in the night and if our day

ahead looked anything like we thought it would only ten hours before. Another major difference was the food; can you tell it made an impression? Mealtime was taken very seriously on the Italian ship; there were set mealtimes and meetings were planned around them. On the U.S. research vessel off Costa Rica, there were mealtimes but they were less defined since the mess hall was always open and stocked with snacks and leftovers. Snacks didn't really exist on the Italian ship, they weren't needed though considering how we were fed at mealtimes.

Would you say you have a decent pair of sea legs at this point?

I would say so, but I am by no means the most experienced guy out on the ship; those guys really know what they are doing. Having been doing seismology for less than two years, I have definitely been fortunate to have so much time at sea. I doubt there are many people who have been as lucky as I have to get so much experience so quickly.

In what ways are you applying your cruise experiences to your own research interests?

The data we collected off Costa Rica is the primary set I will be working on for my Ph.D. and will be using that to look at ocean structure, specifically regions of increased turbulent activity. It is a unique dataset in that we collected a lot of oceanographic data simultaneously with the seismic data. The Adriatic cruise was a great experience for me to see how oceanographers work in the field and collect data. I also brought back, from the Adriatic, both seismic data and data from a turbulence probe which should help in my study of ocean mixing through seismic data.

Are you happy with the research opportunities you have had during your time so far at the Department?

Absolutely! In the twenty months I have been here I have traveled abroad for work three times (the two cruises and a workshop in Spain) which is fantastic for anyone but even more so for a seismologist who could easily spend a career behind a computer. I said before that I was lucky, but considering my experiences and those of other members of Professor Steve Holbrook's research group, I suspect it is less luck and more that the group has made a good reputation for itself in the years prior to my arrival here. ❖



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At the annual Department of Geology & Geophysics spring picnic, awards were given to outstanding faculty, students, and staff. From left to right are this year's recipients: **Sondra Cawley** (not pictured) and **Carol Pribyl**, Outstanding Staff; **Mark Moyer**, A&S Board of Visitor award; **Liz Hajek**, Outstanding Ph.D. graduate; Associate Professors **Mike Cheadle** and **John Kaszuba** (not pictured), Outstanding Faculty; **Paul Haselhorst**, A&S Board of Visitor award; Department Head **Art Snoke**; **Mark Pearson**, Outstanding Undergraduate; **Sharon Bywater** (M.S.), Outstanding Graduate Student; **Amber Baltes**, Outstanding Undergraduate; **Garrett Danburg**, Deputy Director, A&S Development Office.

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