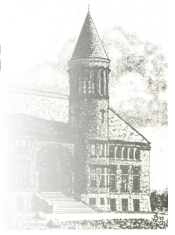
THE OHIO STATE UNIVERSITY
School of
Earth Sciences
WINTER 2008



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DIRECTOR'S UPDATE

Frank W. Schwarz

In a letter to the alumni in November, I touched on themes of change and remembrances. Change is clearly reflected in our faculty. Many of the faculty members from the 1960s and 1970s have retired and been replaced through the late 1980s and 1990s. Coinciding with the formation of the School in 2005 was a surge of new faculty additions. Some of these are assistant professors who joined us from positions at other universities or from various kinds of post-doctoral research positions. More senior colleagues in Geodetic Science transferred from Engineering. Even with the recent retirements of Professors Bergstrom, Elliot, and Foland, our faculty has grown from 24 to 32 on the main campus with four faculty at regional campuses. In the next few newsletters, we will introduce these new professors to our alumni and friends by highlighting their diverse research and extraordinary accomplishments. In this edition of the newsletter, we'll begin with Drs. Alsdorf, Grottoli and Panero.

While our name and organization structure has changed with the formation of the School, much remains the same. Our undergraduate and graduate programs still provide stepping stones for exceptional careers in industry, government and academia. We continue to emphasize field education as capstone experiences. Terry Wilson and Lindsay Schoenbohm lead the field camp in Utah, Doug Pride, Mike Barton, Hal Noltimier and Russ Utgard work together to take care of trips in the Appalachians. Bill Ausich and Garry McKenzie lead trips to the Bahamas at spring break, and Larry Krissek covers the popular oceanography and field geology courses at Stone Lab on Lake Erie. Shorter field trips also remain an integral part of grad and undergrad classes. For example just this fall, Scott Bair and 16 students walked and crawled their way through more than ten miles of Mammoth Cave in Kentucky. Thanks to all our alumni who have contributed to the 'Friends of Orton Hall Fund'. It and other funds continue to help fund student travel to the field and professional meetings. And as part of their research projects, many of our graduate (and top undergraduate) students are gaining experience in remote areas on cutting edge problems. In fact two of them have promoted OSU and geology to John McCain at McMurdo Station in Antarctica (see the SES web page).

In the coming year, I'll be writing and talking to alumni to describe new initiatives, opportunities, and challenges. The creation of an Alumni Advisory Committee is now underway. We have stepped up our activities in the energy arena through new courses and specialized training. With funding support from Shell and AAPG, we were able to send six students to AAPG's 2007 Winter Education Conference in Houston. This year, Jeff Daniels and Pete MacKenzie (Triana Energy, and your Society President) are helping to lead our OSU team in the 'Imperial Barrel' oil-finding competition. The challenges of growing the School to prominence are also formidable. The 'business' model that guides many universities these days challenges us especially in providing and in maintaining analytical equipment, in supporting top students, and in continuing to grow our faculty in key areas.

Please enjoy this newsletter and attend our various upcoming alumni events. Best wishes and **GO BUCKS!**

A LETTER FROM THE ALUMNI SOCIETY PRESIDENT

Pete MacKenzie

O-H!

I hope those around you are staring at you now for hollering the response "**I - O**" at the top of your lungs. This

cheer and the hand signals are becoming well known throughout the country and pop up in the field, airports, and abroad (check out: www.osu.edu/O-H-I-O for some fun pictures). This increasing visibility for OSU is a positive sign for OSU. While our Athletic Department is drawing continued national attention, for accomplishments as well as having the largest budget in the NCAA, few people realize that they also deliver more sporting opportunities to more students than other schools. **O – H, I – O.**

The Earth is warming and, particularly as geologists, we recognize that change is occurring. As students of Earth history, we all know it is constantly either cooling or warming on some scale. What exactly is our role in this cycle? There are lots of opinions on this that have helped to define the question. But climate change and the need for secure energy all mean increased opportunity for geoscientists. Earth scientists are positioned to respond to the changing needs of society, and our alma mater is positioned at the center of research and education related to energy and climate. **O – H, I – O.**

Big changes are occurring in the halls where we earned our degrees. The Geology Department has evolved from the Department of Geological Sciences to the School of Earth Sciences (SES). While other geology programs in the country were disappearing, our nimble department was growing and transforming into an organization to meet the needs of the 21st century. This transformation began during a time of introspection within the University, asking the question: "What are the core, mission essential assets of the University and how does geology fit in?" Geology was being marginalized, in academia, in industry, and in public opinion, paired with declining job opportunities (this latest time in hydrogeology) and number of students. Fast forward to the present and listen to the news -- natural disasters, global warming, eroding coastlines, and high resource prices. Change in outlook, relevance and status is occurring. Geology is the core of Earth Science, and Earth Science is unifying a field of sciences, and our department is now prepared to educate students to lead the way to understanding and solving Earth's mega problems in industry and academia. I saw a poster several years ago from AGI, "Why Earth Science?" it poses; then answers, "Because we live on Earth." Indeed. **O – H, I – O.**

The loosely organized Geology Alumni Society is also going to change - an organizational transition. We are all proud of the fact that we are geologists and Earth scientists, and as Alumni we are the legacy of Earth Sciences at Ohio State. The Society needs to refocus, regroup, realign so that we can be more effective as a group in supporting, and advising, the School of Earth Sciences--another change, this time for the Society. We have a responsibility to our legacy to continue and to increase our support of future Earth scientists. Contributions to the Friends of Orton Hall or other funds in the School of Earth Sciences, do make a difference, and are a responsible way for us to reaffirm our relevancy to society. I am looking for a change in the School of Earth Sciences with rising visibility for outstanding teaching, research and funding. I will have more to say about our potential in the next letter. **O – H, I – O.**

It's a great feeling to be a buckeye, and know that our heritage is preserved in one of the very best geology and Earth science programs in the country. Go Bucks!

Pete MacKenzie, '94
President, Geology Alumni Society

AAPG WINTER EDUCATION CONFERENCE FIELD TRIP

Four undergraduate and two graduate students from the School of Earth Sciences attended AAPG's 2007 Winter Education Conference in Houston. Much of the trip's expenses were covered by a grant from Shell Oil Company. This grant was intended to provide industry-related field trip opportunities to students of SES.

The conference involved a number of short courses on hydrocarbon exploration, production, and development. They ranged from one to three days long, running for eight hours each day. Most instructors were university professors who began their careers in industry and maintained close ties to it. The courses were mostly based on their research, which is focused on advancing techniques and technology used for exploration and production. Because of this, most courses were topic-specific and involved cutting-edge material that is just beginning to be implemented into industry practice. Three courses were listed as "Introduction to…," but were not attended by OSU students, who were interested in learning about the advanced technologies, although solid background knowledge was assumed and not covered much. Most conference attendees were from minor companies in the south, had been employed in industry for several years, and were there to keep up on advancements in their fields.

There were only a few other students attending the conference. Although some of the course content was beyond their current

understanding, students were provided with excellent materials such as CDs with all course lectures, and books from some of the courses. These materials should prove to be valuable resources for any students that pursue careers in the industry. OSU students also had the opportunity to talk to people from various companies about what it is like to work in the industry, and about possible employment and internship opportunities.

Adam English
MS 2007; now Chevron

ALUMNI NEWS

Mark Camp (PhD 1974) has published "Roadside Geology of Ohio" (Mountain Press). It has much to appreciate and use in travels and courses, including the wasted gas resources of Findlay, historical photos (e.g., the interurban RR at Blackhand Gorge), attractive fossil sketches, and maps. Mark clearly shows the importance of geology in the economic, historical and scenic development of the state. A native of Toledo, Mark teaches at the University of Toledo.

Mark Frye (MS 1978), Managing Director, Military Installation Transformation Solutions with BearingPoint, received the 2006 Private Sector Leadership award from the Association of Defense Communities. In 2006, he also was Chair of the Greater San Antonio Chamber of Commerce's Military Affairs Committee.

Please be sure to see more alumni updates in the next edition of our newsletter.

SCHAFFRIN'S MERKATOR

In early summer 2006, Burkhard Schaffrin, Division of Geodesy and Geospatial Information (DGGI), won one of the most prestigious awards on the international stage, namely a Merkator Professorship, granted to eminent scholars in their fields for up to one year by the German Science Foundation (DFG) only after a fierce competition that took place in two rounds: First, Burkhard's proposal on "Total Least-Squares Estimation for Weighted and Structured Models in Geodetic Science" had to be chosen by the University of Karlsruhe among proposals from a variety of different areas in order to defend it, in a second round, before the DFG. After his funding was secured, he left late in August 2006 for a sabbatical year at the Geodetic Institute, with Prof. Guenter Schmitt as his host.

Burkhard found the environment very supportive of scientific research and managed to put out a new manuscript every five weeks, ten altogether. More amazingly he found a small, but very lively group of graduate students who were always ready to engage in scholarly discussions, particularly after he volunteered to offer an experimental course on "Recent Issues Related to Geodetic Adjustment Computations" in Spring/Summer semester 2007. For the University of Karlsruhe, this was the first semester they proudly used the label "University of Excellence", granted to them late in 2006 by the Federal German government, as one of only three institutions of higher learning at the time. (Late in 2007, six more institutions were added in a second and final round.)

The University of Karlsruhe is eager to strengthen its international relationships, and the Geodetic Institute there is no different. OSU's School of Earth Sciences, particularly DGGI, is seen as one of the prime candidates for a cooperation agreement that may soon be initiated for student and faculty exchanges. Burkhard returned home to OSU in September 2007 with a whole bag of new ideas that he plans to engage in with his students.

MUESSIG HONORED

Siegfried Muessig recently received the Ben F. Dickerson III Award for professionalism and contributions to the mining industry. Dr Muessig, a minerals consultant and president of Crystal Exploration, Inc., serves on the advisory board of Bayswater Uranium. Born in Freiburg, Germany, he emigrated with his family to Ohio in 1927, served as a pilot and flight engineer in the Army Air Corps during World War II, and began his career with the mineral-deposits branch of the USGS. In 1955, on leave from the USGS, he led a group that mapped the extensive borate deposits in the Argentine Altiplano. In 1959 he became a manager of an exploration group at U.S. Borax. In 1966, he joined Getty Oil where he organized a new minerals group, Getty Mining one of the most successful exploration and mining groups of its time. As Getty's vice president of exploration and international mining Muessig directed the acquisition, exploration and development program. He was directly involved in the discovery of the world-class Jabiluka uranium deposit and Chile's Escondida (now the world's largest copper producer) and Zaldivar copper deposits. He also participated in the acquisition of substantial coal reserves, the discovery and mining of new uranium reserves at Petrotomics in Wyoming and the discovery of gold reserves at Mercur, UT. As Getty's board member on Tidal Diamonds, a partner with the DeBeers group, he negotiated a deal that resulted in the first successful major offshore diamond-mining venture in Namibia. Muessig is a past president of the Society of Economic Geologists, a Distinguished Member of the Society of Mining Engineers (SME), and a GSA Fellow. On the board of governors of the National Mining Hall of Fame and Museum and a founding member of the Energy Minerals Division of AAPG, he served on the Executive Uranium Advisory Committee of the American Mining Congress and was Chair of the Southern California Section of SME. Siegfried received his MS in 1947, his PhD in 1951 and the Edward Orton Award in 1969, all from The Ohio State University.

FACULTY SPOTLIGHT:

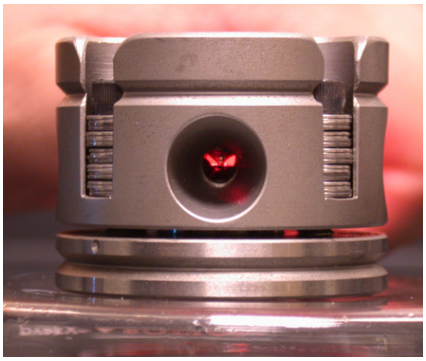
Professors Grottoli, Panero and Alsdorf

Professor Andrea G. Grottoli

Dr. Andréa Grottoli, Assistant Professor in the School of Earth Sciences, brings an important new interdisciplinary dimension to environmental and global change research in SES with her studies of coral reef biogeochemistry and paleoceanography. Her research focuses on understanding climatic and oceanographic change over the past century, the impact of those changes on living corals, and the implications of global change on coral reef resilience. Research questions typically revolve around the issue of carbon and her primary analytical tools are stable and radiogenic carbon isotopes. Her projects have involved reconstructing paleoceanographic proxy records in corals and sclerosponges, studying the effect of stresses expected with continued global change such as elevated seawater temperatures on coral biological and physiological processes in living corals, and studying how the overlying biological processes influence the skeletal proxy records. Research results suggest that while most corals are not likely to be able to withstand the projected elevated seawater temperature conditions, at least one species of coral possesses a novel mechanism for resilience in the face of adverse temperature stress and offers hope that more species like this one may be resilient. Other recent work indicates that the flux of carbon dioxide into the surface ocean may be recorded in sclerosponges and they could be used as natural archives of the rate of ocean uptake of atmospheric carbon over the past century. In other work she shows that corals growing near the mouths of rivers record the isotopic and elemental signature of the waters discharged during flood events and could provide a natural archive of the transfer of carbon from land to the coastal ocean over the past century. Overall, Grottoli's work is making progress towards better understanding how the surface and coastal oceans interact with the atmosphere and coastal terrestrial environment, how global change might influence these interactions, and the implications for understanding the global carbon cycle. Through her international presentations, publications in prestigious journals, and interviews on NPR and CBS, she is helping scientists and society understand the Earth system. For this research, Grottoli has been recognized with many awards, including the W.F. Clark Award in Geochemistry.

In addition to being interdisciplinary, her research combines both in situ observations and field experiments around the world followed by laboratory analyses in her Stable Isotope Biogeochemistry Laboratory (SIB Lab) at OSU. Currently, she and her students are pursuing several lines of research that combine fieldwork in Palau, Saipan, Panama, Puerto Rico, and Hawaii with stable isotope analyses, radiocarbon measurements, and organic chemistry analyses in her SIB Lab. This lab includes a state of the art Finnigan Delta IV Stable Isotope Ratio Mass Spectrometer with in-line capabilities for automated inorganic and organic sample measurements with analytical precision that rivals the best labs in the country. In the field, Grottoli's group combines both SCUBA techniques for sample collection and experimentation, with outdoor flow-through seawater aquaria to conduct controlled manipulative experiments. The combination of field and lab work is essential to understanding the systems she studies and also attracts high-quality students who graduate prepared to address complex research questions involving our changing environment. More than 1M in external funds have supported this research and graduate assistants. Andrea Grottoli graduated from McGill University (BS1992, Biology) and University of Houston (PhD1998, Marine Biology). She joined SES in 2005, after a postdoct fellow at University of California, Irvine and an Assistant Professor in Earth and Environmental Sciences at the University of Pennsylvania. She teaches Principles of Oceanography, Stable Isotope Biogeochemistry, Introduction to Earth System Science and graduate seminars.

For more information on the research, analytical facilities, graduate student research, and fieldwork photos in Grottoli's group, visit www.earthsciences.osu.edu/~grottoli.1/.



Professor Wendy Panero

Figure: The laser-heated diamond anvil cell.

The High Pressure Mineral Physics group at Ohio State University focuses on problems of the state and evolution of planetary interiors. A small device called the Laser-Heated Diamond Anvil Cell (above) is used to achieve the high pressures in the Earth's interior. The diamonds create pressures a million times atmospheric pressure by squeezing the sample between the tips of the two tips: achieving very high pressures, but on just nanograms of sample. Temperatures as high as the surface of the sun are reached by focusing an infrared laser through the diamonds and onto

the sample. The group addresses a variety of questions on the evolution of the Earth.

Some recent work includes:

What is the temperature and dynamical state of the Earth's inner core?
The Earth's inner core is anisotropic: seismic waves travel through the inner core faster when traveling pole to pole than when traveling along equatorial paths. A first order parameter, the viscosity of iron under those conditions, is necessary to explain how the inner core can sustain this anisotropy over billion year time scales, yet is entirely unconstrained. The mineral physics group at Ohio State University is working to measure the diffusivity of iron at the temperatures and pressures of the Earth's core to determine the solid-state viscosity of the inner core using controlled geometry samples fabricated at Ohio State's Nanotech West.

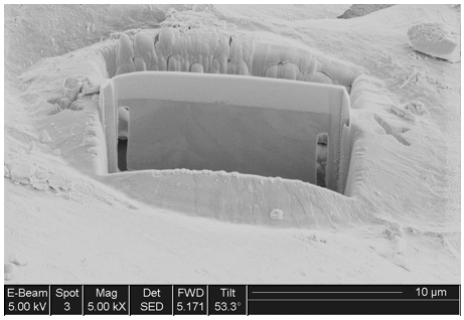


Figure: Graduate student Dan Reaman heated a sample of iron at 30 GPa (300,000 atm) and 2000 K, then extracted a slice of the sample 10 µm wide and just 100 nm thick for examination using transmission electron microscopy (TEM) at the Campus Electron Optics Facility.

What is the distribution of volatile elements in the Earth's interior?
Constraining the volatile content of the planet is quite difficult, as hot planetary formation processes reduces the accretion of volatile elements into the Earth. Hydrogen, carbon, and potassium are all in significantly lower abundances in the Earth when compared to the sun, yet the total budget of many moderately volatile components is poorly constrained. Understanding how volatile elements are distributed in the planet speaks to issues of carbon sequestration in the mantle, powering of the Earth's geodynamo through radioactive decay of 40K, and the effects of water weakening of the Earth's interior on the dynamical evolution of the planet.

The mineral physics group at Ohio State University addresses these questions through a combination of high-pressure, high-temperature experiments and quantum mechanical calculations. Experiments are used to determine the distribution of elements between silicates and iron to model the distribution between the silicate Earth and the core. Calculations help determine the crystal structure and thermodynamics of solution as a compliment to the experiments.

Professor Doug Alsdorf
A recent Federal report commissioned by the President's Office of Science & Technology Policy asked a simple question, "Does the United States have enough water?" The surprising answer: "We do not know". This question and its answer are even more applicable to the rest of the world where technology and economics limit our hydrologic knowledge. Given that the majority of water usage globally is from lakes, rivers, and reservoirs, we need to have measurement knowledge of the water flowing through and the volumetric changes in these systems. Professor Alsdorf and his research team, using satellite remote sensing to obtain water surface elevations and volumes, are answering these questions beginning with studies of the Amazon (its size makes it a primary target) and other tropical, low relief wetlands. Research results are used to improve our understanding of wetland ecosystems, including the hydraulics of floods. The Gravity Recovery and Climate Experiment satellite system provides a coarse, 330km by 330km spatial assessment of the volume on and flux of water through the floodplain at 15-day intervals. At a finer spatial resolution (90m by 90m), interferometric SAR measurements show that temporal changes in flood water heights are more complex than assumed in conventional hydrodynamic models, and water flows are not easily prescribed by discharge down the main channel and floodplain topography alone. Two-dimensional measurements of floodwater elevations and changes are not routinely available, yet are critical to understanding the role of floodplains and wetlands in mitigating flood hazards, controlling biogeochemical cycles and promoting biodiversity. Professor Alsdorf is leading an international team that is proposing the Water And Terrestrial Elevation Recovery Hydrosphere Mapper (WATER HM) satellite to routinely map the ever changing distribution of the world's water and thus to answer the question of global water availability. The Ohio State University through its Climate, Water, and Carbon Program equally recognizes the importance of answering this critical resource question and is a partner in WATER HM research and development.

Doug Alsdorf graduated from OSU (BA1986; MS1991) and Cornell (PhD1996) and held postdocs at Cornell and UC Santa Barbara. Later he was a Research Scientist at Santa Barbara (2000) and UCLA (2001-04) before joining SES in 2004. He teaches introductory earth sciences and graduate courses in hydrology, wetlands, remote sensing, and computational programming.

SES CONTRIBUTES TO INTERNATIONAL POLAR YEAR RESEARCH

By Professor Terry Wilson

The 4th International Polar Year, extending from March, 2007 to March, 2009, has kicked off and SES is leading major projects in both the Arctic and in Antarctica. ANDRILL (the Antarctic Drilling project, www.andrill.org), had a 2nd successful drilling season in October-December, 2007. Current faculty involved include Larry Krissek, Peter Webb and Terry Wilson, as well as graduate students Scott Drew, Katie Johnson and Cristina Millan. U.S. co-chief scientists for both ANDRILL drilling projects were Geological Sciences alums (David Harwood and Ross Powell), and a large number of additional alumni participated as project scientists – a signature of our ongoing leadership in Antarctic paleoclimate and tectonic research! A new international research project involving 28 nations -dubbed POLENET or the Polar Earth Observing Network – also commenced in 2007. Mike Bevis is leading a major component of POLENET involving establishment of continuously-recording GPS stations around the entire periphery of Greenland – a field team from SES and UNAVCO deployed 24 new stations in '07 and will complete the array in the coming summer. Terry Wilson is leading a multi-institutional and multinational project to deploy GPS and seismic sensors across the remote interior of West Antarctica. The field team is in Antarctica through mid-February - check out blogs and podcasts on www.polenet.org. A major focus of the POLENET project is improving understanding of modern and ancient ice mass balance and the contributions of the Greenland and West Antarctic ice sheets to sea level change. We will also learn how solid earth processes influence ice sheet dynamics, and will obtain an unprecedented data set to address questions in global geodesy and seismology.

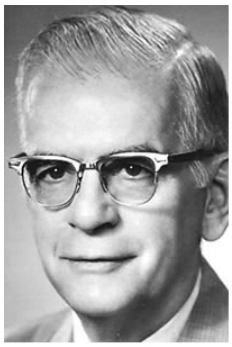
OBITUARIES

Edward Carl Roy, Jr.

Dr. Roy (BS 1961, PhD 1964) passed away on November 9, 2007 in San Antonio. He worked briefly for Shell Oil Company before becoming a Professor of Geology at Trinity University. He served as Dean of the Division of Sciences, Mathematics, and Engineering and later Vice President for Academic Affairs. He retired in 2005 as a Distinguished Professor of Geology. A member of many professional organizations, Dr. Roy served as president of the American Geological Institute, the Gulf Coast Association of Geological Societies, and the South Texas Geological Society. He was the recipient of numerous professional awards including the Edward Orton Award in 1990. The link below is on the SES web page. http://www.legacy.com/sanantonio/Obituaries.asp?Page=LifeStory&PersonID=97702327

Daniel Adolph Busch

Dr. Busch (MA 1936, PhD 1939) noted international petroleum geologist and educator died on November 7, 2007 in Tulsa. An Instructor at the University of Pittsburgh before joining the Pennsylvania Geological Survey in 1943, from 1944-46 he was with Huntley & Huntley Petroleum Consultants. In 1946 he joined Carter Research Lab in Tulsa. From 1951-54 he was Chief Geologist at Zephyr Petroleum and from 1955 until retirement in 1989 he was a Consulting Petroleum Geologist. The author of several award winning papers and books, Daniel was also a Visiting Professor of Geology at the University of Oklahoma (1964-74) and a Lecturer with Oil and Gas Consultants International (1967-89). A senior fellow of GSA, he was President of AAPG in 1973-74 and received many awards including the Edward Orton Award (1960), Sidney Powers Memorial Award (1982) and the Monroe Cheney award (2003). He endowed the Busch Fellowship in the School of Earth Sciences and the AAPG building in Tulsa is dedicated in his name. The link below is on the SES web page. https://www.legacy.com/TulsaWorld/Obituaries.asp?Page=ObitFinderOrder&PersonID=97669978



OSU president Gordon Gee (left) shown with alumnus Bill Toivonen (center) and Executive Dean of Arts and Sciences Jackie Royster.

WILLIAM A. TOIVONEN SCHOLARSHIP FUND

Bill Toivonen, a 1957 alumnus with a degree in geology, created the William A. Toivonen Scholarship fund that supports outstanding School of Earth Sciences undergraduates.

This and other named funds are helping SES attract and support graduate and undergraduate students and their research.

Gifts from alumni continue to be very important in building on our tradition of excellence in the geosciences. The Friends of Orton Hall Endowment Fund (#401258), for students only, is still a fine choice for individual giving.

Thanks for your help.

THE OHIO STATE UNIVERSITY

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THE OSU SCHOOL OF EARTH SCIENCES.
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