THE DEPAUW UNIVERSITY

DEPARTMENT OF GEOLOGY & GEOGRAPHY

BOULDER RUNDOWN

Fall 2003 Newsletter

Letter from the Chair

Greetings from Greencastle! I hope this newsletter finds each of you wrapping up a happy, healthy, and productive summer. Here in the department, we've certainly been busy ourselves. In fact, so much has happened since our last newsletter that I don't know where to begin!

First off, let me update everyone on our staffing. **Fred Soster**, who served as chair of the department for 12 years before passing the baton on to me, is now a full professor. I'm sure that those of you who know Fred will join me in thanking him for his many years of dedicated service to the department in this capacity. Many of the present program initiatives that we now take for granted were conceived, nurtured, and developed during Fred's tenure as chair. **Jim Mills** and **I** both now hold the tenured rank of associate professors, and **Jeanette Jerz** (Virginia Tech '02) joined us last year as a tenure-track environmental geologist. This year, we're also pleased to welcome **Tim Cope** (Stanford '03). Tim is a sedimentologist who will help cover several courses in the department for the next few years. Lastly, the department could not conduct its day-to-day operations without the help of department secretary **Bonnie Bryan**.

Secondly, you will not readily recognize the department's physical spaces anymore as DePauw has just completed a **$36 million renovation and expansion of the Julian Science Center.** As they say, "you'll have to see it, to believe it"...we now have "smart" classrooms with computer-integrated technology, labs with state-of-the-art equipment, and amazing office and study spaces. I would definitely encourage you to drop by campus the next time you pass through the area to see the changes in the department, the Julian Center, and the campus as a whole.

Lastly, please accept our continued **thanks for your support of our program** through your donations to our various Departmental Scholarship Funds. These funds continue both to support student/faculty research and to reward outstanding student academic achievement. In addition, we use some of these funds to defray student field trip expenses as we now range further from Indiana to expose our students to different geologic settings. Thanks for your help!

Cheers,
Scott Wilkerson

FACULTY UPDATE

Jim Mills

Hi all! Since the last newsletter, our household has undergone a major transition, Deb and I are now essentially empty-nesters. All the kids are either married, out on their own or in college. We still continue to work our small farm and have the usual array of farm animals to keep us busy. Deb continues to work for the Department of Natural Resources in the Reclamation Division as a Hydrogeologist. Our idea of a perfect vacation is still finding the best mineral and/or fossil collecting localities!

Mineralogy, Petrology and Earthquakes & Volcanoes continue to be the staple group of courses I teach, although occasionally I teach a section of Physical Geology and Physical Geography which I thoroughly enjoy. Each fall I participate in the Science Research Fellows Program by working with a small group of first-year students on a variety of projects.

My research for the last three years has been focused on the petrogenesis of a series of carbonatite (?) vein-dykes (yes, that's how they're referred to!) in the Bancroft, Ontario region. In addition, I have been working on the hydrogeology of the Greencastle Aquifer.

Fred Soster

A warm greeting to all of you. Let me give you a quick update on what I've been doing professionally and how my family is doing. In 1999 and 2000, my students and I worked with a team of scientists from Case Western Reserve University and from Northern Arizona University in Yellowstone National Park and across Montana examining floodplain sedimentation rates and transport of suspended sediment in the Yellowstone River basin. We used fallout radionuclides to "fingerprint" the source areas and then "followed" the tagged, eroded particles through the drainage basin. Four students traveled with me to assist with the field work during the two-year study: Jennie May, Nicki Neal, Grace Castellini, and Jesse Roehrich. So far, this work has resulted in two presentations at GSA and a manuscript currently in review with GSA Bulletin.

During the course of this work, I wrote an NSF proposal to retool and expand the radioisotope lab (we only had alpha capability). Although the proposal was not funded, DePauw provided $50,000 to acquire a Canberra Low Energy Germanium Detector, which is now calibrated and cranking out good data. This instrument can detect and measure the cesium-137 in your backyard soils that was produced 40 – 50 years ago from atmospheric testing of thermonuclear weapons! This instrument greatly extends our capabilities to address a variety of sedimentation and sediment transport problems using gamma-emitting radionuclides.

Hot Spots

Number of Majors

Geology	6
Env. Geoscience	3
Earth Science	1

Recent Field Trips

Las Vegas, NV
Bancroft, Canada
Moab, UT
Baraboo, WI
Hawaiian Islands
St. Francois Mts., MO
Kentland Impact Site, IN
Mammoth Cave, KY

Departmental Funds

- **E.R. "Rock" Smith Award**-scholarship given to reward academic excellence by departmental majors.
- **E.H. Richard Gault Award**-scholarship given to outstanding departmental majors.
- **Wylie-Condit Science Scholarship**-scholarship given to upper-class students to further their studies in the fields of science & mathematics.
- **C. L. Bieber Fund**-fund to support geoscience-related fieldwork (e.g., major departmental field trips, field camp, etc.).
- **James A. Madison Fund**-fund to support geoscience-related student-faculty research.

2003 Department Awardees†

Sara L. Baughman	$1,000	*Smith*
Troy L. Wyss	$1,000	*Smith*
Sara M. Smaltz	$1,000	*Smith*
Robert M. Schoch	$1,000	*Smith*
Audrey E. Gehlhausen	$1,000	*Smith*
Keith A. Herrmann	$1,000	*Gault*
Kathryn M. Adank	$1,000	*Gault*
Erica C. Amt	$1,000	*Wylie-Condit*

† Some awards reflect income accrued over multiple years.

World-Wide Web Page

http://www.depauw.edu/acad/geology/

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*Please take some time and let us know about what is going on in your life. In future newsletters, we plan to include an **Alumni News** section as in past newsletters so as to keep everyone in touch with each other (and with us!).*

FACULTY UPDATE (continued)

Finally, my family continues to do well. My spouse Jennifer has received a series of promotions over the past several years and is now Associate Director of Admissions and Admissions Office Manager. Erica is now 13 and in the eighth grade (and boy crazy, much to the dismay of mom and dad). Frederick is 8 and in the third grade. He enjoys playing soccer and teasing the heck out of his older sister. Jennifer and I have rediscovered the thrill of riding roller coasters because we have visited a couple of amusement parks with the kids the past few years. And just so life doesn't get boring, we bought a new, very fast ski boat and have spent most of our weekends on the reservoirs in west central Indiana.

Hope all of you are doing well. Please stop by and visit us anytime. You will be absolutely amazed at how much the campus has changed.

Scott Wilkerson

Things have been very busy around the Wilkerson household. As many of you know, Beth and I have two sons, Zach (6 yr) and Ben (21 mo). Both are budding geologists (Zach collects rocks and writes geology "books", whereas Ben just collects "gocks"). In addition to being a full-time mom, Beth works part-time as a GIS/web programmer for two archeologists here at DePauw.

My research on 2D/3D fault-related folding allows me to split my time between fieldwork and computer modeling. My DePauw research student colleagues and I have been fortunate enough to have our recent work published in the AAPG Bulletin (the article is featured on the cover), the Journal of Structural Geology, and several GSA presentations. Our work this past summer on detachment folding has been very productive because we developed a new geometric model that closely matches the 3-D geometry of a natural fold structure in the Sierra Madre Fold Belt in Mexico. Our plans are to submit a manuscript on this work for publication sometime after our GSA presentation this fall. If you're going to be at GSA (or coming near Greencastle), please drop by. Take care and keep in touch!

Jeanette Jerz

Hello and greetings! Last year was a very exciting time for me personally and professionally as I finished my Ph.D. at Virginia Tech, moved to Greencastle, and went through my very own version of depauw.year1. All in all, it was a great first year. I developed four new courses, including a Low Temperature Geochemistry course and an Introduction to Environmental Science Seminar for the new Environmental Geoscience major, wrote a successful $75K NSF grant to purchase an Ion Chromatograph for the lab, and started a research project on Acid Mine Drainage. As for personal accomplishments, I ran my first ever half marathon during the Indianapolis Mini in May.

This next year looks to be an exciting one as well. With a little experience under my belt, I look forward to continuing to develop new classes, including Environmental Geology and Hydrology. My research is very promising, and my students (including Erica Amt, '04) will be presenting some of our preliminary results at GSA in Seattle. Finally, I recently adopted a puppy that has LOTS of energy. Because he needs to burn some of that off, I'm looking forward to doing even better in my second Mini next May.

I hope this letter finds you well. I hope to get the chance to meet you at GSA or perhaps Homecoming. If you're in the area, please come by for a chat!

Tim Cope

I just joined the DePauw faculty on a 3-year appointment this semester, and I'm very excited to be here! The DePauw faculty and staff have been wonderful in helping me get settled. I made the long trek by car from my home in California, where I completed my Ph.D. at Stanford University. Although Greencastle is far from home, the people here are wonderful and have made me feel quite comfortable in Indiana. I can't wait to begin teaching!

My research interests lie in the field of sedimentology, specifically the tectonics of sedimentary basins. Over the last five years, I have been conducting field research in Mesozoic sedimentary basins of northeastern China, and I plan to include DePauw undergraduates in future trips. There are numerous field-based geological problems suitable for undergraduate research in China, including the geology and geochronology of "feathered dinosaur"-bearing strata, sedimentary basins related to Mesozoic continental collision, and small-scale mapping projects within the fold-thrust belt that was the centerpiece of my dissertation. Students accompanying me on field excursions in China will benefit not only from a scientific standpoint, but from the cultural experience as well–China is about as far from Greencastle as you can get!

I hope to meet some of you during my term here…if you're ever in the neighborhood, don't forget to stop by and say hi to "the new guy!"

Students and faculty discussing acid mine drainage at the reclaimed Green Valley Strip Mine near Terre Haute, IN. Increased interest in the environment has led to the development of the ***new Environmental Geoscience major*** *(more next newsletter!)*

Recent Department Publications

Jerz, J.K., and Rimstidt, J.D., in press, Efflorescent sulfate salts: Paragenesis, relative stability, and environmental impact, *American Mineralogist*.

Jerz, Jeanette K., 2002, Geochemical Reactions in Unsaturated Mine Wastes, Ph.D. dissertation, Virginia Tech.

Peter J. Whiting, G. Matisoff, William Fornes, and Frederick M. **Soster**, in review, Suspended sediment sources and transport distances in the Yellowstone Basin, *Geological Society of America Bulletin*.

Soster, F. M., G. Matisoff, P. L. McCall, and J. A. Robbins, 2001, In situ effects of organisms on pore water geochemistry in Great Lakes sediments, p. 279-295, *In* Aller, J. Y., S. A. Woodin, and R. C. Aller (eds.), Organism-Sediment Interactions, University of South Caroline Press, Columbia, SC.

Wilkerson, M.S., Apotria, T.G., and Farid, T.A., 2002, Interpreting the geologic map expression of contractional fault-related fold terminations: Lateral/oblique ramps versus displacement gradients: **Wilkerson**, M.S., Fischer, M.P., and Apotria, T.G. (ed.), Fault-related folds: Transition from two dimensions to three dimensions, special issue of the *Journal of Structural Geology*, **24(4)**, 593-607.

Apotria, T.G., and **Wilkerson**, M.S., 2002, Geometry and kinematics of a fault-related fold termination: Rosario structure, Maracaibo Basin, Venezuela: **Wilkerson**, M.S., Fischer, M.P., and Apotria, T.G. (ed.), Fault-related folds: Transition from two dimensions to three dimensions, special issue of the *Journal of Structural Geology*, **24(4)**, 671-687.

Wilkerson, M. S., and Dicken, C. L., 2001, Quick-look techniques for evaluating 2-D cross sections in contractional settings, *American Association of Petroleum Geologists Bulletin*, **85(10)**: 1759-1770.

Fischer, M. P., and **Wilkerson**, M. S., 2000, Predicting the orientation of joints from fold shape: Results of pseudo-three-dimensional modeling and curvature analysis, *Geology*, 28(1): 15-18.

New (and Old) Departmental Facilities

The Geology and Geography Department is pleased to report that the new Stable Isotope Sample Extraction Laboratory is up and running! This lab allows us to extract CO_2 samples from carbonates for $^{18}O/^{16}O$ and $^{13}C/^{12}C$ data. This facility was initially set-up by Dr. Erik Melchiorre during his two-year position at DePauw – thanks Erik! Currently the lab is being used to analyze samples of calcite from vein-dykes in the Bancroft, Ontario region.

The x-ray diffraction and fluorescence lab is now housed in the basement of Julian and continues to be used for classes and research (see photo on back page!). With any luck we may be adding a donated Rigaku x-ray fluorescence machine in the near future and are simply waiting on final approval from the donating institution. Cross your fingers for us! Have any mineral samples sitting around that you don't know what they are? Send them on in and we'll run them for you on the x-ray diffraction unit.

Student/Faculty Research

Student/faculty research remains a staple of the department. This past summer **all four departmental faculty supervised students from the Science Research Fellows or the Faculty Development Committee Program**.

Jeanette teamed up with **Bridget Gourley** in the Chemistry Department to determine the effect of run-off from the abandoned Green Valley Mine, NW of Terre Haute, on nearby West Little Sugar Creek. Three students from different majors worked together on this interdisciplinary project: **Erica Amt** ('04) from Geology, **Christina Houston** ('05) from Biology, and **Andrew Turner** ('06) from Chemistry. Throughout the summer, we took water and sediment samples from upstream and downstream of the mine site to see how acid mine drainage impacted the stream. The answer, in a nutshell, is that there is considerable impact (significant iron deposition, values of pH that are as low 3.8, dead vegetation and macroinvertebrates) but it changes with climate and discharge. Continued work will investigate mechanisms of acid and metal transport, with special interest to the role of sediment. Look for this work at GSA!

Scott worked with **Dannena Bowman** ('05) and **Sara Smaltz** ('06) through the FDC program this past summer. Their research completed the second year of a two-year NSF/ROA-funded project on 2D & 3D modeling of detachment folds. They constructed a series of 2-D cross sections, which allowed them to simulate 3-D models of detachment fold terminations that formed due to along-strike changes in displacement and/or detachment level. Using this approach in conjunction with a new model they developed to incorporate more realistic real-world fold characteristics, they were able to accurately model a natural detachment fold termination in the Sierra Madre Fold Belt in Mexico, and perhaps most importantly, help constrain the depth-to-detachment in that region. They will present their work as a poster at the annual GSA meeting in Seattle this November.

Over the last three years, **Jim's** research has been focused on the petrogenesis of a series of calcite vein-dykes in the Bancroft, Ontario region. This work began as the result of a Mineralogy field trip to the region in 1999. **Jennifer Berry** ('02) began working with him on this project in the summer of 2001. **Kathryn Adank** ('05) and **Chris Myrvold** ('06) spent this summer working on the project also. There has been much speculation that these vein-dykes are carbonatites by workers in the region. Although they have many similarities to true carbonatites, there is still some question as to their petrogenesis.

The outcome of this work so far has been a poster session at the national meeting of the Geological Society of America in 2001 (Jennifer Berry was lead author!), and an upcoming poster presentation at the Seattle GSA meeting this November with Kathryn and Chris.

Completely unrelated to the Bancroft work has been a long-term project in characterizing the hydrogeology of the Greencastle Aquifer. Many Science Research Fellow students and Geology majors have participated in this ongoing study. What is clear at this time is that the aquifer is only significantly recharged during flood stage, and, that the City of Greencastle is over-pumping the aquifer due to the continued growth of the city and associated industries. A new wellfield is scheduled to come on-line next year that should alleviate the problem.

Student/Faculty Research (continued)

Just when **Fred** thought he was done with the Great Lakes, he received an invitation this past year to join a team of scientists to conduct a one week sampling cruise on Lake Erie aboard the Environmental Protection Agency's 180 foot research vessel the *Lake Guardian*. As part of this work, they decided to repeat their benthic surveys in the western basin that they did in 1981 and 1982, and again in 1993, 1994, 1995. Their data confirms that the benthic fauna in the western portion of the lake has changed dramatically and that this change occurred at about the same time that the zebra mussels invaded and the mayflies reinvaded. Furthermore, the EPA has detected a large dead zone that has developed during the past few years in Lake Erie's central basin for reasons that are not understood. During the August cruise they sampled numerous stations across all of Lake Erie and at several stations they sampled as many variables as they could: thermal structure, water column chemistry, phytoplankton and zooplankton, benthos (bottom – dwelling critters for you landlocked geologists), sediment oxygen demand, and bottom sediment chemistry. Fred's summer research student, **Keith Herrmann** ('05), participated on the cruise. The bad news is that a large area of the central basin is near anoxic again this year. Hopefully, their work can provide some insight into what is causing this event, given the improvement in water quality during the 70's and 80's. (Could it be related to the Dreissenid mussel invasion that began in 1988?)

Photo Tour of the Department...

Top Left: Geology Classroom Lecture/Lab Space (with windows!)
Bottom Left: Department Computer Lab

Top Right: Environmental Geology Research Lab
Bottom Right: X-Ray Research Lab

Come Visit Us during Alumni Weekend for the Julian Science Center Rededication (Nov 1)