

Faculty Activities in 2000

❖ Mary Anderson

Keeping track of departmental activities as department chairman was a stimulating experience during the year 2000 (and the meeting of the Alumni Board in New Orleans in April was not only productive but also a lot of fun), but my scientific life was even more exciting. In June, I traveled to Japan for the Western Pacific Geophysics meeting where I presented a paper (co-authored by Ken Bradbury and Tim Eaton) on the use of temperature measurements in hydrogeological investigations in Wisconsin. I enticed former hydros Charlie Andrews, Erik Webb, and Chunmiao Zheng to present papers at the meeting as well. Husband Charles and I took some vacation time to do a little sightseeing in the Japan Alps. In October, I participated in a workshop on the interaction between ecology and hydrology as a member of the Committee on Opportunities in the Hydrological Sciences, sponsored by the National Research Council. We are currently planning a workshop on groundwater fluxes at interfaces (e.g., recharge and discharge). The highlight of the year, however, was a fantastic symposium held in my honor at the GSA meeting in Reno. The symposium was convened by former students Chunmiao Zheng, Charlie Andrews, and Ken Bradbury. Current PhD students Wes Dripps and Sue Swanson presented papers as did many former hydros. Many other former students also attended the symposium, reception and dinner. The symposium showcased research that has roots in Wisconsin; the reception and dinner provided an opportunity for a great reunion. The week before the symposium, I was honored to accept the C.V. Theis Award, given by the American Institute of Hydrology at their annual meeting in Research Triangle Park, North Carolina. Teaching groundwater modeling continues as does research on recharge estimation and groundwater-lake interaction. Dr. Quanlin Zhou joined the group as a Weeks postdoc and is helping with a new effort on using temperature measurements to delineate flow systems and estimate recharge rates.

❖ Jean Bahr

The year 2000 saw the start of an interdisciplinary Water and Watersheds project funded by the EPA and involving faculty and students from a number of departments on campus. The overall goal of this project is to evaluate hydrologic, ecologic, and social processes that may contribute to degraded water quality and reduced water availability as agricultural watersheds are converted to urban and suburban uses. I am collaborating with UW alumni **Ken Bradbury** (WGNHS) and **Randy Hunt** (USGS) in the hydrogeologic aspects of this project. Graduate students **Sue Swanson**, **Kristin Anderson**, **Dawn Chapel** and **Laura Parent** are contributing to this project through a field and modeling case study of the Pheasant Branch watershed, which complements our DNR funded work in the Token Creek and Nine Springs watersheds. Our work was featured at GSA in an invited talk I presented in a session on groundwater-surface water interactions and in one by Sue Swanson in the session honoring Mary Anderson.

Three of my advisees completed MS degrees in 2000. **Pete Taglia** perfected an in-situ microcosm method to measure field-based rates of intrinsic and enhanced biodegradation. The results of his final experiment demonstrated significant spatial variability of degradation processes and rates. Such spatial variability can complicate the assessment of “natural attenuation” as well as the design of engineered bioremediation. **Tara Root** used inverse geochemical models and data on groundwater chemistry to assess the feasibility of flow paths from Yucca Mountain to a possible discharge area at Franklin Lake Playa. Her results indicate that a number of flow paths converge at the playa from distinct upgradient sources and that these sources could include Yucca Mountain. Using hydrologic records and water chemistry data, **Shaili Pfeiffer** identified areas of groundwater, river water, and local recharge mixing in a lowland savanna along the lower Wisconsin River in a study designed to



photo courtesy Mary Anderson

Charlie Andrews, left, Mary Anderson and Chunmiao Zheng. The photo was taken at the reception that followed the symposium held in May's honor at the GSA meeting in Reno. Read more about the symposium on page 35.

evaluate hydrologic and geochemical factors that may be responsible for degradation of this wetland plant community.

Continuing the tradition of hydrogeology field trips, I traveled to Yellowstone last summer with graduate students who had participated in a spring semester seminar on groundwater heat transport. I also made several trips to Florida as part of my participation in a National Research Council committee reviewing scientific aspects of a major restoration plan for the Everglades. I chaired a subcommittee that focussed on the proposed use of "Aquifers Storage and Recovery" as one of the major storage options in the plan. The report summarizing conclusions from our October workshop on this topic is scheduled for publication by the National Academy Press.

❖ J.F. Banfield

2000 was a busy and productive year for our research group. It was also a year of many changes. Bill Barker accepted a new position as an assistant dean in the College of Letters and Sciences, Phil Bond left for a faculty position at the University of East Anglia, Dave Fowle accepted a position as an assistant professor at the Great Lakes Institute for Environmental Research at the University of Windsor, and Anne Taunton departed for a PhD program in Idaho. Brett Baker, Clara Chan, and John Moreau began their PhD programs and Forrest Huang and Jenn Macalady joined our group as postdoctoral scientists. I spent six months in Brisbane trying (unsuccessfully) to improve my children's pronunciation (Os-tray lya, not Orse tralya; Meblun, not Mel borne, etc.) catching up with old friends and relatives, and pretending to be molecular biology PhD student for a while.

Our research group redirected a lot of energy this year to work on a new geomicrobiology field site associated with the flooded, underground Tennyson mine in SW Wisconsin. The samples collected by our SCUBA diver collaborator, Tami Thomsen Ebert, have been subjected to all sorts of microbiology (Matthias Labrenz, Anne Skatvold, Clara Chan), mineralogy (Sue Welch, Clara Chan, John Moreau, me!), and geochemistry (Greg Druschel) tests, and a picture of active biomineralization of iron oxides and zinc sulfides has emerged. We hope to explore the relevance of these processes to ore formation and groundwater remediation. (See a research article on page 27.)

Our work on the geomicrobiology and geochemistry of acid mine drainage (Greg Druschel, Brett Baker, Phil Bond, Steve Smriga, and Michelle Lutz) has continued at Iron Mountain Mine, in Northern CA. In a related project, Yohey Suzuki is exploring the ways in

which microbes in sediments impact the form and bioavailability of uranium at an abandoned uranium mine site. Thus, a significant fraction of our research group is working on microbial contributions to cycling of metals in environments impacted by mining.

I am becoming increasingly interested in the detailed mechanisms by which microbes impact mineral dissolution and mineral precipitation reactions. Our ability to work on this topic received a major boost with the selection of the Iron Mt. acidophile, *Ferroplasma acidarmanus*, for genomic analysis. This project promises to keep us busy in 2001.

Tom Gihring developed an interesting project involving the role of thermophilic microorganisms in arsenic geochemistry, with a field site at Yellowstone National Park. Sue Welch, Anne Taunton, and more recently, Jenn Macalady continue to explore the impact of microbes on the bioavailability of phosphate in apatite and secondary phosphate phases. Masha Nesterova is spear heading the effort to understand biomineralization of polymers and Jeffrey Brownson is working on clay formation and microbial contributions to mineral weathering.

In parallel with the biogeochemistry/geomicrobiology work, Hengzhong Zhang, Forrest Huang, and Michael Finnegan are exploring the fundamental size-dependent properties and behavior of nanophase materials (nano-scale minerals are products of biomineralization and weathering reactions). This work now involves collaboration with UW Physics professor and synchrotron X-ray microscope expert Pupa De Stasio and post doc Ben Gilbert.

In 2000, our group gave approximately 25 talks at scientific meetings and published 17 papers (including one by Scott Sitzman, MS 1995), four of which appeared in *Science* (including 2 covers!)—a testament to the talent and hard work of the people whose names you see above, as well as prior students (Katrina Edwards, Lee Penn, and collaborators).

This will probably be my last UW newsletter contribution. I have decided to accept a faculty position at UC Berkeley. These have been good, productive years and, in many ways, I will be sad to leave (however, eleven winters is enough). I have especially enjoyed my interactions with many of you who are now our alumni. I wish you all well.

❖ Charles W. Byers

The biggest deal of 2000 for me was being honored by the UW for my teaching. I was one of the recipients of the Underkofler Award for Excellence in Teaching. My thanks to my faculty colleagues who nominated me and to former students who wrote letters of support.