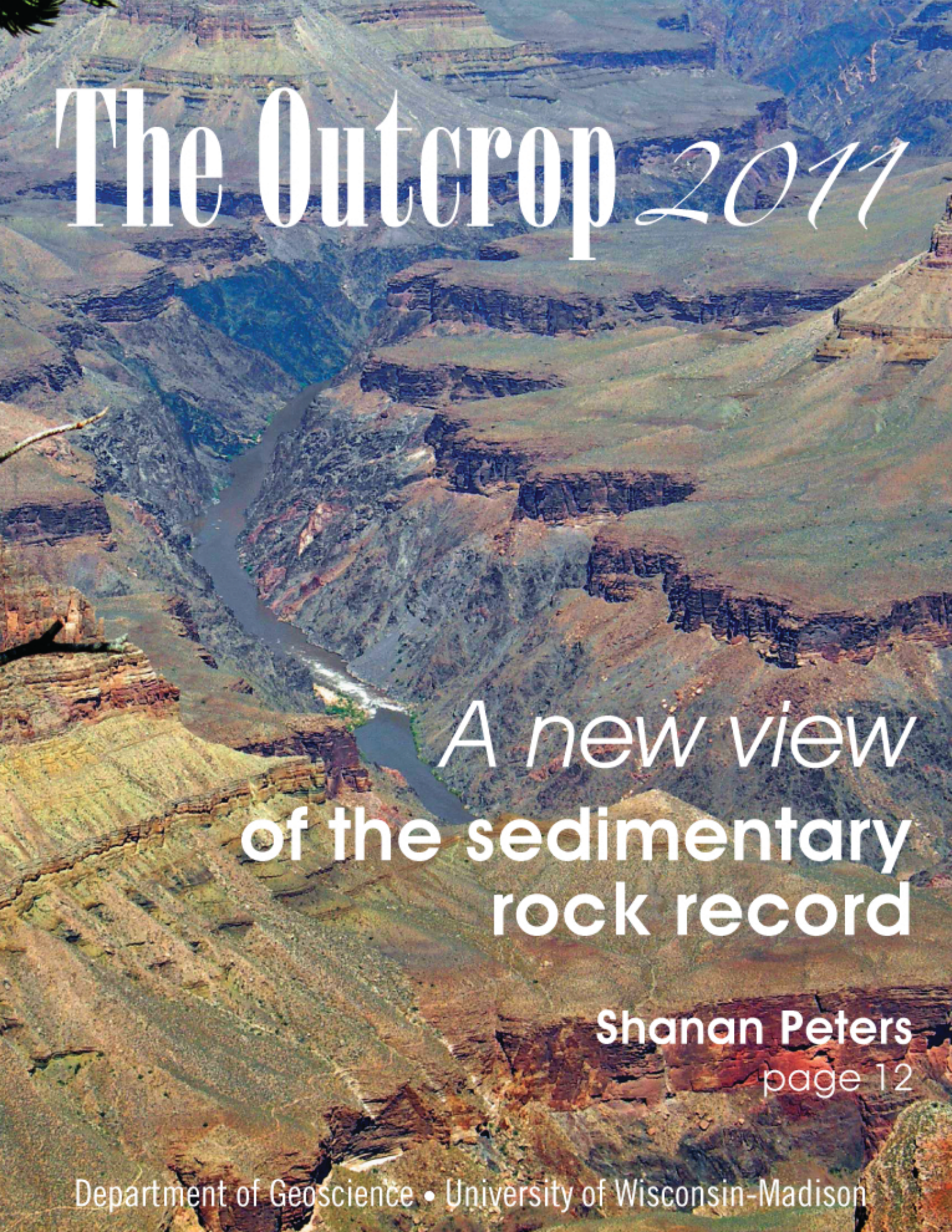

The Outcrop 2011

A new view of the sedimentary rock record

Shanan Peters

page 12

Department of Geoscience • University of Wisconsin-Madison

The Outcrop *2011*

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Bob Dott–Department Historian (rdott@geology.wisc.edu)

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Published March 2012

Please notify the department if you have a mailing address or email address change. The UW Alumni Association or US Postal service may not share new information with us.

We'd like to hear from you! Send professional and personal updates, feedback, news and photos for *Outcrop 2012* (will be published spring 2013) to:

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The Outcrop on the web:
http://geoscience.wisc.edu/geoscience/about/outcrop

Please join us:

Party dates, room location, and time will be announced for Geobadger Alumni Receptions at these national meetings:

- **AAPG in Long Beach, April 22-25, 2012**
- **GSA in Charlotte, NC, November 4 -7, 2012**
- **AGU in San Francisco, December 6-10, 2012**
- **AAPG in Pittsburgh, May 19-22, 2013**

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Cover Illustration:

The Colorado River, visible in this photo taken by Jack Share, has cut through more than one mile of the upper crust to form the Grand Canyon. Here, the Great Unconformity is visible as a sharp stratigraphic surface separating the 1.7 billion-year-old Vishnu Schist from the overlying marine sediments of the 525 million-year-old Tapeats Sandstone. The formation of this prominent gap in the rock record played an important role in the history of the Earth.

See page 12 for details.

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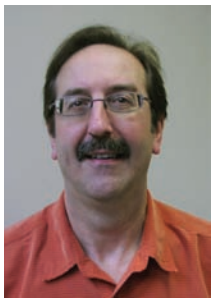

Dear Alumni and Friends,

We are pleased to send you the 2011 edition of The Outcrop. I want to thank graphic artist Mary Diman and Professor John Valley, who have assembled contributions from many in Weeks Hall and beyond. Thanks to all who contributed the information and photographs that chronicle GeoBadger activities and Department happenings of 2011.

2011 was another year of notable achievements and events, punctuated by some rather dramatic changes. The University has a new Chancellor, and a much smaller budget. Despite deep cuts to our state support, the number of undergraduates enrolling in our courses and majoring in Geoscience continues to trend upward and our graduate program is as vibrant as ever. The merger of our two graduate degree programs in Geology and Geophysics into a single Geoscience program has been approved by the University. Just before Christmas, I received word of a major gift from John and Tashia Morgridge that will endow the Dean Morgridge Chair in Geoscience. Inside you will learn about honors and awards to faculty and students, including Emeritus Professor Bob Dott's election to fellowship in the Wisconsin Academy of Sciences Arts and Letters (page 8). Many exceptional field trips including one to Ethiopia led by yours truly (pages 18-19).

The cover article by Professor Shanan Peters (pages 12-14) presents an amazingly fresh perspective on information preserved in the strata of North America. Shanan's signature approach to the rock record, "Macrostratigraphy", has revealed heretofore hidden connections among many proxy records of earth processes that can enrich our understanding of how life has evolved on Earth. It has been a pleasure as Department Chair to support Shanan's work with several groups on campus, including the Morgridge Institute for Research Center for High Throughput Computing, to develop a next generation geo-cyberinfrastructure, based in large part on the macrostratigraphy concept.

Other milestones include Professor Nita Sahai's departure in August to become the Ohio Research Scholar Professor of Polymer Science at the University of Akron; we wish her all the best in the new position. Sadly, Emeritus Professor Clarence Clay, who taught in the department from 1968 to 1989 and was a pioneer in ocean acoustics, passed away in April (pages 10-11).

We appreciate hearing from you. Please let us know about your personal news and activities so that alumni and friends can be updated on what GeoBadgers are doing around the world.

Sincerely,

Brad Singer
Professor and Department Chair

The Board of Visitors' meeting, September 30, 2011: Left to right, seated: Brad Singer (Department Chair), Bill Morgan (Board Chair). Standing: Chris Glueck (UW Foundation), Kirt Campion, Dave Stephenson, Jamie Robertson, Carol McCartney, Maitri Erwin, Tom Hoffmann, and Jay Nania. *Photo, Mary Diman.*

The Board of Visitors

Thank you from the Board of Visitors for your continued support of the department and its activities this past year. Your financial contributions are especially important given the challenging budgetary times for the department and the university.

During 2011, The Board of Visitors assisted the department in several ways. Last spring, the Board, with encouragement from the department, sent a letter in support of the proposed "Badger Partnership" (a proposal that included a provision for more autonomy on the part of the University-Madison in managing its budgetary affairs) to the Joint Committee on Finance of the Wisconsin Legislature. Also during the spring, many Board members attended an all-campus summit of the university's boards of visitors that was held at the Kohl Center. At the summit, the chancellor and other speakers provided an overview of campus activities, challenges, and fund-raising efforts. The event also provided an opportunity to meet board members of other departments.

The Board congratulates **Dave Mickelson, Louis Maher,** and **Susan Simpson** on the publication of their book *Geology of the Ice Age National Scenic Trail* (please see the inside back cover). This is an excellent publication on a key aspect of Wisconsin geology, and one that will be appreciated by anyone hiking the trail, geologists and non-geologists alike. The Board was pleased to raise funds in support of this publication.

The Board is nearing the conclusion of its fund-raising efforts for the Student Field Experience Fund. This fund was started to ensure that field experiences, which have been vital aspects of the UW Geoscience experience, continue to play a leading role in the education of future Department of Geoscience students. To date this fund-raising effort has received commitments in the form of gifts, pledges, and bequests of $1,594,909. In 2010, the Board initiated a matching gift campaign to encourage new donors to contribute to the Student Field Experience Fund. Board members committed $50,000 to be used to match first-time gifts to this fund. The Student Field Experience Fund fund-raising campaign will end soon, so please consider a contribution to help continue "trips to the field," experiences that were instrumental in convincing many of us that geology would be our profession; and take advantage of the Board's matching-gift opportunity.

There are many other ways to contribute to the well being of the department, and students in particular. Please see page 32 for a list of funds and consider a contribution. **Chris Glueck** of the UW Foundation (chris.glueck@supportuw.org, 608-265-9952), who assists the Board with its fund-raising activities, will be pleased to provide you with information on donation options that best meet your particular desires and circumstances.

In 2011, **Anne Lucke**, who has been the Board's liaison to the UW Foundation for many years, assumed a new role at the Foundation. The Board congratulates Anne on her new position and thanks her for her consistently sound guidance and encouragement to the Board in its fund-raising efforts. Chris Glueck has replaced Anne as the Board's liaison to the Foundation and we welcome Chris in his new role.

The Board is always pleased to hear your comments and would welcome your suggestions for nominations to serve on the Board.

On behalf of the Board of Visitors, thank you again for your support of the Department of Geoscience.

William A. Morgan
Chair, Department of Geoscience Board of Visitors
w.a.morgan@conocophillips.com

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Gifts to the department in 2011: *Thank you*

Gifts toward the end of the year may have been recorded for 2012

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Charles T. and Lois S. Young

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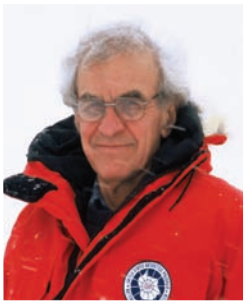
At the GeoBadger GSA reception in Minneapolis: Mo Muldoon, Jim Aiken, and Glen Champion. *Photo, Mary Diman.*

Distinguished Alumni Awards *for 2011*

JOHN C. BEHRENDT

For your distinguished contributions to the study of Antarctica and continental rifts and rifted margins, including your efforts to protect and manage Antarctica for the scientific benefit of the world.

John Charles Behrendt
B.S. Physics 1954; M.S. Geology 1956; Ph.D. Geophysics1961



John C. Behrendt

Six-decade man John Behrendt has a solid Wisconsin background. A native of Stevens Point, he obtained all three of his degrees from the University of Wisconsin-Madison. That may sound rather routine, but in fact was far from it, because he went far afield to reach his Ph.D. thesis area—all the way to Antarctica where he did his field work traversing the Filchner Ice Shelf after spending the southern winter at Ellsworth Station. Wintering over at Ellsworth Station was a legendary experience, about which I will say no more except to direct you to John's first book, Innocents on the Ice.

Returning to Madison he completed his degree under George Woollard and then ventured south again, this time to lead an oversnow traverse across the base of the Antarctic Peninsula, where his group discovered the previously unknown range now known as the Behrendt Mountains.

Even before finishing his Ph.D., however, John was heading off into a new field of Antarctic research—aeromagnetics. In 1960-61 he began flying a magnetometer over West Antarctica in a program that continued intermittently for many years. That first season, though, was very nearly his last forever, and if you're curious to learn more about that you can buy John's second book, The Ninth Circle.

In 1964, John went to work for the U.S. Geological Survey, his employer for 31 years That work included airborne, marine, and surface geophysical investigations in the Rocky Mountains, Lake Superior, and the Atlantic continental margins of U.S. and West Africa, as well as Antarctica, to which John returned often enough to preserve his record of having done research in Antarctic in every decade since the 1950's except, as yet, the current one, which is why I called him a six-decade man.

John's contributions to Antarctic affairs have not been limited to field research, however. Another important aspect of his activity has been as scientific advisor and member of U.S. Delegations to 24 international Antarctic Treaty Consultative Meetings between 1977 and 1995.

For all this John has the distinction of receiving the very first Felice Ippolito Gold Medal for Antarctic research from the Italian Antarctic Research Program and the Academia Nazionale dei Lincei in 1999. To that, and several other awards he has received we are now pleased to add the Department of Geosciences Distinguished Alumnus Award.

—Charles R. Bentley, Citationist

HEATHER MACDONALD

For your distinguished contributions in recognition of your leadership in improving the quality of undergraduate geoscience education, and in particular your efforts as the leader of theNSF-sponsored professional development program, On the Cutting Edge.

Heather Macdonald
M.S. 1979; Ph.D. 1984

Heather Macdonald

Heather Macdonald, Chancellor Professor at the College of William and Mary.Heather grew up in Denver and was first in her class at Cherry Creek High School. Like many another famous geologist, she attended Carleton College, graduating cum laude with a double major in physics and geology.

While still a UW-Madison graduate student, Heather's talents as a teacher were clear. She won the Tyler Award and was a Van Hise Fellow.

At William and Mary, Heather was awarded the Alumni Fellowship for excellence in teaching in 1989 and the following year won the college's Thomas Jefferson Teaching Award. In 1992 she was the first recipient of GSA's Biggs Earth Science Teaching Award, a national honor. She was President of the National Association of Geology Teachers in 1996 and in 2009 she was the recipient of NAGT's Neil Miner Award. In 2003 Virginia selected her as one of its Outstanding Faculty, the Commonwealth's highest honor for faculty at Virginia's public and private colleges and universities. Yes, she knows how to teach.

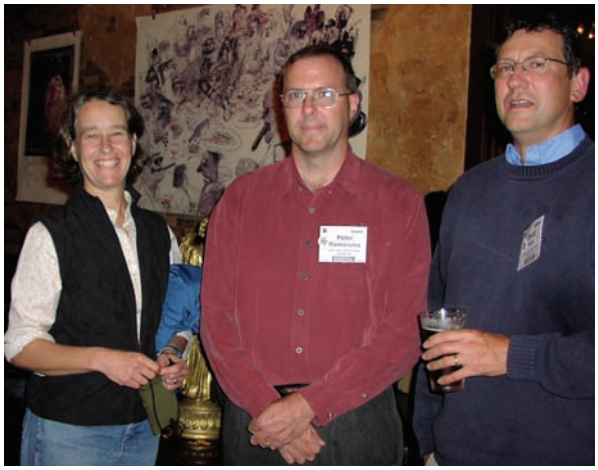
But that is just the start. Her real work has been in sharing that expertise with others, as a national leader in geoscience education. Beginning in the 1990s she published books of teaching materials and methods for earth science instructors at the primary and secondary level. Over the last decade she and her colleagues have developed workshops for college faculty and graduate students in geoscience. The first set of workshops, sponsored by NAGT and the National Science Foundation, began in 1999; they are called On the Cutting Edge, and are aimed at keeping college faculty up to date and preparing graduate students for careers in academia. A second set of workshops, Building Strong Geoscience Departments, moves beyond individual training to focus on bringing departments into the 21st century. These workshops and their associated websites are jointly sponsored by GSA, AGU, AGI, and NAGT, and are funded by the NSF. We are proud to welcome our distinguished alumna back to Madison and to present her with this award.

—Charles W. Byers,Citationist

In the News: Honors and Acknowlegements

- In recognition of her exceptional service to the profession of hydrogeology, **Mary Anderson,** C.S. Slichter Professor Emerita, received the GSA Hydrogeology Division Distinguished Service Award at the GSA Annual Meeting in Minneapolis in October (photo page 29).
- Professor Emeritus **Dave Mickelson** received the GSA Quaternary Geology and Geomorphology Division's Distinguished Career Award. The citationist was alumnus, and professor at Middlebury College, **Jeff Munroe** (MS '96 PhD '01). The award was presented at the QG&G Award Ceremony on October 11 at the GSA Annual Meeting. Former students also organized a session in Dave's honor and a field trip to the Ice Age Trail. (Please see page 30.)
- Professor **Robert H. Dott, Jr.** was recently elected a Fellow of the Wisconsin Academy of Sciences Art and Letters. (Please see page 8.)
- Professor **Robert H. Dott, Jr.** received AGI's 2011 Marcus Milling Legendary Geoscientist Medal at the Annual AGI Convention in Houston last April. The award is given to a geoscientist who has been a consistent contributor of high-quality scientific achievements and service to the Earth sciences having lasting, historic value, and who has a long history of sustained scientific achievement and exceptional service to the geoscience profession.
- Professor **Craig H. Benson,** Chair, Geological Engineering, UW-Madison, was elected to the National Academy of Engineering for improvements in design, construction, and monitoring of earthen liners and covers for municipal hazardous and radioactive waste landfills.
- Professor **Chuck DeMets** and alumnus **Eugene W. Domack** (BS 1978; Professor at Hamilton College) were elected fellows of the American Geophysical Union for 2011. This special honor is granted to only 0.1% of AGU's membership each year.
- Professor **Chuck DeMets** has received a highly competitive WARF Kellett Mid-Career Award from the UW-Madison Graduate School.
- Professors **Shanan Peters** and **Stephen Meyers** have been awarded NSF Early Career Development awards. The National Science Foundation's CAREER Program is its most prestigious award in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research. The award is difficult to obtain, and for one department to have two recipients in the same year is remarkable. Each award provides substantial research funding over a period of five years. Shanan's project is "Towards a high-resolution quantification of the North American rock record-leveraging field data, citizen science, and participatory education for macrostratigraphy" (see cover article, this issue); Steve's project is "Deciphering the Beat of a Timeless Rhythm—The Future of Astrochronology."
- The UW-Madison Physical Sciences Divisional Committee (tenure committee) voted unanimously to promote **Shanan Peters** to Associate Professor with tenure.
- Professor **Eric Roden** was selected by the UW-Madison Graduate School to be a Vilas Associate for the 2012-14 period
- Professor **Basil Tikoff** (with co-author H. Fossen) won GSA's Division of Structural Geology and Tectonics's Best Paper Award for their two papers on theoretical and applied analyses of three-dimensional deformation.
- Professor **John Valley** was elected a Fellow of the Geochemical Society and of the European Association of Geochemistry. The award was made at the Annual Goldschmidt Conference last August in Prague.
- **Richard Alley** (UW PhD 1987) is one of 10 recipients of this year's Heinz Awards. Alley is the Evan Pugh Professor at Penn State and a leader in polar ice studies who discovered that massive climate shifts can happen abruptly. He was named our department's 2005 Distinguished Alumnus.
- **William A. Morgan,** (BS 1975, MS 1977) Board of Visitors Chair, received a 2011 Distinguished Service Award from the American Association of Petroleum Geologists "In recognition of, and appreciation for, his pursuit of AAPG ideals through exceptional leadership, exemplary publications and being an example of professionalism for all to emulate." The Distinguished Service Award is presented to members who have distinguished themselves in singular and beneficial long-term service to AAPG.
- Sedimentary Badgers in the news: **Evan Franseen** (BS 1981, MS 1985, PhD 1989) is a candidate for president of the Society for Sedimentology (SEPM). **Rick Sarg** (BOV Senior Advisor) is the sole candidate for Foundation president of the Society.

At the GeoBadger GSA reception in Minneapolis: Aaron Pruitt, Kalina Dunkle, and Jonathon Carter.



At the GeoBadger GSA reception: Madeline Gotkowitz, Peter Riemersma, and Dave Hart. *Photos, Mary Diman.*

Student Awards and Scholarships for 2011

***The Wasatch-Uinta Field Camp Scholarships* provided by these funds:**
Herbert & Albert Weeks, C.F. Schiesser, BP
Kyle W. Fredericks Michael J. Hurth, Alexandra S. Macho
Christian G. MacLeod Stacy L. Oszuscik, Steven L. Rubinyi
Alex E. Ruff James Senn Marshal S. Tofte
Sydney A. Wallner
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Cole M. Christiansen Dylan P. Colon
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Ross K. Tipton

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Raymond V. Nechtaval

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Joe D. Kington

The Stanley A. Tyler Excellence in Teaching Award
David M. Lovelace

The Thomas E. Berg Excellence in Teaching Award
JoAnn R. Gage

The Morgridge Distinguished Graduate Fellowship
JoAnn R. Gage

The ExxonMobil Research Award
JoAnn R. Gage

The ConocoPhillips Research Award
Carolyn M. Streiff

The BP Research Assistantships
Chao Ma Helena M. Menendez
Jue Wang

The Distinguished Undergraduate Student Award
Stephen T. Johnson

The Distinguished Graduate Student Award
Bryn A. Benford

The C.F. Schiesser Outstanding Research Paper Awards

Bryn Benford
Benford B, Crowley J, Schmitz M, Northrup CJ, and Tikoff B (2010) Mesozoic magmatism and deformation in the Owyhee Mountains, Idaho: Implications for along-strike variations in the western Idaho shear zone. Lithosphere, v. 10, p. 93-118.

Ninfa Bennington
Bennington N, C Thurber, K Feigl, J Murray-Moraleda (2010) Aftershock distribution as a constraint on the geodetic model of coseismic slip for the 2004 Parkfield earthquake, Pure & Applied Geophys., 167.

Lauren Chetel
Chetel LM, and Carroll AR (2010) Terminal Infill of Eocene Lake Gosiute, Wyoming. Journal of Sedimentary Research, v. 80, p. 492-514.

Amalia Doebbert
Doebbert AC, Carroll AR, Mulch A, Chetel LM, Chamberlain CP (2010) Geomorphic controls on lacustrine isotopic compositions: Evidence from the Laney Member, Green River Formation, Wyoming: Geological Society of America Bulletin, v. 122, p. 236-252.

JoAnn Gage
Gage J, Goodwin L, and Tikoff B (2011) High-grade metamorphism and deformation on Mt. Chapple, Arunta Inlier, central Australia: A record of multiple tectonic events and was published by the Journal of Australian Earth Sciences. v. 58 p. 273-284.

Kuang-Sheng Hong
Hong, K-S, Xu, H., Konishi, H., and Li, X. (2010) Direct water splitting through vibrating piezoelectric micro-fibers in water. Journal of Physical Chemistry Letters. 1, 997-1002

Jason Huberty
Huberty, JM, Kita NT, Kozdon R, Heck PR, Fournelle JH, Spicuzza MJ, Xu H, Valley JW (2010) Crystal orientation effects in $\delta^{18}O$ for magnetite and hematite by SIMS. Chemical Geology, 276, 269-283.

Libby Obbink
Obbink EA, Carlson AE, and Klinkhammer GP (2010) Eastern North American Freshwater Discharge during the Bølling-Allerød Warm Periods: Geology, v. 29, p. 171-174.

Jeremy Pesicek
Pesicek JD, CH Thurber, S Widiyantoro, HR DeShon, ER Engdahl, and H Zhang (2010) Sharpening the tomographic image of the subducting slab below Sumatra, the Andaman Islands, and Burma, Geophys. J. Int., 182, 433-453.

Paul Riley
Riley P, Goodwin L, and Lewis C (2010) Controls on fault damage zone width, structure, and symmetry in the Bandelier Tuff, New Mexico. Journal of Structural Geology, v. 32, p.766-780.

Fangfu Zhang
Zhang F, Xu, H, Konishi H, and Roden EE (2010) A relationship between d-104 value and composition in the calcite – disordered dolomite solid solution series. American Mineralogist, 95, 1650-1656.

2011 Badger Receptions

Alumni and friends signing the guest book...

AAPG: April 12 – Houston

Jack Benthin
John Biancardi
Kate McColgin Bower
Alec Bray
Barbara Brown
Rob Bunge
Kirt Campion
Meredith Rhodes Carson
Ron Charpentier
Linda & Ken Ciriacks
Cory & Liz Clechenko
Paul L. Decker
Danica Dralus
Eric & Sheri Frodesen
Justin Gosses
Chris Griffith
Bruce Handley
James Henderson
Bob & Liz Hickman
David M. Hite
Dennis Kerr
Brad & Norma Macurda
William A. Morgan
Maria Mutti
John Naranjo
Doug Neese
Tina Nielsen
Ted Oppel
Rick Sarg
Stuart Schmitt
Martin Shields
Chris Smith
Mike Sweet
Roderick Tellman
Scott Thornton
Mary VanDerLoop
Ross Vandrey
Mark & Janice Veltern
Colin & Ashley Walling
Marwan Wartes
MaryBeth Wegner
Steve Westrich
Wayne Wiese

GSA: October 10 – Minneapolis

Ken Aalto
Jim Aiken
Charlie Andrews
Lawford Anderson
John Attig
Jean Bahr
Wyatt (Boomer) Bain
Christy Barszhewski
Richard Becker
Chloë Bonamici
Carl Bowser
Nate Booth
Ken Bradbury
Nicole Braudy
Bret Breithaupt
Shiy Brishel
Phil Brown
Steve Brown
Mark Bultman
Rex Buchanan
Pat Burns
Anders Carlson
Cary Carlson
Doug Carlson
Eric Carson
Jonathon Carter
Angeline Catena
Aaron Cavosie
Glen Champion
Ron Charpentier
Doug Connell
Steve Corsi
Aaron Curtis
Andy Czaja
James Dawson
Mary Diman
Amalia Dobbert
Steve&Mary Driese
Peter Drzewiecki
Kallina Dunkle
Don Elsenheimer
Eric & Rebecca Everman
Matt Francsis
David Fastosky
Erin Fenlon
Bridget Garnier (Diem)
Chris Gellasch
Casey Gherke
Scott Giorgis
Madeline Gotkowitz
David Hart
Noel Heim
Marc Hendrix
Tina Hill
Eric Horsman
Harry House
Mike Hultsren
Mindy James
Britta Jensen
Rick Johnston
Junfeng Ji
Josh Keeley
Matt Kuchta
Ben Laabs
Will Lamb
Andy Leaf
Nick Legg
Todd LeMaskin
Weiqiang Li
David Lovelace
Chris Lowry
Matthew Ludwig
Chao Ma
Richard Manser
Shasta Marrero (McGee)
Stephanie Maes
James (Jim) Mayer
John McLeod
Stephen Meyers
Zach Michels
Dave Mickelson
Vin Mickelson
Bill Mode
Claudia Mora
Maureen Muldoon
Jeff Munroe
Alan Nelson
Gordon Nord
Julia Nord
Andrea Pellis
Shanan Peters
Tina Pint
Aaron Pruitt
Laura Pugh
Paul Putzier
Todd Rayne
Alberto Reys
LeighAnne Riedman
Peter Riemersma
Brooke Alderfer Roecker
Laramie Roecker
Ashley Russell
Ben Sanderford
Tim Schroeder
Steve Sellwood
Zhizhang Shen
Ryan Sibert
Madeline Schreiber
Bill Simpkins
Brad Singer
Dana Smith
Michael Smith
Betty Socha
Ariel Strickland
Nick Sullivan
Matt Swanson
Kent Syverson
Michelle Szabo
Juli Thompson
Sarah Titus
Laura Toran
Blair Tormey
Jack Travis
Dave Ullman
Rich Whittecar
Jeff Wilcox
Eric Williams
Tao Wu
Zhongwen Wu
Huifang Xu
Fangfu Zhang

At the Spring Awards Banquet

April 29, 2011

Below, some of the undergrad award winners: Cole Christiansen, Will Montz, Brigitta Rongstad, Matthew Walker, Allie Macho, and Dana Peterson.

Above, graduate student award winners: Chao Ma, Dave Lovelace, Joe Kington, JoAnn Gage, Amalia Doebbert, Fangfu Zhang, Helena Menendez, and Carolyn Streiff. *Photos, Neal Lord.*

AGU: December 6 – San Francisco

Ninfa Bennington
Brian Boston
Austin Breed
Maxwell Brown
Mike Brudzinski
Aaron Cavosie
Andy Czaja
Heather DeShon
Bob Engdahl
Inge Engdahl
Jessica Feenstra
Melodie French
JoAnn Gage
Charles Geiger
Brian Jicha
Joe Kington
Christopher Kyriakopoulos
Ben Laabs
Dietrich Lange
Luis E. Laza
Tatyana Levy
Weiqiang Li
Tim Masterlark
Jeffrey McDonald
Helena Menendez
Stephen Meyers
Nobutatsu Mochizuki
Jeff Munroe
Summer Ohlendorf
Ian Orland
Jeremy Pesicek
Donna E. Phillips
Bob Phinney
Stuart Schmitt
Jeanne Scott
Brad Singer
Michael Smith
Ellen Syracuse
Alex Teel
Cliff Thurber
Frederick Tillman
Sarah Titus
David Ullman
Matt Weingarten

The Archivist's Corner

Wisconsin Academy remarks, November 6, 2011, upon his election.

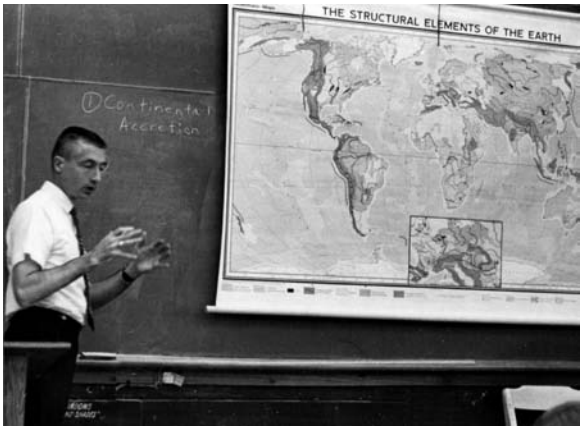
Robert H. Dott, Jr.

Both my father and an uncle were geologists, so the only thing I was sure of as a youth was I did not want to be a geologist. However, I craved the out-of-doors and as a lad I fell in love with the Rocky Mountains. When I entered college, I discovered to my surprise that geology was fascinating and could keep me outdoors. I was hooked.

Having grown up in the oil patch of Oklahoma, I first tried working in petroleum, but was soon called to active duty at an Air Force research center. There I was a logistical coordinator for projects in the Arctic. Necessary travel to Greenland and Alaska suited me just fine. While in the service, I decided that I really wanted a career in academia. Wisconsin seemed the best fit, so I arrived here with my young family in September, 1958.

My predilection was for the sedimentary record of earth history. This fascination led to a co-authored a textbook in 1971. To my surprise, Evolution of the Earth it is still in print in the 8th edition. More recently I co-authored with John W. Attig Roadside Geology of Wisconsin, a different kind of book for the layperson.

Reconstructing past times that no human witnessed has been the most fascinating challenge I could imagine. William Blake's opening line 200 years ago captures this passion nicely: "To see a world in a grain of sand…" It is like a great Sherlock Holmes mystery. From a few clues, one reconstructs the historical "crime" scene. For example, how had the five hundred million year old rocks in my back yard formed? The few fossils present are known only from marine rocks. Weird crinkly laminated layers are stromatolites, which today are formed in very shallow marine areas by photosynthetic microbes. Some other layers show ripple marks, which attest to wave and current action. Mystery solved—the rocks in my yard were deposited in a shallow, agitated sea inhabited by microbes and some invertebrate animals.



Professor Dott lecturing in room 180, Science Hall, May 1969. *Photo, Department Archives.*

But there is more. Closer Sherlockian examination reveals that the upper part of the stromatolite layer is broken into angular pieces encased in a matrix of quartz sand

Bob Dott at Van Hise Rock (seen from the east) in 1973. *Photo, Department Archives.*

grains. This records some unusually powerful event. As one British geologist said, "The rock record is like the life of a soldier with long periods of boredom punctuated by brief periods of terror." The terror in my case was provided by tropical storms, for inside information tells us that 500 million years ago Wisconsin lay in the tropics about 10 degrees south of the equator where tropical storms would have been common.

I have also investigated the older, Precambrian record of the Baraboo District, the roots of an ancient mountain range. It is a classical area made famous by a professional forefather, Charles R. Van Hise, before he became president of the university in 1905. While studying the Lake Superior iron resources critical to the industrialization of the nation, he created a famous Wisconsin School of Precambrian Geology, which I wrote about several years ago in the Academy Review and in the Outcrop for 2002 (pp. 32-33). The Baraboo District soon became a show place for demonstrating a number of fundamental principles and it is still a mecca for dozens of colleges and universities.

For much of my research, I sought mountainous regions of the western U.S. as well as southern South America and Antarctica. For centuries it had been assumed that the earth began as a molten sphere and gradually cooled through time. During the late nineteenth century, it was suggested that contraction of the cooling earth wrinkled the crust "like a drying, shriveling apple." Mountain ranges represented the wrinkles. Such a simple mechanism was beautifully appealing, but one ugly fact can destroy even the most beautiful hypothesis. The ugly fact in this case was that the amount of wrinkling by the cooling and shrinkage was inadequate to create mountains. A new theory was needed.

It is not clear when or by whom the remarkable parallelism of the opposite shorelines of Africa and South America was first noticed. Perhaps it was the Mock Turtle of Alice in Wonderland who observed

What matters it how far we go?
His scaly friend replied,
There is another shore, you know,
Upon the other side.

In any case, beginning about 1910,

Bob Dott, far left, lectures at Ableman's Gorge, September 27, 2008, to alumni, students, and staff. The field trip was part of the Board of Visitors-sponsored 2008 Alumni Reunion weekend. *Photo, Kurt Feigl.*

geologists of different nationalities began to speculate that the continents had moved and wrinkled up mountains on their prows. The most famous advocate was the German meteorologist, Alfred W. Wegener. His reconstruction of the continents 250 million years ago was far more consistent with the distribution of past climate zones than permanently fixed continents. Geologists then showed that identical sequences of strata and their fossils occur on the now widely separated five southern continents. Many of the fossils in those strata were non-marine animals and plants, which could not have dispersed across wide oceans! The postulated grouping together of the southern continents soon became known as Gondwanaland.

American geologists were the most antagonistic to continental drift, which was pronounced "utter damned rot" by a former president of the American Philosophical Society. As an undergraduate, I never heard drift mentioned. It was a British fellow graduate student at Michigan who introduced the subject to us naïve "colonials." Things changed after World War II with investigations of the ocean basins. The startling conclusion was that those basins had been growing wider during the past 250 million years with new oceanic crust formed by volcanic activity along seafloor ridges. Such a ridge is exposed in Iceland. So the continents on either side were drifting apart as the sea floor between expanded.

Meanwhile, some British physicists investigated the magnetism frozen into rocks such as basaltic lavas. Certain iron minerals become magnetized by the earth's magnetic field at the place and time of eruption and so provide a frozen clue to their ancient positions on the earth. Lo and behold, the older the fossil magnet sample, the farther it's orientation deviates from the present latitude of that sample. Moreover, comparison of samples of the same ages from different continents agreed well with Wegener's restored positions of the continents. Paleomagnetism had made continental drift a respectable theory—even in America!

During the 1960s things changed rapidly. Large movements of continents through time became inescapable, as did evidence for the progressive opening of ocean basins as the continents flew apart. And the formation of mountains as a consequence of moving and colliding continental plates suddenly became clear. Thus was born the great synthesis we call plate tectonics, which unites many aspects of geology and geophysics.

Plate Tectonics has been celebrated in poetry as well as on T-shirts:

> The plates can't curl down; they must curl up
> To form a kind of dish
> To stop the oceans spilling out
> And losing all the fish.*

I feel very fortunate to have lived through this great revolution in earth science. Besides finally having a satisfying theory to answer my boyhood wonder about mountains, we also have gained an understanding of the origin of continents and ocean basins. And we have come to appreciate the importance of impacts by extraterrestrial bodies, which knocked out the dinosaurs and other life forms. And we understand that our entire planet has undergone a profound evolution beginning with its origin four and half billion years ago—really a co-evolution of the physical earth and the biosphere on a two-way street. Because of this balance between life and non-life, it appears that Dr. Pangloss was correct that this is, indeed, "the best of all possible worlds"—at least in our solar system. ●

*B.C. & G.C.P. King (1971) *Nature*, v. 232, p. 37

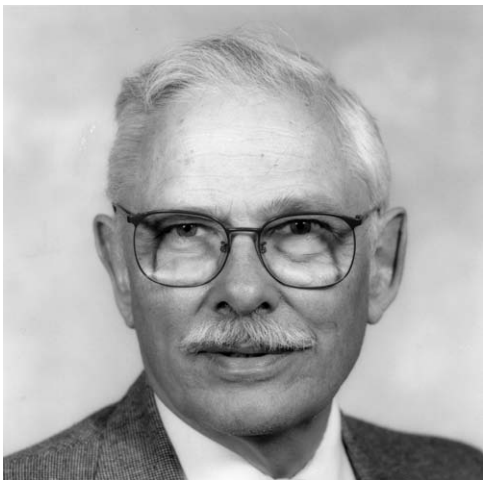
November 6, 2011, in Madison. Newly elected Fellows of the Wisconsin Academy of Sciences Art and Letters, from left, front: JoAnna Poehlmann, Bob Dott, Maury Laws. Back: Donald Nichols, Jeremi Suri, Steven Ackerman, Judith Faulkner. *Photo, C.W. Byers.*

In Memoriam: Clarence Clay

Professor Emeritus Clarence Clay died suddenly April 4, 2011. Known to friends simply as "Clay," he was a member of the faculty of the Department of Geoscience for 21 years. He grew up in Kansas and began his college education at Kansas State University, but left to serve in the Army during World War II. After basic training, he was placed in specialized programs at the University of Cincinnati and Ohio State University. He was then assigned to the Signal Corps to maintain and operate electronic equipment. While in Ohio, he met Jane Edwards and, after completion of Clay's training, they were married in 1945. Clay's group was chosen to maintain electronic equipment during the planned invasion of Japan.

After separation from the Army, Clay completed both the Bachelor's (1947) and Masters (1948) degrees in Physics at Kansas State University. The Clays then moved to Madison where he entered the PhD program in physics. His dissertation under Professor Gibson Winas was entitled, "Field Strengths and Spectra of High Frequency Gas Discharges." After completing the Ph.D. in 1951, Clay taught for one year at the University of Wyoming, but then joined the Carter Oil Company Research Laboratory in Tulsa, Oklahoma, as a Research Physicist to develop new methods for geophysical exploration. In 1955, Clay moved to the Hudson Laboratories of Columbia University where he was a Senior Research Associate for marine geophysical research. Here Clay worked in an unusually stimulating group specializing in marine acoustics. Among many accomplishments at Hudson, the group located several important U.S. and Russian sunken ships. With his colleague I. Tolstoy, he coauthored an important monograph on ocean acoustics published in 1966.

Clay applied his considerable mathematical skills to solving problems in signal processing that led to five patents between 1959 and 1967. His inventions show a remarkable prescience. For example, his 1959 patent for a "multiple transducer array … of particular utility in the area of seismic prospecting" has been referenced as recently as 2000 by several petroleum companies. His 1964 patent for "Signal Correlation Method and Means" for "oceanic depth measurement" refers "not only to measurements of the depth of the water, but also to the depth measurements of the earth layers below." It led, years later, to a Navy sonar project for mapping the ice pack floating in the Arctic Ocean to determine if submarines could safely navigate beneath it. Similarly, the 1967 patent for "Directional Filtering of Summed Arrays" for "maximization of signal output by means of a matched-filter technique" with Robert A. Frosch explicitly recognizes the mathematical similarity between sound waves in water and electromagnetic waves in air. Indeed, the patent refers to the sonar and radar "arts", respectively, anticipating—before digital computers—many techniques, such as "time reversal", that continue to see widespread application and extensive research today.



Clarence Clay, Professor Emeritus.

Clay joined the Geophysics faculty at the UW-Madison in 1968. He taught introductory geophysics to scores of students and he mentored many graduate students who today hold important positions in academia and industry around the world. His extensive ocean acoustics experiences led to an interest in fish acoustics. As faculty members in the graduate program in Oceanography and Limnology, Clay and Professor John Magnuson discovered a mutual interest in tracking aquatic organisms. They developed a fruitful collaboration involving graduate and post-doctoral students from their respective specialties to conduct cruises off Cape Hatteras using acoustical techniques to study the distribution of organisms along the northern edge of the Gulf Stream front. They then extended their research over deeper water beyond the Continental Shelf. Clay also conducted a geophysical survey for an antenna array in northern Wisconsin used for extremely low-frequency (ELF) communication with ships anywhere on Earth. Although practical, this technology became controversial with both environmentalists and marine zoologists.

While at UW-Madison, Clay published a second edition of the Tolstoy and Clay monograph and two editions (1977 and 1998) of another monograph on acoustical oceanography with former Hudson colleague, H. Medwin. These two books have appeared in Russian translations and are the international standard references for marine acoustics. Clay also published a textbook for exploration seismology (1990). In 1993, the Acoustical Society of America recognized Clay's preeminence by awarding him its prestigious Silver Medal, "for contributions to understanding acoustic propagation in layered waveguides, scattering from the ocean's boundaries and marine life, and ocean parameters and processes". His contributions are listed in detail on Wikipedia. Like many mathematicians, Clay possessed an

Professor Clay and Jane Clay in 2004 on a trip along the Inside Passage of Alaska's coast. *Photos, Department Archives.*

intuitive appreciation for music. He began playing the euphonium and singing in choruses as a youth and continued through adulthood. He and Jane, who plays the clarinet, joined the New Horizons Band for people over 50 years old. Clay also played in the Madison Community Orchestra. Both he and Jane sang in the First Unitarian Society choir for many years.

Clay continued his scientific pursuits after retiring in 1989. He participated in a Chaos Seminar led by Professor Clint Sprott and also explored fractals. He found that fractals describe wind-blown ocean waves, seafloor sediment surface features, and many aspects of the land surface. His last interest was in climate change. To look into the future, he was analyzing records over the last 800,000 years, using spectral algorithms that he characteristically insisted on re-deriving from Fourier's first principles. Although the shortening of Madison winters since the 1920s and the rapid shrinkage of the Arctic Ocean ice cover indicate warming, Clay became convinced, based upon his understanding of the orbital cycles identified by Milankovitch that, in the longer run, we are on the cusp of a new ice age.

The Clays raised four children of whom Clay was very proud. While living in New York State, the family took up sailing on the Hudson River in the summer and skiing in the winter. When they came to Wisconsin, both Clay and Jane served for many years on a ski patrol. Attending to injured skiers inspired Jane to obtain a degree in nursing after which she served as a registered nurse, certified at the University Hospital. The Clays were always active members of the First Unitarian Society of Madison, of which Jane was president of for a number of years.

Clay was always generous with his time and patient in sharing his knowledge. He was positive, considerate, genuinely interested in other people, and never tried to force his opinions on others. Even when the family was struck by tragedies of the most profound sort, Clay remained joyous in life. ●

Robert H. Dott, Jr. (Professor Emeritus), Memorial Committee Chair
Kurt L. Feigl, Professor
Mary P. Anderson (Professor Emerita)

SPEAKERS IN 2011

January 21–Dr. Gail Christeson, University of Texas at Austin: The Chicxulub Structure: What an Impact!

January 28–Dr. Marcia Bjornerud, Lawrence University: "Dry" vs. "Wet" pseudotachylyte: Observatons from Norway and New Zealand

February 3–Dr. Matt Pritchard, Cornell University: Testing mechanisms of subduction zone segmentation and seismogenesis with slip distributions from recent Andean earthquakes, the location of seismic swarms, and cracks in the Atacama desert

February 4–Dr. Matt Pritchard, Cornell University: Volcano deformation: When does it signify a hazard? A global compilation and case studies from the Andes

February 9–Dr. Craig Manning, Mineralogical Society of America Distinguished lecturer, Department of Earth and Space Sciences, UCLA: In Deep Water: New Insights into Geologic Fluids in the Deep Crust and Upper Mantle

February 11–Dr. Alberto Reyes, Department of Geoscience, University of Wisconsin-Madison: Really old and really cold: ancient permafrost and Pleistocene interglacials in Yukon and Alaska

March 4–Dr. William C. Haneberg, 2011 Jahns Distinguished Lecturer: The Landslide that ate Laprak

March 24–Dr. Kate Scharer, Appalachian State University: Kinematics of a sag pond at the edge of a transpressional bend: The challenges of unraveling slip rate in regions of structural complexity

April 1–Dr. Paul Kapp, University of Arizona: Building the Tibetan Plateau (and blowing it away)

April 15–Dr. David W. Peate, University of Iowa: Tracking the development of magmatic plumbing systems in flood basalt provinces through stratigraphic variations in crustal assimilation

May 6–Dr. Christie Rowe, UC Santa Cruz & McGill University: Frictional Decarbonation of Dolomite during Earthquakes, Naukluft Thrust, Namibia: Strange Fault Rocks and Evidence for Extreme Fault Weakening

September 9–Dr. Andy Czaja, Department of Geoscience, University of Wisconsin-Madison: Evidence for significant free oxygen in the ocean prior to the 2.4 Ga Great Oxidation Event

September 16–Dr. Gary Weissmann, University of New Mexico: Use of Outcrop Analogs to Improve our Understanding of Subsurface Physical Heterogeneity

September 23–Dr. Jessica E. Tierney, Lamont-Doherty Earth Observatory of Columbia University: Biomarker Perspectives on African Climate

September 30–Dr. David J. Des Marais, NASA Ames Research Center: Marine microbial mats and the search for evidence of life in deep time and space

October 6–Dr. Steve Silliman, University of Notre Dame–National Ground Water Association 2011 Darcy Distinguished Lecture: Characterization of a Complex, Sole-Source Aquifer System in Benin, West Africa

October 7–Dr. Martin Van Kranendonk, Geological Survey of Western Australia: Eight hundred million years that changed the world: Contingent drivers of environmental change across the Archean-Proterozoic transition

October 14–Dr. Terry Plank, Columbia University, Lamont Doherty Earth Observatory: Hot and Cold Slabs: Water Recycling at Subduction Zones

October 28–Dr. Huifang Xu, Department of Geoscience, University of Wisconsin-Madison: Sweet Spots for the Formation of Sedimentary Dolomites

November 4–Dr. Steve Wesnousky, University of Nevada, Reno: The Walker Lane and Basin and Range Fault Systems of Western North America: Styles and Rates of Deformation, Fault Mechanics, and Insights to the Structural Evolution of a Major Transform Plate Boundary

November 18–Dr. Sumit Chakraborty, Mineralogical Society of America, Distinguished Lecturer, Institut fuer Geologie,Mineralogie and Geophysik, Ruhr-Universitaet Bochum, Germany: How long do geological processes last?—The long and the short of it

December 2–Dr. Jessica Blois, Center for Climatic Research and Department of Geography, University of Wisconsin-Madison: Spatial and temporal dynamics of community responses to paleoclimate change

A new view of the sedimentary rock record

Drivers of Earth system evolution are encoded by gaps and rocks

by Shanan E. Peters

Charles Darwin closed his chapter in the *Origin of Species*, not subtly titled "On the Imperfection of the Geological Record," with a now well-known simile: "I look at the natural geological record, as a history of the world imperfectly kept...of this history we possess the last volume alone...Of this volume, only here and there a short chapter has been preserved; and of each page, only here and there a few lines." Although Darwin was a talented geologist who used the rock record to derive many new insights into Earth history, his message was very clear and it was articulated in one of the most influential scientific texts ever written. Beyond demonstrating that our planet is unimaginably old and ever-changing, the rock record is so incomplete that it cannot provide a reliable account of anything, particularly organic evolution.

Today, our perception of the rock and fossil records is somewhat different, especially with respect to the utility of the fossil record in documenting evolution, but in many ways it remains unchanged. All geologists value their rocks and the richness of the stories they can tell, but they also understand that the rock record is patchy, riddled with gaps, and gets worse with age due to tectonic processes and erosion. If we are lucky, or so the mantra goes, there will be a bit of rock somewhere in the world that survived destruction and that is well enough preserved that it might contain a useful proxy record of some kind, something that can be removed from the incomplete rock record and measured in a laboratory. Although this is a widespread sentiment among geologists, much of my recent work is showing that not only is this view inaccurate, at least from the Neoproterozoic to Recent, but it may also shackle our understanding of many important drivers of Earth system evolution.

The first step towards scientific understanding is to measure something that is fundamental to the object or phenomenon of interest. The approach I have taken to measuring the rock record is based on a simple but core principle that has roots going back to Wheeler's chronostratigraphy. At any point in space, the entire rock record can be subdivided into discrete packages that formed continuously at a given scale of temporal resolution and that are bound by gaps. In the case of sedimentary rocks, most of these gaps correspond to discrete surfaces representing unconformities. Sampling the entire surface and subsurface rock record at multiple locations and then determining the times of initiation and truncation of rock packages at each of those locations forms the basis of macrostratigraphy.

Fig. 1: Distribution of the 949 current macrostratigraphic control regions in the Americas and Caribbean.

Compiling and analyzing macrostratigraphic data has occupied much of my time for the past four years. To date, and with the help of **Noel Heim**, **Deb Rook**, and **Annaka Clement**, I have compiled 24,641 rock units from 1,013 geographic regions in the Americas and the Caribbean (Fig. 1), **Clay Kelly** and **Andy Fraass** (MS 2009) helped with 7,124 units from the deep sea, and **Neal Auchter** (BA 2009) completed a senior thesis in which he compiled and analyzed 2,168 units from 329 locations in New Zealand (you can explore all of these data in a simple interface at macrostrat.org). This work is producing many fascinating results, including some that shed new quantitative light on some old geological observations.

The simplest quantity that can be tabulated from macrostratigraphic data is the amount of rock as a function of age, such as the total number of sediment packages and sediment coverage area in each Phanerozoic stage (Fig. 2). The temporal pattern of marine rock quantity for the areas shown in Figure 1 is interesting for two reasons. First, there is indeed a long-term trend in preserved rock quantity, but that trend is a *decrease* towards the Recent, such that there is more Cambrian marine sedimentary rock than there is Miocene marine sediment. Although this makes intuitive sense to anyone with basic knowledge of the geologic history of North America, most of the models that are used by geologists to describe the rock record echo Darwin's view and assume that there is a dominant signal of erosion and destruction of rock, leading to an exponential decay in rock quantity backwards in time. Macrostratigraphic data do not support this hypothesis. If they did, there would be a trend through time in rock quantity, but it would be in the opposite direction. This is not to say that erosion doesn't occur or that it isn't important in shaping the marine rock record, but it does suggest that the *strength* of the destruction signal relative to the signal that was imparted by variation in how much marine rock was formed in the first place, must be small. Intriguingly, the time

series describing non-marine sedimentary rock quantity in North America does exhibit temporal asymmetry (Fig. 2, green line), with a large increase in quantity towards the Recent. There are several hypotheses for what might be responsible for the dichotomy between this aspect of the marine and non-marine rock records, but my favorite involves the dichotomy in the way that sediment accommodation space is created on the continents, namely sea level change and tectonics.

The second interesting aspect of the macrostratigraphic data for rock quantity is that they capture two familiar patterns that have long been part of the qualitative repertoire of North American geologists: Sloss Sequences and the Wilson Cycle. Recent work with **Steve Meyers**, published in 2011 in EPSL, identified an ~250 million year component of variability in marine sediment coverage area, an "M-curve" corresponding to the Wilson Cycle of continental coalescence and breakup. More intriguingly, we also found evidence for a significant 56 Myr oscillatory signal corresponding to many Sloss Sequences. The finding of a significant

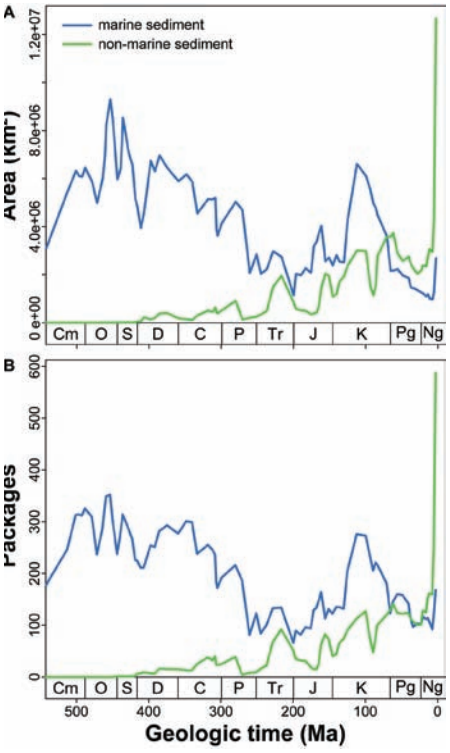


Fig. 2: Macrostratigraphy-derived time series of rock quantity in North America. A) Total number of packages. B) Total sediment coverage area. Blue line shows marine sedimentary rocks, green dotted line shows terrestrial sediment.

periodicity in marine sedimentation on the continents suggests that there is some tectonic process, as-yet unidentified, that operates with a periodicity of ~56 Myr and that this process is linked to the volume of the ocean basins and/or the mean elevation of the continents. There are a few ideas in the literature that are relevant, including cyclicity in the deformation of convergent margins and the timescales for mantle plume activity, but we still do not know the cause of the 56 Myr cycle. Given that statistically similar periodicity occurs in marine biodiversity and in seawater $^{87}Sr/^{86}Sr$, it is important that we find and understand the mechanism for this fundamental pattern in sedimentation.

The results above show that the marine sedimentary rock record is not dominated by erosional degradation, but that it instead captures a signal related to continental flooding. The question then becomes what effects did these large changes in Earth's surface have on the evolution of life and environment? To address this question, macrostratigraphic data need to be combined with data that describe biological and geochemical conditions on Earth, records which also come from sedimentary rocks.

In a *Science* paper published this year with a colleague from Bergen, we addressed this question by examining correlation and causation among marine biodiversity, geochemical proxy data related to global carbon cycling, sulfur cycling, climate, sea floor spreading/continental weathering, and sea level, as well as the number of marine sediment packages in North America. The remarkable result of this study is that even though the rock record of North America covaries with the global fossil record in ways that are predicted by Darwin's hypothesis, namely that the history of life is written in the tattered pages of an incomplete stratigraphy, the fossil record of diversity actually contains a signal that is also found in stable isotopic ratios related to sulfur cycling and sea level, which are in turn linked to records of carbon cycling and sea floor spreading. Moreover, we show that the biodiversity signal in the face-value fossil record isn't adversely affected by variability in the sedimentary rock record at all, even though fossil data do have a signal of idiosyncratic sampling by paleontologists. The most important result, however, is that we

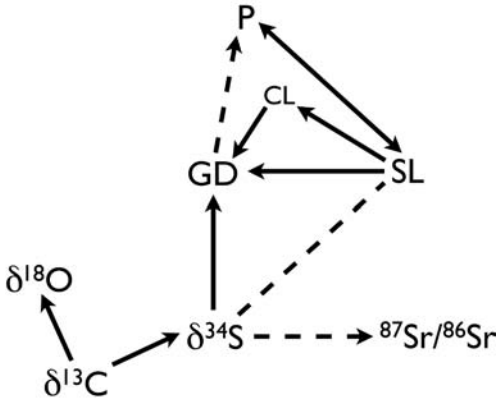


Fig. 3: Flow of information among global proxy records, North American macrostratigraphy, and marine fossil diversity. Solid lines with arrows show significant statistical dependence and direction of information flow, interpreted as causality. Dashed lines show statistical dependence but ambiguous causal relationships. GD, genus diversity; P, marine sediment packages; SL, sea level; CL, number of fossil collections. See Hannisdal and Peters (2011) *Science* for more information.

now have concrete evidence for an intricate network of causal relationships between many different proxy records for Earth systems evolution (Fig. 3), with information flowing from sea level to macrostratigraphy, and with sea level itself related to records that are affected by sea floor spreading and rates of continental weathering; the fossil record captures some of these environmental signals quantitatively too, which is not surprising given the responsiveness of the biosphere to physical environmental change.

Because macrostratigraphy is based on the gaps in the rock record as much as it is the rocks themselves, the results described above provide prima facie evidence for the hypothesis that there is important process information encoded within the very gaps that have troubled geologists and paleobiologists ever since Darwin. As a result, my attention, and that of my colleague Bob Gaines at Pomona College, has recently turned to understanding the implications of the biggest gap of them all, the "Great Unconformity," so named by John Wesley Powell during his epic 1869 voyage down the Grand Canyon (cover).

Coinciding in time with the Cambrian Explosion of marine animal life, the "GUn" has long been an icon for the inadequacy of the fossil record. In most places, including right here in Wisconsin, Cambrian marine

(Peters continued, next page)

(Peters continued)

sediments overlie igneous and metamorphic rocks that were formed at crustal depths hundreds of millions of years before the Cambrian (Fig. 4). Such non-conformities obviously impose a large gap in fossil recovery at a critical time in the history of life on Earth. However, the GUn is also a globally occurring, fundamentally unique paleogeomorphic surface that documents a protracted period of extensive continental denudation followed by the first continent-scale marine transgression of the Phanerozoic. This is important because the weathering of continental crust affects biogeochemical cycling in many ways, and the weathering of this continental crustal surface was enhanced during the Sauk transgression. Thus, rather than being a stand-out example of the incompleteness of the rock record, the formation of the GUn may have actually triggered one of the most important transitions in Earth systems in the past 1 billion years, a transition that is defined biologically by the Cambrian Explosion and geologically by a profound shift from high-standing, eroding continents to low-standing continents that readily accumulated sediments in expanding and contracting shallow seas.

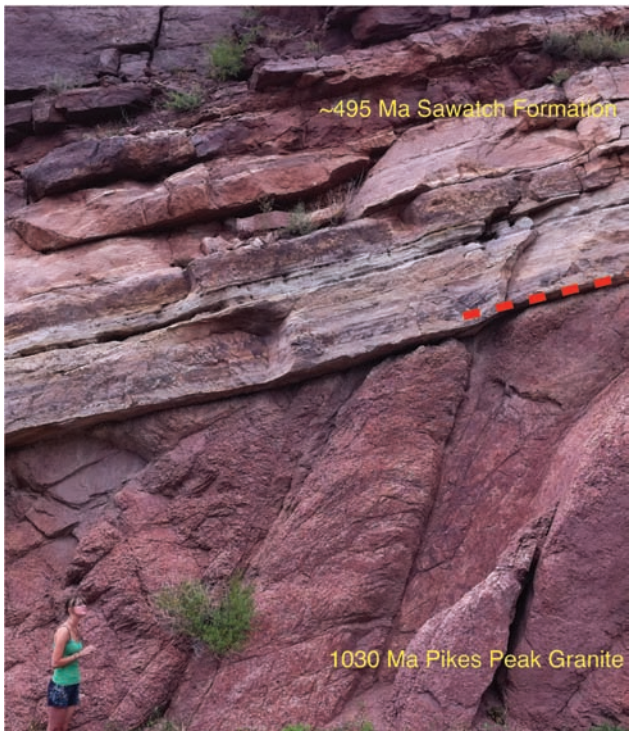


Fig. 4: The Great Unconformity outside of Colorado Springs, CO.

On the whole, much of my work in 2011 has shown that Darwin was right about the rock record only in the sense that the panoply of Earth systems interactions which control the spatiotemporal pattern of sedimentation result in a patchy and gap-riddled rock record. However, the new quantitative view provided by macrostratigraphy suggests that the gaps contain important and unique information about changes in Earth's surface environment. Thus, geologists would do well to move beyond Darwin's view of the incompleteness of the rock record and remember the words of the French composer Claude Debussy: "music is the space between the notes." ●

Students in the Field

Southern Exposure

Geobadgers head for southern hills

by Shanan Peters

For many Weeks Hall occupants, Spring Break means heading into the wilds in search of great rocks, and spring 2011 was no exception. Under the direction of **Shanan Peters** and **Alan Carroll**, and first-rate graduate student co-leaders **JoAnn Gage** and **Joe Kington**, a group of 11 undergraduate and five graduates trekked to the southern Appalachians.

Spring break came early this year, so on Friday, March 11th the group loaded department and UW fleet vehicles and left Madison, headed for the broad structural dome around Nashville, TN. Once there we took in lake-side and road cut exposures of fossiliferous Ordovician carbonates. This was the perfect starting point to begin our transect, as these sediments record the early Paleozoic passive margin that existed prior to later Paleozoic deformation, with a few scattered ash beds evidencing offshore arc volcanism. From Nashville, we headed southeast, towards Ocoee Gorge. On the way, we saw a prominent unconformity separating the black Devonian Chattanooga Shale from Ordovician carbonates and then ran up section, into carbonate-rich lower Mississippian rocks capped by younger Carboniferous clastics derived from the rising Appalachians. Ocoee Gorge itself exposes structurally displaced Precambrian metasedimentary rocks of the Great Smoky group, which record the rifting that formed the Paleozoic passive margin.

After our arrival in the heart of the Appalachians, we turned north and headed to the Brevard Fault Zone, one of the major structural features that record multiple phases of deformation, some of which brought Grenville basement rocks, as well as mafic and ultramafic rocks, to the surface *(photo, page 15)*. Another look into the orogen was provided by the Grandfather Mountain Window, a highlight of which was great exposures of the Linville Falls Fault. Great Smoky Mountain National Park was home for two nights before heading back west, across the valley and ridge and into the Appalachian Basin. A stop for an underground tour at Mammoth Cave marked the end of the trip's geology.

The Spring Break '11 group. *Photo, Joe Kington.*

Our group of students, **Devon Armstrong, Boomer Bain, M'bark Baddouh, Nicole Braudy, Jenny Crozier, Woody Fang, Sam Freitag, Samantha Leone, Ben Link, Patrick Loureiro, Jim Senn, Erik Skarman, Carolyn Streiff, Marshal Tofte, Sydney Wallner,** and **Eric Williams** were great, and we all enjoyed Joe's mountain serenades around evening campfires. All in all, it was another successful Geobadger Spring Break trip, made possible by the alumni Student Field Experience Fund. ●

Mapping Quest

Geoscience 202 to the Black Hills

The Geoscience 202 class on the early Cenozoic paleosol weathered into the Pierre Shale in Badlands National Park. *Photo, Andrew Walters.*

by Anders Carlson

Over the past decade, a key component of the undergraduate curriculum has been Geoscience 202, introduction to geologic structures. The class has morphed somewhat as the core curriculum has changed and now focuses on structural geology and how the rocks and structures interact with surficial processes to make Earth's geomorphology. An integral component of the class is the yearly trip to the Black Hills for the students to map structures first hand and actually *see* the geology that streams and wind have exposed.

In 2011, I led my fourth 202 fieldtrip to the Black Hills, this time solo and with 63 students. TA's **Andrew Walters, Zach Michels** and **Dana Smith** along with volunteer **Nichole "Nicolicoster" Braudy** provided an immense amount of additional help. After an all-night drive with two buses to accommodate the large number of students, we spent Thursday morning investigating Badlands National Park, identifying and mapping faults in the flat strata. After lunch and the obligatory stop at Wall Drug where we were able to keep track of everyone surprisingly, we headed on to Rapid City for a review of the Jurassic racetrack from Dinosaur Park with its kitsch cement dinosaurs and then on to camp.

Students finding their current location on the map and then taking strike and dip of the resistant sandstone bed on which they are standing. We spooked a rattler right after this photo, sunning itself on one of the better bedding planes. *Photo, Andrew Walters.*

Spring Breakers and Alan Carroll (front right) in the Appalachians: A chilly and rainy day didn't stop Geobadgers from checking out this nice exposure of mylonitic rocks in the Brevard Fault Zone. *Photo, Shanan Peters.*

Former students may remember camping in Custer State Park, but we changed camp areas in 2010 and now spend three nights at Bear Butte State Park near Sturgis, which better accommodates the change in class focus to mapping in detail two regions. The first one now is Bear Butte, which we tackled on Friday. Bear Butte is a Tertiary rhyolite intrusion that domed up the surrounding Mesozoic rocks. Another unexposed intrusion to the southwest of Bear Butte resulted in two domes overlapping, making for "interesting" field geology. Despite this complex setting, the students "get it" at this location with the TA's and I leading them through the mapping process. Once the rocks are mapped hiking up the butte, we are given an amazing view of the surrounding landscape where the hogbacks of resistant sandstone layers clearly layout the two-dome structure. The students take this knowledge of cliff and valley forming layers and then apply it in the afternoon to another intrusion called Elkhorn Peak, which they map from afar.

Saturday is the big mapping project day and we headed to Red Gate-White Gate on the east side of the Black Hills. The students are turned loose to map the classic monocline structure of the Paleozoic strata. This is a great location for such an assignment because a stream has cut through the fold, leaving the monocline of the Madison limestone and Deadwood Formation exposed in cliffs. We then move on to Precambrian rocks in the afternoon, visiting the Homestake Mine followed by mapping of the Deadwood-Precambrian contact near Lead High School. We finished the day at Mount Rushmore where, once again, our visit corresponded with donor-appreciation festivities, not allowing us to purchase ice cream from the convenience stand!

The first Saturday night of October 2011 was also UW's first conference game against Nebraska. Needless to say, many students were "upset" about having to miss the game. But technology to the rescue. One of the students can broadcast onto the web what is currently on his TV. I was thus able to stream the game live through my iPhone onto my laptop and we watched the game in the campground, followed by a good victory celebration.

We packed it up Sunday morning and began the long haul back to Madison. All in all a successful trip. Sixty three students returned, with a new appreciation for geology, structures and how they shape the Earth's surface. ●

October 1-4, 2011

WHITE LAKE TRIP REUNION

by Phil Brown

At the Little White River (it's Nip the dog in front): From left to right standing: Jamie Robertson, Shaun Wood and Ally, Charlie Andrews, Tim Prokop, Mary Jo and Jack Hallberg, Mike and Joan Sargent. Kneeling/ sitting: Larry Bradfish, Missy Setz, Devon Armstrong, Phil Brown, Jason Huberty, and Carl Bowser. *Photo, ©Carl J. Bowser–Silver Pixel Images.*

In the pre-dawn darkness of Saturday Oct. 1 multiple generations of White Lake alums gathered in the parking lot of Weeks Hall to begin the 10-hour drive to the Little White River in Ontario. Except for the time of year (normally the last week in April) and the time of day (we normally leave in the afternoon) the beginning was similar to the 65+ versions of this trip that preceded it. Participants excited to be escaping from Madison and looking eagerly forward to being a real geologist for a few days–tromping through the woods, puzzling over scarce outcrops, building a geological story in one's mind's eye (and hopefully on a map and cross section). And as the leaders of this intrepid band, Carl Bowser and I are, as always, wondering do we have all the equipment, did we buy enough food, does everyone have their passport?

The answers to all these questions were 'yes' and thus began a successful four-day reunion trip that brought together 10 course alums, family members and the two course instructors who have led 40 of the last 45 years of this remarkable course. Charlie Andrews (1975) and Jamie Robertson (would'a been in the 1970s but somehow the geophysics students didn't get out much) represented the Board of Visitors. Apparently all of the 285 students from the 1980s and 1990s were too busy with their real lives to play hooky but the last decade was represented in the van by Tim Prokop and Jason Huberty (2007) and Devon Armstrong and Missy Setz (2011). After an uneventful drive we arrived at the Little White River Lodge and were greeted by Jack Hallberg (1963) and his wife Mary Jo and of course the current owners of the cabins Gary and Hanny Ziegler. Later that afternoon Larry Bradfish (1974) and Shaun Wood (2000) and his family joined the party.

Phil Brown points out features of a roadside outcrop. *Photo, Jamie Robertson.*

Sunday morning Carl and I led a hike on the north central traverse—the traditional first mapping day that provides the students with a look at examples of nearly all the rocks in the mapping area. And this traverse includes some of the key outcrops in the map area. Part of the group took a shortcut up an ATV trail to the outlet of Bat Lake while the rest of us had a sweatier hike over the top of hill 407 and then joined up at the traditional lunch spot. While eating there, Mike Sargent (1964) and his wife Joan materialized out of the woods—they had driven to the camp that morning and located us in the wilderness.

As always, we cooked outside between the cabins along the riverbank and shared stories, good food and local as well as imported beverages. Gary and Hanny have owned the property since 1985 and as any of the 363 students who have struggled with the geology there in these last 26 years will attest, Gary can make wine or beer out of just about anything growing on the property. The blind taste testing that we did on Sunday left everyone with a favorite although the parsley wine was a bit bitter for my taste. Sunday evening we reprised our traditional Thursday night banquet—a sit-down meal complete with napkins, pepper shakers and dessert provided by Hanny.

Before dinner I rolled out the actual maps created by nearly all the reunion participants when they were students—I have a huge stash of maps and special projects dating back to the early 1950s as well as dozens of field books. Carl and I also have group photos and candid field shots from every year back to 1968. Much hilarity and good-natured ribbing accompanied the viewing of this 'ancient' history. But seriously, more than 1000 Geology and Geophysics (and now Geoscience) students have participated in the White Lake course in the last 70 years and gotten their start on careers that may or may not have ever included making another map. At one extreme Jack Hallberg spent a career mapping the inhospitable wilderness of western Australia—although he would be the first to admit that his White Lake map left a bit to be desired (tongue-in-cheek emoticon here).

Monday most of the group took a half-day

road trip to see some of the classic outcrops between the camp and the once vibrant uranium-mining town of Elliot Lake. During the course we normally take this drive at mid-week to give everyone a break and because the stops include some beautiful pillow lavas and a spectacular boulder conglomerate that marks locally the unconformity between the Archean granite gneisses and the world famous lower Proterozoic Gowganda diamictite. This later unit preserves some of the earliest and most extensive evidence for widespread continental glaciation in the rock record.

Tuesday morning we left for Madison while those who had driven themselves headed out in various directions. I think the trip was successful and I believe that all the alums and especially their spouses agree. The weather was as perfect as one could hope for in early October and the trees were beautiful shades of red, orange and yellow. Carl and I appreciate the effort that people put into making the trip to this beautiful and very out of the way place and I can't wait for the end of April to come so that I can return with this year's crop of 15 students. ●

With Jack Hallberg and Charlie Andrews poring over maps in the background, Carl Bowser, left foreground, reminisces with Tim Prokop, Jason Huberty, Mike Sargent, Gary Ziegler, and Phil Brown. *Photo, Jamie Robertson.*

Right: Relaxing at lunch near one of the historic uranium mines outside Elliot Lake, Ontario. *Photo, Larry Bradfish.*

Fall Field Trip

Exploring southwest Wisconsin

Students in the Field

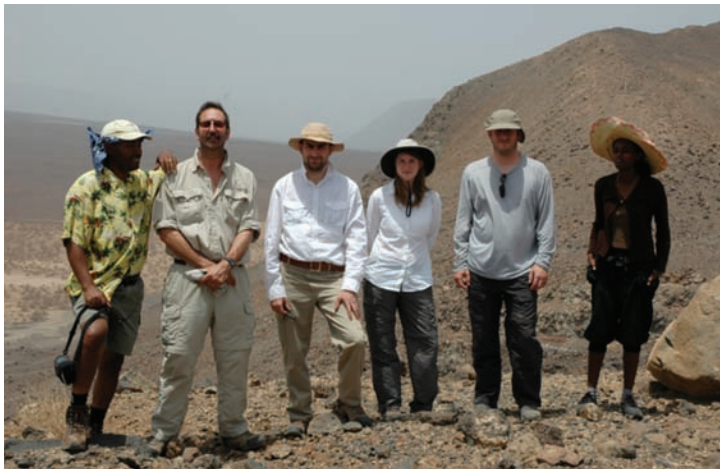
by Anthony Pollington

Overlooking the Wisconsin and Mississippi Rivers at Wyalusing State Park. Left to right: Alex Teel, Andrew Walters, Shannon Graham, Susanna Webb, Andria Ellis, Jessica Feenstra, Helena Menendez, JoAnn Gage, Carolyn Streiff, Joe Kington, Nicole Braudy, Anthony Pollington, and Ellen Syracuse. *Photo courtesy of Anthony Pollington.*

In October 2011 a group of 13 Weeks Hall residents went on the annual fall fieldtrip, planned by **Shannon Graham** and **Anthony Pollington**. We explored the bluffs of the Mississippi and the Driftless Area of southwest Wisconsin. Highlights included hunting for Ordovician fossils, discussing Wisconsin's glacial history (and lack thereof in this area), hiking at Devil's Lake and the newly reopened Parfrey's Glen. We had great times around campfires, playing games like, "guess who's going to get lost on the way back from the bathroom," and watching an impromptu interpretive play about glaciers performed by **Susanna Webb, Nicole Braudy, Helena Menendez, Ellen Syracuse,** and **Andrew Walters**. It was a wonderful weekend getting to know each other, seeing great geology and exploring our beautiful state. Support was provided by the department and BP. ●

Field Research In Ethiopia

by Brad Singer



The research team at Dobi. From left: Tesfaye Kidane, Brad Singer, Max Brown, Allie Macho, Brian Jicha, and Mahlet Adamu.

In early March, undergraduate student **Allie Macho**, lab manager **Brian Jicha**, and I headed to Ethiopia to collect samples of extensive sequences of basaltic lava flows in the Afar rift thought to record back-to-back geomagnetic field reversals that occurred about 2.1 million years ago. The aim is to correlate the magnetic field behavior recorded in two lava sections at Gamarri Lake and Dobi, Ethiopia with records in lava flows at Reunion Island, southern Argentina, and the Huckleberry Ridge tuff at Yellowstone National Park, as a well as sediments cored from the North Atlantic Ocean and use these records to better understand dynamo processes that cause field reversals. This project is supported mainly by the NSF and is a collaboration between my group, Josh Feinberg (University of Minnesota), Max Brown (Potsdam University, Germany) and Tesfaye Kidane (Addis Ababa University). Allie was able to participate thanks to support from the Shell undergraduate research fund. She is currently completing her senior thesis on the $^{40}Ar/^{39}Ar$ geochronology of the lava sequence at Gamarri Lake.

Upon landing in Addis Ababa on March 11th, it was clear that many people in the airport were upset at what they had been seeing on the television or hearing on the radio—the magnitude 9 Tohoku earthquake and tsunami had just struck Japan. During the first couple of days in Addis Ababa, as we prepared for our expedition to Gamarri Lake, which is on the far eastern edge of Ethiopia adjacent to Djibouti, we also were kept abreast of politics in Wisconsin during BBC broadcasts. That the governor had just signed his budget repair bill and 14 state senators who had taken refuge in Illinois were returning to Madison was making headlines in Africa! We left the bustle of Addis on March 13th for a two-day drive to Semera province and the Gamarri Lake area. Crossing the Awash river valley in the Afar rift brought us into a remote desert that to our surprise was teeming with wild boars, oryx, ostriches, camels, and gazelles. Accommodations in the outpost of Semera on the Djibouti-Addis Ababa road were courtesy of the president of the province in the local military barracks. The president insisted that during our field work in the Afar rift valley we were to be accompanied at all times by two armed police officers, Mohammed and Ahmed. As our two 4WD vehicles left the paved road for the 30 mile trek on jeep tracks to the Gamarri cliffs where we planned to use gasoline powered drills to sample the lava flows, it became apparent why the police were necessary—every male over the age of 15 carried an AK-47 rifle and a large curved knife.

On our way to the research site we had to get around many obstacles, including the Gamarri people who intimidated us with their large knives and guns. Fortunately the King of Gamarri was riding with us, and once we bought corn from the tribe and gave them cigarettes they let us pass.

Our campsite at Lake Gamarri, which was filled with 10 ft long crocodiles and hippos. *Photos, Brad Singer.*

Gamarri Lake had expanded since Tesfaye Kidane had last visited the region so we could not drive to the base of the 200 meter tall lava section we planned to drill. Instead we hired camels to porter our food, water, drills, etc. and walked over talus the last three miles to reach the section. It took three days to drill 23 lava flows in sweltering 95 degree heat (in the summer it can reach 130 degrees here!) during which we nearly ran out of water. Troupes of baboons that combed the cliffs above our heads were curious about the sound of the drills. We had to sleep rough in the talus for two nights under mosquito nets. On the first night, just after everyone had retired to their rocky beds, the baboons in the

(Continued, next page)

Degrees Awarded May–December 2011

Ph.D. Degrees

Ninfa Bennington, Thurber, *Advances in Geophysical Methods at Parkfield, California*

Matthew W. Knuth, Tobin, *Ultrasonic Velocity Measurements in Sheared Granular Layers: Implications for the Evolution of Dynamic Elastic Moduli of Compositionally-Diverse Cataclastic Fault Gouges*

Jie Xu, Sahai, *Mechanistic Studies of Model Biomembrane Stability and Bacterial Cell Viability at the Oxide-Water Interface*

Masters Degrees

Meagan E. Bosket, Johnson, *Tracing the build-up to the 7.7 ka climactic eruption at Mount Mazama, Crater Lake, Oregon using U-Th isotope geochemistry*

Edward Greiner, Sahai, *Adsorption of Alpha Aminoacids L-Glutamate and L-Aspartate to p-Al$_2$0$_3$*

Caitlin R. Keating-Bitonti, Peters, *The Influence of North Atlantic Deep Water on the Global Carbon Cycle During the Late Miocene*

Matthew M. Kogle, Wang, *Non-destructive Evaluation of Rock Bolts and Rock Mass Associated with Optical Strain Sensors at the Former Homestake Gold Mine*

Aaron E. Masters, Feigl, *Interferometric Synthetic Aperture Radar Analysis and Elastic Modeling of Deformation at the Svartsengi Geothermal Field in Iceland, 1992-2010: Investigating the Feasibility of Evaluating Reservoir Pressure Changes from Low Earth Orbit*

Daniel S. Murray, Singer, *Northern Hemisphere Forcing of the Last Deglaciation in Southern Patagonia*

Raiza R. Quintero, Valley, *Oxygen isotope ratios in zircon and garnet: A record of magmatic processes and contamination history in the Dinkey Dome peraluminous granite, Sierra Nevada Batholith*

Joshua S. Roberts, Wang, *Hydrostatic Leveling Sensors as Long Baseline Tiltmeters to Evaluate Ground Motion in Two Underground Mines*

John R. Schneider, Tobin/Goodwin, *Relating Fault Zone Structure and Physical Properties Using Ultrasonic Velocity: How Mineralogy, Cement Distribution, and Cataclasis Influence the Material Properties of Sandstones*

Zhizhang Shen, Xu/Brown, *Composition and Microstructure Evolution During Dolomitization of Wisconsin Ordovician Limestones*

Sarah E. Siewert, Singer, *Integrating $^{40}Ar/^{39}Ar$, U-Pb, astronomical clocks in the Cretaceous Niobrara Formation*

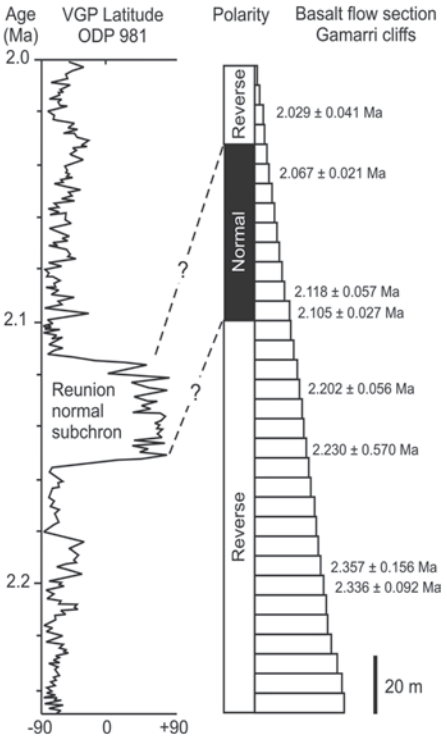
Eric M. Skarman, Carroll, *Quantitative Geographic Analysis of Shortite Paleoburial Depth, Wilkins Peak Member, Green River Formation Wyoming*

Mo Zhou, Xu, *Carbonate-Silicate Interface: Effect of Biotite and Diopside on the Precipitation of Callite Polymorphs*

Chunxiao Zhu, Sahai, *Role of Cell Wall Structure and Extracellular Polymeric Substances (EPS) in Shielding Against Specific Mineral Toxicity-Implications for Cell Surface Evolution*

Undergraduate Degrees

Devon M. Armstrong
Wyatt M. Bain
Wesley J. Braga
Dylan P. Colon (Physics)
Jamie L. Dillon
Nicholas T. Dosch (GLE)
Molly L. Finnegan (GLE)
Kyle W. Fredericks
Samuel A. Freitag (GLE)
Kimberly L. Hoxie
Stephen T. Johnson (Anthropology-Honors and Certificate in Archaeology)
Jacob J. Krause
Samantha E. Leone
Dylan P. Loss (Honors)
Patrick Loureiro (Certificate in Environmental Studies)
Lauren L. Meyer (GLE)
Steven L. Rubinyi
Ryan F. Shedivy (GLE)
Bethany M. Welke
Emily E. Woch



Figure, left: The virtual geomagnetic pole (VGP) latitudes obtained from marine sediment cored at ODP site 981 by Channell et al. (2003) record the Reunion normal subchron. The lava flows at Gamarri, with $^{40}Ar/^{39}Ar$ ages and uncertainties shown on right are also thought to record the Reunion subchron, however, the ages we have obtained thus far from lava flows with normal polarity are younger than those from ODP site 981, suggesting that lava flows at Gamarri may record a distinctly younger geomagnetic excursion known as the Huckleberry Ridge excursion that occurred about 2.09 Ma.

(Singer continued)

cliffs above us became loud and agitated. We learned why when Mohammed bolted upright and triggered his AK-47 toward a large hyena that had appeared in our camp looking for food. No shots were fired, the hyena disappeared into the night, but this made it nearly impossible to contemplate trying to sleep. The next day, Mohammed pointed out that within 20 meters of our camp, several crocodiles had hauled out of Gamarri Lake to get some shade in bushes along the shore—great!

Despite the unexpected wildlife, we completed the sampling of the Gamarri section and another section near the salt mines of Dobi. Allie has done $^{40}Ar/^{39}Ar$ experiments on nine of the lavas at Gamarri. The results thus far (see figure) suggest that the lavas at Gamarri record a ~40 kyr period of normal magnetic polarity that began at about 2.105 Ma and ended after 2.067 Ma. The $^{40}Ar/^{39}Ar$ ages are significantly older than the K-Ar ages acquired by Tesfaye Kidane in 1999. Given the uncertainteis associated with the ages determined from each of the lava flows, the $^{40}Ar/^{39}Ar$ data allow us to tentatively correlate the Gamarri record with sediments at Ocean Drilling Program site 981 in the Atlantic Ocean that have been dated using astrochronology (see figure). Together these records are allowing Josh Feinberg and Max Brown build a model for the field reversal process associated with the Reunion subchron. ●

Alumni News—2011

1960s

A.J. (Joe) Erickson, Jr., BS 1960, MS 1964

I was a consultant in mining geology for seven years after retirement from Exxon in 1998. I have fond memories of White Lake with Dr. Dott and the basement of Science Hall in Dr. Cameron's realm. I have been mostly involved in genealogy rather than geology of late, with considerable success. I am enjoying three grandsons and one granddaughter. I celebrated my 75th birthday in April and 50th wedding anniversary in August.

Theodore E. (Ted) Jacques, BS 1961

poppated70@yahoo.com

I am a retired independant geologist. I worked for Conoco, UnionTexas Petroleum, and E.L. Cox. I'm now a custom furniture maker, singer, and bluegrass guitarist.

Philip H. "Pete" Stark, PhD 1963;

Senior Advisor–Board of Visitors.

I will receive an AAPG Honorary Member award at the 2012 Annual Convention in Long Beach. It is an honor to join fellow Badger Ray Thomasson among those who have been named an Honorary Member. The values of a Geo-Badger education and principles of the Wisconsin Idea certainly resonate in the guidelines for consideration of candidates for this award. It is a treat to realize that those values are being perpetuated in the current generation Geo-Badgers at Weeks Hall. Cheers to all who made Science Hall such a memorable and rewarding experience.

Elwood R. (Woody) Brooks, PhD 1964

Research Associate at U.C., Davis, since 2001 and Senior Fellow of GSA, is still plugging away. He annually teaches a field workshop in geology at the San Francisco State Univ. Sierra Nevada Field Campus near his home in Sierra City, CA, and is one of ten authors of "Eocene-early Miocene paleotopography of the Sierra Nevada-Great Basin-Nevadaplano based on widespread ash-flow tuffs and paleovalleys", to appear in a special issue of *Geosphere*.

Lloyd C.Furer, PhD 1966

I retired from the Indiana Geological Survey at Indiana University in 2000. Current activities include subsurface stratigraphy of N. Rocky Mountains and family history research. I now have 11 grandchildren.

Dennis M. Howe, BS 1964, MS 1966

I have oil exploration projects in Powder River Basin, Wyoming (Permian Minnelusa Formation) and in Carbon County Wyoming with drilling anticipated in 2012. I am 70 years old. My oldest son runs an internet marketing company in Los Angeles; my youngest son is in marketing for Trek bicycles. I have four grandchildren, smart and good looking like their grandmother.

Peter R. Vogt, MA 1965, PhD 1968 Oceanography

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I got the first UW graduate degree in Oceanography—I was recruited for that because I already had the required ship time on research ships when the program was initiated. Although "retired" from the Naval Research Laboratory since late 2004, and in the absence of an emeritus type status there, I'm still engaged in a bit of real research. Retirement gave me time to widen my research scope—as evidence there's a new paper (Vogt and Parrish, 2012, *Palaeo-3*) just out linking the Middle Miocene shallow marine deposits exposed in the Calvert Cliffs near my house to global paleoclimate issues—particularly the Middle Miocene Climate Optimum (an ironic term indeed!) and corresponding relative sea level highs. Venturing still further from my NRL "quad" of deep-ocean geophysics and geology, I came up with a new hypothesis for the origin of those mysterious "knees" produced by baldcypress—I argue they are evolutionary anachronisms (see *Maryland Naturalist*, winter 2011-2012 issue). And STILL further from my professional field, I recently wrote two children's books (*The Monster Shark's Tooth* and *A Most Mysterious Fossil*, BarclayBryan Press) with the aim of teaching natural history and geology, including fossil collecting "ethics," in the guise of science fiction. I also just began collaborating with a young tenure track prof at the Univ of Maryland in her planned research on biogenic methane in sediments under the Chesapeake Bay. But I haven't given up on the Mid-Oceanic Ridge—just need to get back and revise and resubmit a paper on axial volcanism.

Gary D. Rosenberg, BS 1966

Our Earth Sciences Department, IndianaU, PudueU, Indianapolis is becoming blessed with several UW alums: our new chair Kevin Mandernack and also Greg Druschel. This year for the first time in my 32 years at IUPUI, I led our grad students to Baraboo, with Kevin's encouragement. Charlie Byers showed us some sights—more beautiful and informative than I remembered. Thanks to Charlie and to my mentor from 1963-66, Bob Dott for the rock solid "Wisconsin Experience."

Larry Asmus, BS 1968

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I am enjoying retirement. I have two new grandchildren: Dahlia Donna Root, and Daniel James Asmus.

Stanley Fagerlin, BS 1969, MS 1971

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My house and garage both survived being hit by the Merrill, WI tornado of April 10, 2011. Five acres of woods fared less well. Fifty cords of pulp logs were removed. Tops and unusable trees are all over and other houses and road which I couldn't see before are now in plain view. While the popples and evergreens will shoot up in the next few years the large sugar maples are another story. I am still enjoying my retirement. The big trip this year was a month-long road trip west.

1970s

Robert H. Blodgett, BS 1972

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I continue to enjoy teaching geology at Austin Community College and service to the National Association of Geoscience Teachers (NAGT). As a NAGT Councilor-at-Large, I chaired a 13-member committee which created the first national organization of two-year college (2YC) geoscience faculty. Called Geo2YC, the group became an official division of NAGT in October and has over 100 members. In August I was awarded a NSF grant to work with Heathter Macdonald (MS 1976, PhD 1984), Eric Baer, and Jan Hodder on a three-year project, called SAGE 2YC, to improve professional development for 2YC geoscience faculty.

My partner Jeff and I took our first-ever trip to England in search of family roots and British geology. In Haughley, Suffolk we saw the mid-16th century church built with Cretaceous flint where my ancestors were married and buried. We also enjoyed the Natural History Museum in London and fossil collecting in Lyme Regis.

Barbara Goldman Grundl, BS 1976

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I just completed a teacher certification program to teach elementary children and to teach English as a second language.

Our children are grown. Katie graduated from UWEC with an illustration/web design degree and Nick is in his junior year at UW-Madison working hard toward a degree in chemical engineering and biochemistry. Tim my husband is the chair of the School of Freshwater Science at UW-Milwaukee.

Paul La Pointe, MS 1976; PhD 1980 Rock Mechanics

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Another busy year! Did field work in Papua New Guinea mapping fractures and structures for petroleum exploration and reservoir characteriza-

Alum Paul LaPointe in the field in New Guinea.

tion. Our field party helicoptered in to a remote portion of the country, where we lived with some locals who built a camp out of the jungle. Other than some rice we brought in, we lived subsistence for the bulk of the time in an old-fashioned fly camp. It was quite an experience to be with the first party that had ever done geological reconnaissance and mapping in an unmapped (at least from the ground) area. We'd spy outcrops from our helicopter, and then the locals from our field party would hack a path through the jungle to get there. Sometimes we traveled by pirogue if the outcrops were near the water. I also completed some field work on fracturing in the Mesaverde in the Uinta Basin, and carried out some major reservoir characterization projects for fields in Mexico, Kuwait and Abu Dhabi. New book: (AAPG Memoir 96) published on uncertainty and reservoir characterization.

1980s

Judith Brandt, BS 1981

I have worked for the Southern Nevada Water Authority in Las Vegas since 2001, as a remote-sensing analyst.

Greg Kimball, MS 1982

I'e been an environmental consultant for 25+ years and now have been with WSP Environment & Energy for almost five years. Still like the work (good projects, great clients), the challenge of figuring out contaminant distribution in complex geologies, and working with some great remediation engineers to get it fixed. I have also been volunteering my time with a non-profit group (World Hope International) to try to maximize well drilling efforts in Sierra Leone, Africa and bring clean water to people. It's very frustrating trying to help the drilling teams with almost no data so if anyone knows where I can get some real data (drilling logs, geophysical survey results) for Sierra Leone please contact me.

My granddaughter is three years old. She loves the rocks and minerals in my computer room so maybe we will have a new geology student for U of W in another 15 years or so. My three kids are mostly grown up but they are always your kids and need you no matter how old. Life is good, work and playing trumpet in a concert band, jazz band, two rock & roll bands, a couple quintets, and sometimes an orchestra, keeps me amused. My best friend in the world (my wife Laurie) and I went to Alaska this last fall and saw God's creation in all its beauty. I also got to actually walk on a glacier, and that made the trip as good as it could be for me. Rock on everyone (pun totally intended).

Jay C. Nania, BS 1984, MS 1987

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I have now celebrated my 25 year anniversary with BP, and continue on as the New Wells Delivery Team Leader for our Deepwater Western Gulf of Mexico business. My team also supports all deepwater wells across the GoM in providing specialized services such as shallow hazards analysis, pore pressure prediction and detection, biostratigraphy, and wellsite operations. Likewise, I also continue to enjoy my role as a Senior Advisor to the UW Geoscience Board of Visitors, and look forward to joining many of my fellow alumni in supporting the financial needs of the department, in particular the Student Field Experience Fund. Being in the field was also a theme for my family in 2011 with numerous hiking activities, including a great trip to Ecuador and the Galapagos Islands. Christina – age 16, Jason – age 14, and Julia – age 12 continue to progress in the sports of fencing, cross country and basketball, and soccer respectively. They even manage to squeeze in some school work. My wife Silvia has a busy ophthalmology practice at Baylor College of Medicine, and still serves as the Chief of Ophthalmology at the Veterans Administration in Houston.

1990s

Gary Gianniny, MS 1990, PhD 1995

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I was promoted to full professor and awarded Fort Lewis College Scholar of the Year Award. We had two great visits to Madison this year to see Bob and Nancy Dott. Cynthia (Dott) is now an associate professor of biology at Fort Lewis College and both of our kids Cari and Gordon are in high school.

Lucy Meigs, MS 1990, PhD 1994

lucy@everyoneoutside.org

I worked as a professional hydrogeologist in Albuquerque. After moving to Durham, CT, I have gradually transitioned to working as an outdoor educator. I am loving spending time outdoors and continuing to learn and connect with the natural world. I created Everyone Outside (www.EveryoneOutside.org) to write grants to support programs and curriculum development. We are enjoying life in Durham. Martha is 14 and Charlotte is 10.

2000s

Tammy Rauen, BS 2003, MS GLE, 2007

I am a Project Engineer at Golder Associates Inc., Lakewood, Colorado. I earned my Professional Engineering license (PE) in October 2011.

Michael Markgraf, BS 2005

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mike@schmitttechnicalservices.com

I was recently promoted to Senior Geologist/Petrographer, Field Operations/Geological Services Managerat Schmitt Technical Services, Inc., Cross Plains, WI. My wife Diane and I celebrated our third year of marriage and we celebrated the 1st birthday of our son Mason.

Jennifer Lewis (Nielsen), MS 2006

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I am still teaching full time at Madison Area Technical College and enjoying it. I am teaching General Geology. Earth Science, and Survey of Oceanography and am serving my college as the Center for Excellence in Teaching and Learning's Online Teaching Fellow. One of my roles as online teaching fellow is to train our faculty in online pedagogy. My son, Anders William Lewis, joined the Lewis family in February 2011!

Alumni Death Notices

Hubert H. Hall, MS 1949, PhD 1953, of Lecompton, KS, died on September 25, 2010.

Victor J. Mayer, BS 1956, of Windsor CO, died on July 26, 2011. He was born in Mayville, Wisconsin. He was a geologist, Earth Systems Scientist, science educator, Fullbright Fellow, world citizen and lover of the Colorado mountains.

Joseph J. Mancuso, MS 1957, died in April 2009. He earned his BS from Carleton College in 1955 and his PhD at Michigan State in 1960. He taught geology at Bowling Green State University for 35 years. In 2007 He was the winner of the Lake Superior Institute on Geology Goldich Medal. He also established the Mancuso Family Scholarship for Field Studies at Bowling Green.

George A. Desborough, PhD 1966, of Golden Colorado, died in August 2010.

Stephen Vihel, BS 2001, died Dec. 1, 2011, in Tucson, AZ, at the age of 31 of a congenital heart defect. In October he had received a mechanical heart in anticipation of a transplant. Steve was the well-known owner of a popular Tucson bike shop.

Faculty News—2011

Jean Bahr

The (successful!) search for a new faculty member in hydrogeology kept me quite busy in the spring semester, both with hosting interview candidates and with a graduate seminar in which we read and critiqued papers by the finalists. In addition, my final year as a GSA officer included trips to section meetings in Pittsburgh, Wilmington NC, New Orleans, and Logan Utah. As at previous sections meetings, I enjoyed both the science and the chance to talk with a host of enthusiastic students who are at the start of their careers in geoscience. I also enjoyed field trips to see landslides in western Pennsylvania, the aftermath of Hurricane Katrina, and springs in the mountains above Logan. Sharing teaching of Environmental Geology with **Chuck DeMets** facilitated that travel schedule.

In the summer, I offered the three week hydrogeology field methods course. We used some of the field exercises to gather data for a Water Resources Management project exploring the use of treated wastewater as a source of groundwater recharge in the Madison area. We also travelled north to the Chequamegon National Forest to collect data on groundwater-surface water interactions in MS student **Aaron Pruitt's** field area and conducted a pumping test at the monitoring well nest established by PhD student **Chris Gellasch**, who is studying potential pathways for virus migration from near surface sources to deep bedrock aquifers. In the late summer, I had the opportunity to visit Biosphere II near Tucson while attending a GSA Leadership retreat.

The fall offering of hydrogeology attracted almost 50 students, a recent record (although not as high as in the mid-90s). With the increasing number of new geology and geological engineering majors, I expect that course to remain well subscribed in the next few years. New PhD student **Steve Sellwood** joined the hydro group in September. Steve plans to build on former MS student **Andy Leaf's** work with downhole distributed temperature sensing (currently in press in *Ground Water*) to characterize preferential flow zones in clastic bedrock aquifers. A fall highlight was getting to see many former hydrobadgers at the GSA annual meeting in Minneapolis. I particularly appreciated the hospitality and assistance of **Matt Swanson** and **Laura Pugh** when my Prius hybrid battery died as I was about to drive back to Madison.

Phil Brown

The last year sure was eventful—unwanted but well deserved national publicity as the university seeks a path to survival over the coming years. Twelve blocks west of the capitol I continue to be very busy teaching largely undergraduate courses, collaborating on several research fronts internationally, and serving the professional community.

In February I chaired one of two Geoscience panels for the NSF Graduate Research Fellowships—nearly 300 wonderful proposals suggesting to me that our science broadly defined has a rich future ahead of it—lots of very good people with interesting ideas. In March I chaired a more focused evaluation effort of over 100 graduate research proposals for the Society of Economic Geology—mineral deposits research is a popular field world wide.

After teaching the Minerals as a Public Issue (Problem) course in the spring, I taught four weeks of the field camp in Utah. Enrollments continue to be strong with 51 total students including 15 who signed up through UW. The gold mining industry in Nevada continues to hire several students from our field camp every summer—this has turned out to be a great partnership. The college has unexpectedly provided us with the opportunity to explore a new funding model for field camp going forward. On the plus side we will now be able to enroll students from any college or university for the same fees that we charge our own students – this perhaps will ensure strong enrollments into the future. However with our own growing crop of majors we will need to make sure that Field Camp doesn't grow too big for the Chateau and our ability to staff it.

I taught the mineralogy class during the fall to 50 students—a massive jump from the nine students enrolled in the fall of 2010. These students were shoehorned into two lab sections and we were very thankful for the 24 new petrographic microscopes acquired earlier in the year. Simultaneously I co-taught our Introduction to Geologic Structures class that had an enrollment of 63—all indications are that these unprecedented enrollments will continue for the next few years at least. From my point of view the biggest problem with these huge classes is when we try to go to the field for labs or overnight trips—buses instead of vans and our inability to interact with all the students in the field as they work to improve their observational skills. Our teaching assistants are great but budgetary constraints mean there really aren't enough of them to optimize learning.

As I have described on pages 16-17 **Carl Bowser** and I really enjoyed organizing and leading a 4-day White Lake Reunion trip in early October. The weather was great and the alums (and spouses and children) had a great time – well worth the effort.

My immediate family is well—Jason got married to Liz and the fact that they live about a mile from us is very nice although as busy as we all are, we commonly go multiple weeks without seeing each other. They continue a long process of renovating the inside of their house that allows me the vicarious pleasure of destruction/construction without the dust being in my family room. At least we have moved most of his belongings out of our house! Peter and Abbey have moved to Bloomington, Indiana where Abbey has begun law school and Peter is working in the IT area at Indiana University. Karin has finished a two-year MBA and Masters in Sports Management program at U. Mass and continues as the assistant coach at Amherst while waiting for the right head-coaching job to open up. Kris continues to manage the only library in the Madison public schools with an active instructional program—a real feat in the face of the beating that public education, at all levels, is taking in Wisconsin.

Anders Carlson

2011 was another good year for the Quaternary Research group. **Dan Murray**, co-advised with **Brad Singer**, finished his MS on the onset of valley glacier retreat in southern Patagonia and its implications for the forcing(s) of global deglaciation. **Kelsey Winsor** passed her preliminary exams in August, advancing to dissertator status. She and **Dave Ullman** also conducted research in Labrador just after her examination, making for a "hectic" period. Kelsey also received a "best student presentation" award for 2010 AGU presentation on her MS research on glacial-interglacial fluctuations in Labrador Sea temperature, which is now in revision at Paleoceanography. Dave Ullman is continuing on his research on the last deglaciation of the Laurentide Ice Sheet and received a NSF Doctoral Dissertation Research Award in May for his study of the onset of deglaciation in Wisconsin. **Alberto Reyes** joined the group as a post doc in January after finishing his PhD at U. Alberta-Edmonton, and is constructing the extent of the south Greenland Ice Sheet over the last 400,000 years. He received his first "taste" of Greenland this summer spending a month on the island. Former Quat **Lisa Colville's** MS thesis on the extent of

the south Greenland Ice Sheet during the last interglaciation was published in July in *Science* with co-authors **Brian Beard**, Alberto Reyes and Dave Ullman, and received international press coverage. The group published six papers this year and gave 18 presentations at GSA, AGU, the International Union for Quaternary Research Congress in Bern, and the Arctic Workshop in Montreal.

Chuck DeMets

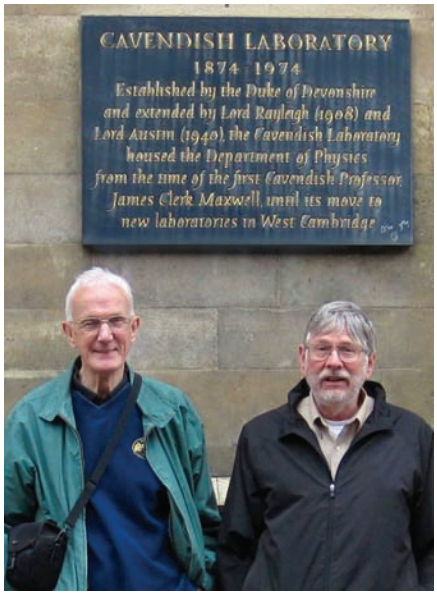
My research efforts in 2011 were focused in the Caribbean, Central America, and Mexico, where I have been combining continuous and episodic high-precision GPS measurements with a variety of geophysical modeling techniques to study regional-scale tectonics and active faulting since the mid-1990s. In April of 2011, I learned that NSF funded four more years of my GPS work in Mexico, where I have worked since the mid-1990s with assorted investigators and agencies to study transient strain phenomenon and long-term strain buildup associated with the Mexico subduction zone. The M=9 Tohoku, Japan earthquake of March 2011 was a wake-up call that our long-held expectation of a maximum-magnitude 8.2-8.4 earthquake along the Mexico subduction zone could be wrong, as similar expectations were proved wrong in Japan by the Tohoku earthquake. Russian scientist Dr. Serge Merkouriev spent two months working in my lab in May and October of 2011, continuing our long-term study of global plate motions since 20 Myr. In July, I reciprocated by visiting his native St. Petersburg, a wonderful mid-summer destination.

This fall, my PhD students **Shannon Graham** and **Bryn Benford** each submitted for review their respective modeling studies of active deformation in Honduras and Jamaica. Both hope to finish their degrees in 2012.

Last, but not least, I received satisfying recognition for my career accomplishments via my selection as a 2011 AGU Fellow and a Kellett Mid-Career award from UW-Madison. The latter will provide much-needed flexible research funds for my ongoing projects over the next three years. I only hope that 2012 can be half of what 2011 was!

Kurt Feigl

In May, **Aaron Masters** successfully defended his MS thesis entitled, *Interferometric synthetic aperture radar analysis and elastic modeling of deformation at the Svartsengi geothermal field in Iceland, 1992 to 2010: feasibility of a reverse impulse-response evaluation of reservoir pressure from low Earth orbit*. Following an internship with ConocoPhillips in Houston, he has accepted full-time employment there.



One of the early pioneers in microanalysis, Peter Duncumb, left, and John Fournelle in Cambridge, England. *Photo, John Fournelle.*

Post-doctoral research associate **S. Tabrez Ali** and I are making great progress on a clever scheme for optimizing complicated numerical models that describe image data from satellite radar interferometry (InSAR). Now that we have completed the nitty-gritty technical details of validating the technique, we are looking forward to applying it to several large signals, including: viscoelastic relaxation following the Krafla Fires rifting event in northern Iceland, two intrusions and an eruption at Eyjafjallajökull volcano in Iceland; Okmok volcano in Alaska (with graduate student **Summer Ohlendorf** and **Cliff Thurber**); the earthquake deformation cycle in Mexico (with graduate student **Shannon Graham** and **Chuck DeMets**), as well as the Laguna del Maule volcanic field in the Andean Southern Volcanic Zone (with **Brad Singer** and others).

At Laguna del Maule, the rate of uplift, as measured by InSAR, is at least 180 millimeters per year, or more than three times faster than the growth rate of a human fingernail! Since this rate is also faster than observed during intrusive episodes at Yellowstone or Eyjafjallajökull in 2010, I became quite interested indeed. Tabrez and I are convinced that the signal is the result of magmatic intrusion at depth.

2011 was a year of many proposals. To quote Dickens, "It was the best of times, it was the worst of times." The best outcome was a grant with **Herb Wang** from the U.S. Department of Energy to study the geologic "F-word". Also known as "stimulating" or "enhancing", the technique serves to increase their power production of a geothermal field. We want to perform a hydro-mechanical experiment to analyze the (constitutive) relationship between impulse and response. The impulse—the net volume of water injected into or withdrawn from the reservoir—is known from the history of production and injection. The responses—subsidence and seismicity, as well as pressure and temperature in other wells—can be measured using geophysical techniques.

John Fournelle

My wife Judi Munaker accompanied me to Europe this spring (no adventures with volcanic clouds causing us to migrate south this time), prior to attending the European Microbeam Analysis Society in Angiers, France. We were able to visit one of the early pioneers in microanalysis, Peter Duncumb, in Cambridge, where I interviewed him for the Microanalysis Society's oral history series. Back in France, several days were spent south of Paris with Emmanuel de Chambost, comparing historical notes (he just wrote the definitive history of CAMECA, having himself worked there a couple of decades with SIMS development). Together we visited the University of Paris at Orsay, where Raymond Castaing (who built the first functional electron microprobe) and Andre Guinier (his thesis supervisor) together with Jacques Friedel founded the Solid State Physics branch in 1959. In a dusty old cupboard, we located some long lost documents from the first years of the electron microprobe, including the original copy of Castaing's thesis. Earlier in 2011, I got involved with trying to analyze some tiny (<1 micron) crystals of iron silicide found by **Mike Spicuzza** in lunar soil; this analytical project turned out to be a stumper, and now **Phil Gopon** (MS 2010) is working on a PhD project with me attempting to solve the "soft x-ray" problem for material such as this. In July I gave an invited presentation on electron microprobe standards at the yearly Microscopy & Microanalysis conference in Nashville. And in September I presented my "Anchorage urban history" research at the annual meeting of the Alaska Historical Society.

Dana Geary

I enjoyed the second half of my sabbatical during the winter-spring of 2011, working mostly on projects involving mollusc shell chemistry (stable isotopes and Sr/Ca) and its relation to environment.

I have new NSF funding for a collaborative project with colleagues at Cornell/PRI and the University of South Florida to compare evolutionary tempo and mode in various mollusc lineages from icehouse (Florida Plio-Pleistocene) and greenhouse (Western Interior and Gulf

(continued, next page)

(Geary, continued)

Coast Cretaceous) intervals. We did some nice field work in Wyoming and northern Colorado during the summer.

My family and I spent the summer in Colorado—Rob and I worked on manuscripts, the girls had various volunteer jobs, and we all logged as many trail miles as possible. We also did some college touring, as this new interval is just around the corner for us: Sarah is a high school senior, Molly a sophomore. Very interesting to see universities from "the other side!"

In the fall, **Ray Ostrander** arrived as a new paleo grad student. He will do his MS degree on cardiid bivalve evolution as part of the icehouse-greenhouse NSF project.

Pictured: A field trip to Yellowstone National Park August 2011 with faculty, students, and postdocs connected to the UW-NASA Astrobiology Institute project—see Eric Roden's report, page 25.

Left: Orange microbial biofilm at Grand Prismatic Spring, Yellowstone.

Above: UW-Madison students, post-docs, and faculty at Yellowstone's Norris Geyser Basin. *Photos, Clark Johnson.*

Laurel Goodwin

2011 began and ended with the publication of papers documenting evidence of the beautiful complexity of deep crustal flow in the granulite facies rocks of the Arunta Region in the Red Center of Australia. **JoAnn Gage's** MS research and a piece of **Chloë Bonamici's** PhD research share common features: both are field-based projects that integrate never-out-of-fashion observations made at a range of scales with new techniques or concepts. Both represent significant contributions to our understanding of the structural and tectonic history of this fascinating region.

My research group underwent a significant shift in 2011, as **John Schneider** (co-supervised with **Harold Tobin**) finished his MS thesis and new students **Dana Smith, Kyle Fredericks** (also co-supervised with Harold Tobin), and **Andria Ellis** (co-supervised with **Basil Tikoff** and **Chuck DeMets**—as if one of us weren't a big enough burden), came on board. They've brought a lot of positive energy into the Craddock wing. John's work demonstrated that shear deformation bands in quartz-rich sandstones enhance ultrasonic velocity, particularly when waves travel parallel to deformation bands. Kyle plans to build on this study by systematically investigating the effects of variable amounts of clay in sandstone on both deformation band fault-zone character and ultrasonic velocity. He will also build the first 'laboratory on the outcrop' to investigate fault-related changes in velocity at the meter scale. Dana and I are zooming off in a totally new direction, using the paleomagnetic record of pseudotachylyte (frictional melt produced at seismic strain rates) in low-angle normal faults to answer the contentious question of whether the faults produced earthquakes in their current orientations. We are jazzed about working with in-house collaborator **Brad Singer** and external collaborators Josh Feinberg and Matt Heizler on this project. Andria will also participate, determining whether exposures of these rocks are sufficient to back out additional information about earthquake source parameters. 2012 will be a fun year!

Stephen Meyers

It's been an exciting two years since joining the Geoscience faculty. This past year saw the rapid fruition of several collaborations with UW-Madison colleagues, including an article with **Brad Singer** and **Sarah Siewert** (*et al.*) on the intercalibration of radioisotopic and astronomical clocks during the Cenomanian/Turonian, and publication of a study with **Shanan Peters** that provides evidence for a 56 Myr rhythm in North American sedimentation during the Phanerozoic, defining most of Larry Sloss' original cratonic sequences and showing a close relationship to marine biologic diversity. The Cretaceous geochronology study is the first major product of an NSF-sponsored project to revise the Late Cretaceous time scale (with **Brad Singer** and Brad Sageman, Northwestern Univ.). Graduate student **Chao Ma** generated data in the new XRF scanner lab to extend the C/T cyclostratigraphic work, and he presented his initial findings at the annual GSA meeting. Further exploring the interface of macrostratigraphy and cyclostratigraphy, graduate student **Wasinee Aswasereelert's** investigation of the Green River Formation is in post-revision review with GSA Bulletin (with **Alan Carroll, Shanan Peters, Kurt Feigl** and **Michael Smith**). Graduate student **Andrew Walters** also joined our group last fall to evaluate repetitive sedimentary (micro) facies of the Green River using XRF scanning.

The most exciting professional development of 2011 was the selection of my NSF CAREER proposal for funding. Titled *Deciphering the Beat of a Timeless Rhythm—The Future of Astrochronology*, this work compliments the Cretaceous geochronology project, and another NSF-sponsored project to evaluate orbital-insolation versus stochastic controls on climate over the past 36 Ma. Regarding the latter study, Wasinee Aswasereelert presented work on Miocene paleoclimate records at the Fall AGU meeting, and graduate student **Miao Du** joined our group last fall, with an interest in evaluating non-linear climate dynamics.

Also of note is an in-press publication with Andrew Dale (GEOMAR) *et al.* using state-of-the-art reactive-transport modeling to evaluate geochemical and paleoenvironmental change during OAE 2. And while the focus of the XRF scanning has been cyclostratigraphy, graduate student **Ian Orland** began using the method to evaluate speleothems, and with colleagues at Yale University, we've produced data to investigate the Holocene African Humid period, both of which were presented at the fall AGU meeting.

A source of continual amazement and inspiration for everything I do, my son Teal is now almost two years old. His big trip for 2011 was to the Netherlands, where I gave an invited talk at Utrecht University.

Chris Johnson observes iron oxide formation among biofilms in a Yellowstone stream. *Photo, Clark Johnson.*

UW-Madison Yellowstone field trip participants, L to R, back: Huifang Xu, Clark Johnson, Liz Percak-Dennett, Meagan Bosket, Andy Czaja, Fangfu Zhang, Weiqiang Li, Ed Greiner. Front: Eric Roden, Matti Urrutia, Alan Roden, Anna Roden, Ji Xu, Chris Johnson. *Photo, Clark Johnson.*

Shanan Peters

There are good years and there are less good years, but by all accounts 2011 was the best I've had so far. In the spring, **Caitlin Keating-Bitonti** successfully defended a great MS thesis on deep sea sedimentation and the Late Miocene carbon isotope excursion, which I co-advised with **Clay Kelly**. **Ben Linzmeier** also defended his MS thesis on SIMS analysis of Nautilus growth bands, which I co-advised with **John Valley**. My first PhD student, **Dave Lovelace**, accepted a full-time job offer from BP and will be moving to Anchorage after defending his dissertation on the Triassic system in the western U.S. in 2012, and **Deb Rook** passed her preliminary exams for PhD candidacy. **Noel Heim** was also promoted to Assistant Scientist and continues to play an important role in keeping many different projects moving forward. Some new people also joined the group. **Tim Foltz** started a MS project on the Sauk Sequence in Montana and I was fortunate to hire Senior Programmer Analyst **Puneet Kishor**, a creative geospatial data-focused fellow who is helping to build some innovative new interfaces for interacting with geological data.

By far the biggest event of 2011 for me personally was my successful promotion to Associate Professor with tenure in December. Receiving an NSF CAREER award, having a paper published in *Science*, receiving an Honored Instructor award this fall, and being tapped by the Provost's office to lead a campus-wide initiative in Earth science data integration helped round out nine great semesters here in Madison. I look forward to this next phase of my career, and to enjoying my new flat on the near eastside, near Orton Park and the Weary Traveler.

Eric Roden

The geomicrobiology group had a busy and productive 2011, participating in ten publications and 14 conference presentations. Similar to recent years, much effort was directed toward experimental studies of stable iron isotope fractionation under both abiotic and microbial iron oxide reducing conditions. A large portion of this work was driven by postdoc **Lingling Wu**, who will join the faculty at the University of Waterloo in Canada in March. Lingling's fourth paper on this subject, now in press, synthesizes a large body of data and concepts related to the origin of Fe fractionations in Precambrian rocks. NASA Astrobiology Institute (NAI) graduate student **Liz Percak-Dennett** made a nice contribution to this line of inquiry in a paper describing her MS research on iron isotope fractionation coupled to microbial reduction of a novel iron oxide/silica coprecipitate that mimic iron oxide phases likely to have been the starting material for Archean and Neoproterozoic Banded Iron Formations. Iron figured prominently in other work as well, in particular a new paper by former UW postdoc **Aaron Coby** documenting the potential for sustained redox cycling of iron linked to oxidation of ferrous iron with nitrate by the same bacteria responsible for production of the ferrous iron in the first place! This paper helps to unravel the potential complexities of how iron may cycle in low-temperature earth surface environments, a topic at the heart of two short-review style papers published by yours truly and other iron-pumping colleagues from Canada and Germany as well as the U.S. We also enjoyed success in explicating key quantitative aspects of microbial respiratory metabolism in general, including a literature review paper that demonstrated a direct correlation between cell growth yield and the free energy available for microbial energy metabolism. Fun stuff for geochemistry-loving microbe lovers! But nothing was more fun than the field trip to Yellowstone National Park (YNP) in August 2011 with faculty, students, and postdocs connected to the UW NAI project (photos pages 24, 25). With expert guidance from UW NAI commander-in-chief Professor **Clark Johnson** and our new friend and colleague Dr. Eric Boyd from Montana State University, we worked our way through virtually all the major hot spring environments, cramming our brains full of a (sometimes smelly) combination of microbiology, geochemistry, and volcanic geology. Good things have come from our brief but fascinating sojourn at YNP, including some data on microbes and iron isotopes in an acidic hot spring that is making its way into a new collaborative NAI proposal.

Bradley Singer

2011 was another eventful year for my program. In March, senior honors undergraduate student **Allie Macho**, **Brian Jicha**, and I travelled to Ethiopia for two weeks to collect samples from lava flow sections exposed in the Afar Rift Valley (see page 18). This is part of an NSF grant to determine the precise timing of a geomagnetic field excursion recored in the lavas. Allie has made great progress dating these lava flows for her thesis. **Sarah Siewert** completed her MS thesis on the geochronology of Coniacian-Campanian strata in the Rocky Mountains and **Dan Murray** completed his MS thesis on the chronology of late-glacial climate change in Patagonia. Sarah is now at BP in Houston, and Dan is with the Wisconsin State Geological survey. **Mike Smith, Toni Simo,** and I presented a paper on a new Ordovician Time Scale at the Minneapolis GSA meeting. I also co-authored a couple of GSA presentations with **Steve Meyers** and **Chao Ma**. New graduate student **Nathan Andersen** joined my group in the fall and is working with me on the geochemical evolution of the Laguna del Maule volcanic field in the Chilean Andes. I lead the preparation and submittal of a large proposal to the NSF to undertake geophysical, geochemical, and modeling studies

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(Singer, continued)
of this unusual volcanic field—where surface uplift of nearly 18 cm a year has been occurring since 2007 and a large amount of rhyolitc magma has leaked to the surface in the last 24,000 years. This project on caldera inception is forging exciting new collaborations with **Cliff Thurber, Chuck DeMets, Kurt Feigl, Jeremy Pesicek, Clark Johnson, Brian Beard, Brian Jicha,** and **Tabrez Ali**, as well as investigators at five other universities in the US, Canada, and Chile. I took on the responsibilites of Department Chair precisely as the university began to grapple with a very significant reduction in support from the state government, a topic that I only wish I could avoid! As Chair, it was however, quite invigorating to meet more than 130 enthusiastic GeoBadgers at our GSA reception at Hells Kitchen and about 50 more of you at the fall AGU reception. My daughter Zoe continues to flourish in her senior year at Kettle Moraine High School. She was recently accepted to attend both UW-Madison and the University of Chicago and thus has some interesting choices to make. Teri and I began looking at houses in Madison and 2012 will be the year of the big move.

Clifford Thurber

2011 was a year of numerous transitions for me. I ended my three-year term as department chair and began a postponed year-long sabbatical. Two major research projects ended in 2011, but several others are continuing and five new projects have begun, two of them involving work in New Zealand. The first edition of my inverse theory textbook went out of print and a new edition has taken its place. In contrast, my research group has remained relatively stable, with new graduate student **Jessica Feenstra** joining others working in the area of volcano seismology. Assistant Scientists **Jeremy Pesicek** and **Ellen Syracuse** both were successful in getting NSF proposals funded, on the 2010 earthquakes in Chile and Christchurch, respectively. Post-doc **Emily Montgomery-Brown** continued her work on Kilauea Volcano. **Ninfa Bennington** defended her PhD thesis on joint geophysical inversions and transitioned to a post-doctoral position here. As for my continuing graduate students, **Alex Teel** passed his PhD preliminary exam, focused mainly on the structure beneath the Sacramento River Delta, **Summer Ohlendorf** transitioned from volcano seismology to volcano geodesy applied to Okmok Volcano and co-advised by **Kurt Feigl**, and **Helena Menendez** continued her research on the seismic structure of Long Valley Caldera. Junior undergraduate **Dana Peterson** spent the summer studying nonvolcanic tremor beneath the San Andreas Fault and presented posters on her work at the Southern California Earthquake Center and American Geophysical Union meetings. Other 2011 highlights include co-leading two GeoPRISMS (formerly MARGINS) workshops on Subduction Cycles and Deformation, participating as an instructor in the Pan-American Advanced Studies Institute, "New Frontiers in Seismological Research: Sustainable Networks, Earthquake Source Parameters, and Earth Structure," in Quito, Ecuador, and co-chairing a fall AGU special session on Geophysical Characterization of Magmatic Systems.

Grad student Joe Kington should really be wearing a hard hat as he checks out turbidites and mass transport complexes here beneath an overhang in the Ainsa Basin, northern Spain. *Photo, Harold Tobin.*

Harold Tobin

The Earth is keeping those of us interested in subduction zone faults, earthquakes, and tsunami very busy lately! 2011 was a year of globetrotting and transitions for me and for my research group. The March 11 magnitude 9 earthquake and ensuing disastrous tsunami in Japan did not occur on the Nankai Trough subduction zone where we have been working for years (see 2006 *Outcrop* cover story); it was 800 kilometers away to the north in the Japan Trench. Nevertheless, it had a huge impact on both our science in general and ocean drilling plans in particular. The scientific drilling ship *Chikyu* was in port in the region inundated by the tsunami and sustained substantial damage (only quick action and some good luck prevented injuries to those on board). Our plans for a 2011 Nankai drilling expedition were postponed until 2012 while the ship went for repairs. Scientifically, the earthquake showed for the first time that a megathrust can actually slip 60-80 meters in one go, and all the way to the oceanic trench, changing some of our ideas of how subduction zones work. Nankai drilling is now all the more vital to understand how.
I enjoyed many department visits as a Earthscope Distinguished Lecturer in 2011, giving talks at Scripps Institute of Oceanography as well as the universities of Oregon, Minnesota, and Wyoming. In the early summer, I tried out something new, spending two weeks in a studio recording 36 video lectures on Oceanography for the Great Courses company (a.k.a. The Teaching Company) lecture series. It was the hardest teaching I have ever done, lecturing to three cameras in an empty studio! Oceanography: Exploring Earth's Final Wilderness was released in November and is available through the Great Courses web site. Meanwhile, **Matt Knuth** completed his PhD and moved to New Orleans for a position with Shell, **John Schneider** finished his MS and went to Chevron in Houston, and **Carolyn Streiff** was working hard to complete her MS as the year came to a close. PhD student **Joe Kington** (photo) and postdoc **Jo Tudge** traveled with me to Barcelona, Spain for a workshop followed by a fantastic field trip to the Ainsa Basin in the foothills of the Pyrenees, where we got up close and personal with forearc basin sediments and tectonics.
I went to New Zealand for an excellent small conference on slow earthquakes in subduction zones held right on top of a slow slip zone on the east coast of the North Island, followed by work on a new proposal for IODP drilling at NZ's Hikurangi Trench. This is complementary to a new project working with NZ colleagues on drilling and sampling the Alpine Fault on land on the South Island. To help keep all these and other projects going, I welcomed new students **Tamara Jeppson**, **Susanna Webb**, and **Kyle Fredericks** into my research group this fall. 2012 is shaping up to be even busier with fault drilling projects proliferating!

John Valley

2011 was a wonderful year. In August, I went to the International Eclogite Conference in the Czech Republic where **Gordon Medaris** gave the opening comments as Elder Statesman of high-pressure metamorphism and **Ashley Russell** presented her MS research on oxygen isotope zoning in high-pressure garnets.
After the meeting Gordon ran a field trip (see photo page 28). Over real Budweiser beer, we heard stories of his early fieldwork when these fabulous eclogite localities were yet unstudied behind the Iron Curtin. Counting Ashley, I had eight graduate students last year using the WiscSIMS lab for their research. **Raiza Quintero** finished her MS on peraluminous granites of the Sierra Nevada and landed a job

Grad student Ashley Russell in the Czech Republic where she presented her research at the Ninth International Eclogite Conference. *Photo, John Valley.*

at BP. **Ben Linzmeier** is almost done in his MS study using micron-scale oxygen isotope zoning to track depth migration of nautilus, co-advised by **Shanan Peters**, and will continue for a PhD. **Ian Orland** has completed a major investigation of climate change since the last glacial maximum based on speleothems from Soreq Cave in Israel. **Jason Huberty**, in addition to camping three weeks in the State Capitol Building last winter and regular noon sessions singing in the Rotunda, published his work on silicon substitution in magnetite. Fortunately, Jason didn't bring his drum to work. Chloë Bonamici published her PhD work on titanites from a major mylonite zone in the Adirondacks. Oxygen isotope zoning in these crystals demonstrates arrested diffusion profiles which show that cooling and uplift of the Grenville belt was episodic and far faster than previously thought. **Anthony Pollington** published his studies of oxygen isotope gradients across single quartz overgrowths in Mt. Simon sandstone of the Illinois Basin, which document quartz cementation over 100 myr during burial and heating. Two new students joined my group, **Tyler Blum** who is studying caldera-forming rhyolites of the Snake River Plain and **Gabriella March**, co-advised with **Huifang Xu**, who is studying metastable carbonates from alkaline springs in serpentinite of the California Coast Range. Meanwhile, the engine room of the WiscSIMS Lab is powered by an amazing group of nine post-docs and scientists working with **Noriko Kita** and me: **Ayumi Hyodo, Kouki Kitajima, Reinhard Kozdon, Kevin Lepot, Daisuke Nakashima, Ariel Strickland, Travis Tenner, Taka Ushikubo,** and **Ken Williford**. We were sad to see Ayumi and Kevin leave last year for Texas A&M and Univ. of Lille, respectively. This group assists outside users of the lab, conducts their own awesome research, and publishes too many papers to name, on far-ranging topics including single forams and diatoms, stardust, chondrules, metamorphic core complexes, Astrobiology, and Archean microfossils. What could be better? One thing. Andrée and I became grandparents in November with the birth of Sophia Valley to Matthew and Claire in Paris. We went over for the New Year and helped push the stroller over Montmartre and through the Latin Quarter.

Herb Wang

2011 was the middle year of our three-year project to study rock behavior in underground facilities. Most of our field work was in the Homestake Gold mine in Lead, SD, which is now called the Sanford Underground Research Facility (SURF). **JoAnn Gage** (PhD, x2012) developed and installed two-meter-long, fiber-optic sensors in a small alcove beside the drift at the 4100-ft depth level in February. This trip was followed by another in May in which JoAnn applied a 10-ton load with a hydraulic jack between the floor and ceiling to induce deformation. She applied 100 tons in January 2012. A trip in June with Fermilab physicist Jim Volk, GLE professor **Dante Fratta**, and **Matt Kogle** (MS Aug. 2011) included installing 12 Hydrostatic Level Sensors at the 4850-ft level as well as ultrasonic sounding of rock bolts. Matt and his wife Bridgette are joining the Peace Corps as teachers in Ghana. **Josh Roberts** completed his thesis (MS Aug. 2011) on tilt data from the Homestake Mine and the Lafarge limestone mine along the Fox River near Fermilab. He is now working as a hydrogeologist with ARCADIS in Knoxville. Professor Fratta and I went to the University of Tokyo to attend a conference on fiber-optic sensors organized by our collaborator, **Professor Tomochika Tokunaga**. 'Tomo' spent 1996-97 in Madison as a post-doc. While in Japan we installed four water-level sensors as two tilt arms in a vault of the Earthquake Research Institute about 70-km southwest of Tokyo. Other activities related to the project were a visit to the laboratory of Dr. Rudi Giese 150-meters deep in the Reiche Zeche mine in Freiberg, Germany and a couple of days along the Calapooia River near Corvallis, Oregon to observe an experiment of John Selker in which fiber-optic cable was laid in the water to test a technology called Distributed Acoustic Sensing. I taught rock mechanics in the spring semester and a seminar on poroelasticity in fall, which included a modeling component using the ABAQUS software. I also taught a Freshman Interest Group (FIG) on Oil, Water and Climate. The 18 students were co-enrolled in Econ 100 and Geology 106 (Environmental Geology).

Huifang Xu

Graduate students **Mo Zhou** and **Zhizhang Shen** (co-advised by **Phil Brown**) defended their master theses in the summer. Mo worked on effects of silicate minerals on nucleation and growth of Ca-Mg-carbonate minerals in order to understand long-term immobilization of sequestrated carbon dioxide. Zhizhang studied microstructural evolution during dolomitization of limestone using EBSD and Z-contrast imaging techniques. Graduate student **Fangfu Zhang** (co-advised by **Eric Roden**) has discovered that certain polysaccharides adsorbed on calcite or dolomite surfaces can catalyze dolomite growth. He also investigated dolomite crystallization in the presence of hydrogen sulfide using in-situ AFM. Fangfu's discoveries will shed new light on solving the "dolomite problem" that has puzzled

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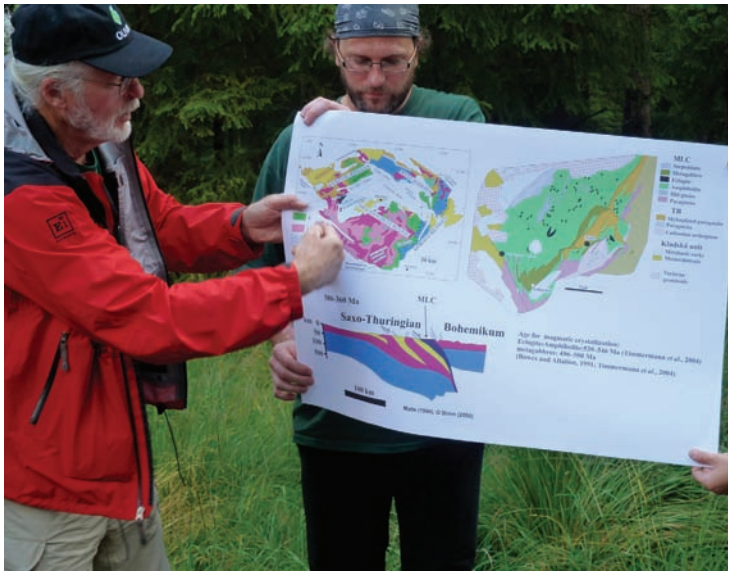
GeoBadgers at 57th Annual Meeting of Institute on Lake Superior Geology (May 19-20, 2011), Ashland, WI. From left to right: Marcia Bjornerud (PhD, 1987; Lawrence University), Gordon Medaris (Goldich Medalist), Laurel Woodruff (USGS), and Huifang Xu (Keynote speaker).

(Xu, continued)

geologists for decades. Graduate student **Tina Hill** continues her study on micro- and nano-phase minerals in pyroxenes from ultra-high pressure metamorphic rocks supplied by **Gordon Medaris**. Year 2011 was challenging for graduate student **Jason Huberty** (co-advised by **John Valley**) who tried to balance his time in Weeks Hall and in demonstrations at the Capitol Square. Visiting graduate student **Zhongwei Wu** worked on micro- and nano-phases of precious metals (Au, Ag) from a modern black-smoker site in order to understand both mineral and compositional evolution during the mineral precipitation. First year graduate student **Gabriella March** (co-advised by **John Valley**) has started research on dolomite and other Ca-Mg-carbonates precipitated from alkali springs associated with the Del Puerto serpentinite, California Coast Range. Undergraduate students **Josh Kemp** and **Yihang Fang** investigated adsorption of hydrogen sulfide on dolomite, and the relationship between bio-mats and dolomite distribution in ancient stromatolites, respectively, in order to understand roles of anaerobic bacteria in dolomite precipitation. **Hiromi Konishi** (manager of S.W. Bailey X-ray Diffraction Lab) and I investigated structures and defects of minerals using Z-contrast imaging techniques with our aberration-corrected scanning-transmission electron microscope. The new images with sub-Ångstrom resolution will provide keys to many unsolved and controversial problems in mineral science. ●



Gordon Medaris, left, and Ondrej Lexa, from the Institute of Petrology and Structural Geology, Charles University, Prague, on a field trip they held following the Ninth International Eclogite Conference in the Czech Republic. *Photo, John Valley.*

Guidottiite:
New mineral named for Charles V. Guidotti

Guidottiite is a new manganese mineral in the serpentine group discovered in the Kalahari manganese deposit in South Africa. Its grains are no larger than an eighth of an inch across, black with a glassy luster. It splits easily into the thin sheets. So far the mineral is only known to come from the one locality in South Africa, but now that it has been reported and characterized in the scientific literature, it is possible mineralogists will be able to find it in other locations in the world.
Source: University of Maine News.

Charles V. Guidotti (1935-2005), a UW-Madison, Department of Geoscience professor from 1969 to 1981, and recently of the University of Maine-Orono, was honored by the naming of a new mineral: guidottiite ($Mn_2Fe_3^{+}(SiFe_3^{+})O_5(OH)_4$). The scientific description and honor were reported in "Guidottiite, the Mn-analogue of cronstedtite: A new serpentine-group mineral from South Africa", in Clays and Clay Minerals (2010), v. 58, p. 364-376, in recognition of Guidotti's prolific publication record on phyllosilicates and his interests in manganese minerals found in small deposits in Maine.

Guidottiite is a story directly involving three former members of the Wisconsin geoscience department: Charles Guidotti, **S.W. "Bull" Bailey** (UW faculty 1951-1989), and **Steve Guggenheim** (UW PhD 1974), their love/study of phyllosilicates and a supporting group of former Wisconsin students.

Guidottiite. *Photo, Ludi von Bezing.*

Back in the early 1970s, Bull Bailey started a crystal-structure study of cronstedtite, an iron-rich serpentine, with **Diane Henry** (UW MS 1974). Later, **Charles Geiger** (UW MS 1981) got involved, which resulted in a paper published in 1983. However, the project was difficult because of complexities from using an imperfect crystal, although the crystal was the best available at the time. Unfortunately, the study could not define the crystal structure very precisely. During this time, Guggenheim was working on his doctorate on the crystal structures of micas with Bailey, but he got involved with several other phyllosilicate projects, including one on titanium in micas with Guidotti. In 1993, Guggenheim, now at University of Illinois-Chicago, received a sample of what turned out to be a new manganese mineral in the serpentine group discovered in South Africa. The sample looked like cronstedtite, but turned out to have manganese partially replacing iron. Here might be a chance to better understand the structure of cronstedtite by examining this new mineral, it's manganese analogue.

Mike Wahle and Tom Bujnowski finalized the effort as part of their master's degrees with Guggenheim. Like Henry, Geiger, and Bailey's description, some of the same issues that plagued cronstedtite were observed in guidottiite. However, they were able to resolve why the sample produced such unusual X-ray results by involving Toshi Kogure who examined the material using high-resolution TEM. Kogure found that two orientations of layers were randomly intergrown in all crystals, which produce the diffraction effects that were observed and which would also produce the effects seen in cronstedtite. Thus, the metaphor—to kill two birds with one stone—was appropriate: both crystal structures could be resolved!

The next issue was to decide on a name. In 2005, Guidotti and Guggenheim were working together on the crystal chemistry of chlorite when Guidotti died. It was appropriate to honor him because of his prolific publication record on phyllosilicates and his interests in localized Mn deposits. His expertise and friendship are sorely missed by his colleagues.

Contributed by Stephen Guggenheim,
University of Illinois at Chicago

Emeritus Faculty News—2011

Mary Anderson

The end of 2011 marked 2½ years of retirement for me. I continue to stay active professionally with students at UW and national committee work. My last student, **Kallina Dunkle**, will finish the PhD in 2012. I am currently in the process of moving out of my office and into an emeritus office in preparation for our new faculty member in hydrogeology, Mike Cardiff, who will take up residence in fall 2012. I am also serving on quite a few national committees, including as an officer of my section in the National Academy of Engineering. I am also writing a review paper for GSA and am still trying to tackle the revision of the Anderson/Woessner textbook for a 2nd edition. Hopefully that will begin in earnest in 2012.

Mary Anderson received the George Burke Maxey Distinguished Service Award from the Hydrogeology Division at GSA in Minneapolis. With her were HydroBadgers: left to right, Maddy Schreiber, Chris Gellasch (front), Andy Leaf (back), Jeff Wilcox, Laura Toran, Chunmiao Zheng, Jean Bahr, Randy Hunt, Peter Riemersma, Mary Anderson, Moe Muldoon, Chris Lowry, Kallina Dunkle, Ken Bradbury, Sue Swanson, Todd Rayne, Bill Simpkins, Dave Hart, and Madeline Gotkowitz.

Charles and I had a busy year of travel that included two international trips. In May, we went to Austria and Hungary, where we visited hydrobadger, **Bill Woessner**, professor of hydrogeology at University of Montana, and his wife Jean. Bill was on assignment as a Fulbright fellow with two universities in Graz. In November, we visited China as guests of my former PhD student, **Chunmiao Zheng**. I was named a "Visiting Chair Professor" in the Peking University Water Center, which Chunmiao directs. Besides Beijing, we visited Shanghai, Hangzhou, and Suzhou. A highlight of the trip was a boat trip through a new national wetland park near Hangzhou. There were just four of us as passengers in a boat rowed by a sturdy boatwoman along narrow, tranquil waterways meandering through lush vegetation.

In October, I participated in the annual meeting of the National Academy of Engineering and also went to the GSA meeting in Minneapolis, where I visited with many hydrobadgers (see photo) and was proud to accept the George Burke Maxey Distinguished Service Award from the Hydrogeology Division. Hydrobadger **Maureen Muldoon** delivered the citation.

Lest you worry that I am working too hard in retirement, be assured that there is plenty of fun too. Charles and I travel frequently to our vacation house in northeastern Wisconsin (Door County) to partake of the many scenic, cultural, and culinary pleasures there. We also enjoy opera and theater in and around Madison, as well as in Des Moines; Stratford, Ontario; and New Orleans.

David L. Clark

Please read Dave's article, "Ed Young Remembered" on page 30.

Chris Gellasch and Carol McCartney at GSA. They are at the Quats party for Dave Mickelson and Jim Knox. In the background is John Attig. *Photo, Mary Diman.*

Robert H. Dott, Jr.

(Please see Bob Dott's "Archivist Corner" on page 8.) The 2011 year began well as Nancy and I took a wonderful safari trip to Tanzania. We saw all of the famous mammals and many of the birds for which East Africa is known. Crossing the eastern rift branch and driving across the Ngorongoro caldera were special extra thrills for a geologist as was an all-too-brief stop at Olduvai Gorge made famous by the Leakeys' discoveries of early hominid remains in the 1950s. In April we joined a Friends of the UW Arboretum tour of Zion, Bryce, Monument Valley, and the Grand canyons in Utah and Arizona. It was a nostalgic trip for us.

Most of the rest of 2011 was a medical roller coaster for us. In July I had surgery to fuse three lumbar vertebrae, which is very successful and I am now free of back pain, which had been dragging me down for the past 10 years. I had almost completed my recovery when, on November 15, Nancy suffered a serious stroke, which paralyzed her left arm and leg; fortunately her speech, thinking, and memory were unaffected. As I write this (in February, 2012), she remains in the Oakwood Hebron Rehabilitation Center where rigorous therapy is helping her to recover some function, but it is unclear how much she can recover ultimately. Our five children have been wonderfully supportive, having come in turns when I was recovering from surgery and again after Nancy's stroke. Many friends have also been helpful.

Gordon Medaris

2011 was a year of writing field guides—first, co-editing and writing portions of *High-Pressure/Ultrahigh-Pressure Rocks in the Bohemian Massif* (Geolines, v. 23, 135 pp) with Shah Wali Faryad for the Ninth International Eclogite Conference in the Czech Republic (photo page 28), followed by co-authoring *The Baraboo District—A North American Classic* (Geol. Soc. America Field Guide 24, p. 63-82) with **Bob Dott, John Craddock, and Steve Marshak** for the GSA Annual Meeting in Minneapolis.

A highlight of the GSA meeting for me was presenting a paper on PT conditions and cooling rates of garnet peridotites with **Herb Wang** in a session honoring the 2011 Roebling Medalist, J.G. "Louie" Liou, who was a classmate at UCLA eons ago.

Nancy and I continued our yearly tradition of a European bike trip—in September pedaling along the Neckar River in Germany, from its source to its confluence with the Rhine at Mannheim, savoring German food, beer, and wine along the way. We had hoped to snorkel in the Sea of Cortez in March, but were thwarted by frigid water, so had to be content with whale-watching, sea kayaking, and of course, drinking margaritas.

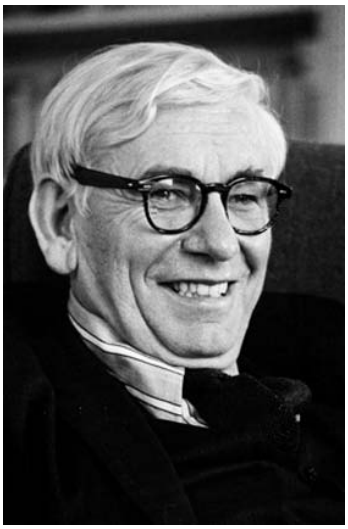
Dave Mickelson

It was an exciting year for me in several ways. There were no long trips except for three visits to family in New England. I continued to do some consulting and finished testifying in a big legal case concerning erosion on the Lake Michigan shoreline. It was a great experience to work with highly effective attorneys and other experts. Much of the spring was spent finalizing our (with Lou Maher and Susan Simpson) book *Geology of the Ice Age National Scenic Trail.* http://www.facebook.com/pages/Geology-of-the-Ice-Age-National-Scenic-Trail/174530675976228 (Please see the inside back cover.)

Jim Knox, left, and Dave Mickleson, right, were guests of honor at a party organized by former students at GSA in Minneapolis. In the center here is GSA Fellow Allan Schneider. *Photo, Mary Diman.*

It was great to finally have it come out in October, just in time for the national GSA meeting. A high point of the year was this conference in Minneapolis where quite a few former students appeared for a party organized for **Jim Knox** and myself by **Carol McCartney** and other former students. I was pleased to see so many people that I haven't seen in years. Quite a few former students were on the field trip that Mark Johnson, Kent Syverson, and I led on the Saturday before the meeting. We had a full bus and a beautiful day! I was also pleased to receive the Quaternary Geology and Geomorphology Division's (GSA) distinguished career award at the conference. Thanks to so many of you for writing letters supporting the nomination. **Jeff Munroe** gave the citation and it and my response will be published online at the QG&G website sometime this spring. Another highlight of the event was the singing of a couple of Quaternary songs led by **Bill Simpkins** after the presentations. Less than a week after getting back to Madison I had a catheter put in to check my arteries because of shortness of breath. The right cardiac artery was 95% blocked and they put in a stent immediately. No heart attack so I was very, very lucky! Will have to watch those cheese factory visits, though! ●

ED YOUNG REMEMBERED



Ed Young, 1978. *Photo, UW Archives.*

by David L. Clark

Ed Young, was a great friend of the department. Former chancellor at Madison as well as UW System president, Edwin Young died on January 2, 2011, at age 94. Without his intervention the name of our building and the nature of the department could be different. Here is the story.

When I was department chair and also chair of the building committee, the faculty agreed to the idea that if Lewis Weeks would help with the funding for our building, we would name the building after him. We had secured $500K from the NSF, the first part of the funding for the building, and because of strong departmental justifications, the State Building Commission had approved almost two million more. However, this was less than one-half of what was needed for a new building. Early in the negotiations, both Lewis Cline and the building committee (Lou Maher, Bull Bailey, and I) had talked with Weeks concerning a gift to assist in construction of the building. Then at a dinner for Weeks at Chancellor Young's residence, Young assured those present if Lewis helped, the building would be named Weeks Hall. Indeed, Lewis provided the additional funds, and the planning for construction was underway.

At that time, 1971 or 1972, the university had a committee whose responsibility was approving names for campus buildings. As our building plans developed, and anticipating no problem, I wrote a memo to the committee asking for their approval to name the building the Lewis Weeks Hall. I was shocked when in response the committee said no, because in their judgment, no building should be named for someone who was living. We had a problem: Lewis's gift completed funding for the building, he was promised that the building would bear his name, architects were working, and now the university Building Naming Committee said no to our naming request. This was a problem that needed a quick solution.

At the same time as the naming committee said no, I had to fly to a meeting somewhere and by chance ran into Chancellor Young at O'Hare. When I told him that his committee had refused to honor our request, he smiled, and with a New England chuckle promised me that he would take care of the problem. He told me that when he returned to Madison, he would talk to his committee and if they would not alter their decision, he would formally disband the committee and approve the naming himself.

And sure enough, the committee refused to reconsider its decision, Young dissolved the committee, and because of his action, two things happened: Weeks Hall became a reality, and the possibility of additional departmental assistance from Lewis was greatly enhanced (the Weeks endowment was received several years later). I don't know if succeeding Madison chancellors have reestablished the Building Naming Committee or if naming buildings is done the same way Young handled it. Anyway, I liked the way Young worked! He was a valuable friend of the department more than 40 years ago. ●

UNIVERSITY OF WISCONSIN-MADISON

Geology Museum

Some Highlights from 2011

The museum rang 2011 in with the installation of a new, geology-themed donation container. It replicates Wisconsin's stratigraphy and looks like a rock core, complete with Precambrian and Paleozoic sequences and a glacial till cap. Visitors can see their contributions accumulate in the large unconformity between the Devonian and Pleistocene. Thanks to the **Friends of the Geology Museum** for supporting this purchase.

Our continuing collaboration with **Carol McCartney**, outreach specialist at the Wisconsin Geological and Natural History Survey, culminated in the publication of a new educational poster, "Wisconsin's Geologic Past" (detail, right). Intended for use in Wisconsin classrooms, the poster uses a simplified bedrock map, a representative core sample, and a cross-section to teach students about the ages and kinds of rocks and fossils found beneath their feet.

In the spring, UW-Madison hosted the National Science Olympiad competition. Being so close to event headquarters in Union South, we were a main attraction for the competitors and their families. Over the four day span of the competition, we had thousands of visitors through our doors. **Richard Slaughter** mobilized a roving outreach cart in the museum. On it he carried two spectacular pieces from our collection, cores from the Chicxulub impact crater and a large piece of the ejecta layer from the Sudbury impact. The latter piece weighs in around 200 pounds and documents Earth's second largest impact 1.85 billion years ago. It was collected by **John Valley** and **Huifang Xu** on an astrobiology field trip in Canada. Additionally, **Dave Lovelace** ran fossil identification workshops for middle and high school students to prepare them for the competition.

Throughout his career Professor Emeritus **Lloyd Pray** and his students made significant contributions towards understanding the geology of the Permian Reef Complex of the Guadalupe Mountains. During this work, Lloyd and his students gathered thousands of specimens, many of which were from localities now protected and no longer open to collecting. Last year, **Carrie Eaton** secured funding from the National Park Service to catalog Lloyd's collection and incorporate the material into the Guadalupe Mountains National Park cataloging system. Carrie trained several undergraduate students in museum curation practices and they have now assembled a well-organized research collection of some of Lloyd's renowned work.

What rocks are underfoot? Students can find out using an educational poster produced by the UW Geology Museum and the WG&NH Survey. Detailed here: "What's under Milwaukee?"

Outreach efforts on behalf of the Wisconsin Astrobiology Outreach Consortium (WARC PI—Clark Johnson) continue to focus on non-traditional venues. During the summer, museum personnel and WARC graduate students and post-docs set up an "Astrobiology in Your Backyard" booth at three iconic Madison music festivals. Hundreds of Wisconsinites toured our booth to learn about astrobiological curiosities that can be found as close as their own backyards. These included tardigrades (microscopic animals that can withstand the rigors of space exposure), lichens (another space-hardy organism) and possibly micrometeorites (tiny meteoroids that can sometimes be recovered from rain barrels and gutters, given patience, luck, and a strong magnet, but beware of coal ash and other anthropogenic debris).

Also with NASA funds, **Brooke Norsted** brought the traveling art exhibition *Beyond the Edge of the Sea: Diversity of Life in the Deep Ocean Wilderness* to UW-Madison. This show is a collaboration between oceanographer Cindy Lee Van Dover and expeditionary illustrator Karen Jacobsen. Together, these two women journeyed to eight locations at the bottom of the sea with Van Dover at the helm and Jacobsen painting what they saw through the portholes. The result is an assemblage of over 70 watercolors, all of which profile strange creatures and phenomena from more than two miles deep in the ocean and evoke other unseen worlds in the universe and the life they may host. Over the four months that the show was up, an estimated 4,600 people from the university and greater Madison communities visited the exhibition.

Post-doc Andy Czaja and a young visitor inspect a hardy tardigrade (aka "water bear") at the "Astrobiology in Your Backyard" booth at the Orton Park Music Festival.

Scientific Illustrator Karen Jacobsen works with a UW art student in a drawing workshop, part of programming related to the art-science exhibition *Beyond the Edge of the Sea.* *Photos, the Geology Museum.*

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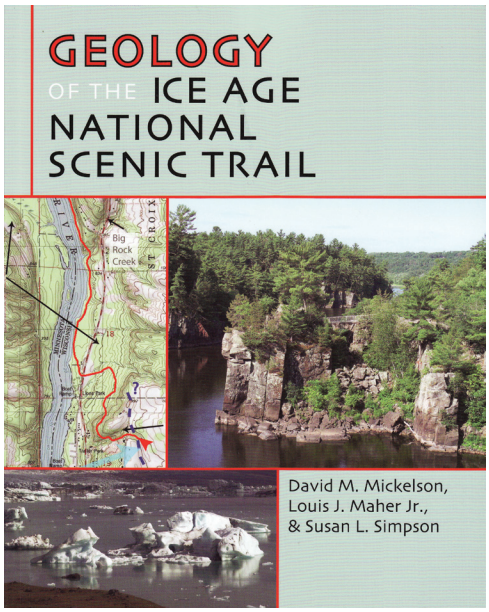

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Dave Mickelson, Lou Maher, and Susan Simpson are donating their royalties from the sale of the book to the Department of Geoscience.

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