

# WATER CURRENTS

Center for the Management, Utilization and Protection of Water Resources



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## Center Co-hosts Prestigious AEESP Lecturer René Schwarzenbach

One could say that René Schwarzenbach, this year's Association of Environmental Engineering and Science Professors (AEESP) Distinguished Lecturer, "wrote the book" on the study of organic chemistry in the environment, literally. The textbook, titled *Environmental Organic Chemistry*, that he co-authored won the Chemistry Book of the Year Award from the Association of American Publishers and has been established as the industry standard in the field.

It's no wonder, then, that the Center was honored when it earned the opportunity to co-host Schwarzenbach's lecture, titled "Use of Stable Isotope Fractionation to Assess Organic Pollutant Transformation in Contaminant Hydrology," as part of the annual AEESP series. The Center co-hosted the presen-

tation with the Departments of Civil and Environmental Engineering at Vanderbilt University and Tennessee Technological University.

"We consistently compete successfully to host these speakers," Dennis George, Center director and environmental engineer, said.

Schwarzenbach's presentation, held September 13 at Tennessee Tech, attracted students, faculty and other professionals who study and work in environmental chemistry. His lecture focused on the

possibilities and limitations of using isotope fractionation data to assess organic pollutant behavior. An element is said to have isotopes when the nuclei of atoms of the same element have different masses. Schwarzenbach's work shows how abundant isotopes of multiple elements may be useful for identifying contaminant sources of

water, among other important environmental uses.

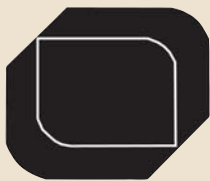
Schwarzenbach teaches at the Federal Institute of Technology in Zurich, Switzerland, and heads the Department of Environmental Sciences there. He also heads the Institute for Aquatic Sciences and Water Pollution Control at the Federal Institute for Environmental Science and Technology. In 2001,

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*"We consistently compete successfully to host these [AEESP] speakers." -- Dennis George, Center director and environmental engineer*

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he won the Society of Environmental Toxicology and Chemistry Environmental Education Award. His research focuses mainly on the distribution, fate and effects of organic pollutants in the natural environment.



**AEESP**

# 2 Exploring the Duck River

## Center Completes Project to Document Water Quality and History of Duck River Watershed



Above is a dam in Shelbyville, which lies within the Duck River watershed. (Photo by Scott Oldham)

The Center combined its water quality analysis, geographic information system (GIS) and editorial/graphic design expertise with historian Michael Birdwell in a project to create an annotated bibliography of information about the Duck River watershed region. The project was sponsored by the Tennessee Duck River Development Agency.

"This project helps us realize the historical, cultural and natural value of our state's watersheds," Dennis George, project principal investigator, said.

Yvette Clark, research and development engineer with the Center, and Amy Knox, editor for the Center, also worked on the project.

The bibliography is distributed via CD-ROM and an interactive Web site (currently found at [www.tntech.edu/wrc/duckrivermanual/duckrivermanualbegin.htm](http://www.tntech.edu/wrc/duckrivermanual/duckrivermanualbegin.htm)) and is

used for educational and reference purposes by the Development Agency, regional stakeholders, water professionals, school children--grades K-12--and others who are interested in learning about this region. River flow and quality, biological, historical, cultural and community-specific information was united in the final project. The water quality data, which encompassed several parameters, including aluminum, ammonia, mercury and lead, incorporated historical as well as recent data obtained from national environmental agencies. The biology section focused on endangered species indigenous to the area.

Birdwell and his student Scott Oldham examined the historical and cultural aspects of the Duck River area.

"This project could act as a model for the entire state," Birdwell said.

"We've collected historic and cultural information in one, easy-to-use location.

"I've learned a great deal about the Duck River that I never knew, and we think this tool will continue to add to the general public's knowledge of the region. Not only that, the product is something that can be added to easily as new materials arise."

The end product is a searchable database of hundreds of pieces of information. It provides an in-depth look at the Duck River watershed and its abundant natural and historical wealth.

"We hope that this project will lead to more like it," George said.

"There are 54 watersheds in Tennessee that would be perfect for work like we've done on the Duck River."

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# Center Co-hosts AWWA Web Cast at Tennessee Tech Campus

## Theme Focuses on Pharmaceuticals and Personal Care Products in Our Water Supplies



Tennessee Tech was one of the host sites for a broadcast by the American Water Works Association. Participants included Tennessee Tech faculty, staff, and graduate and undergraduate students who are interested in environmental research and environmental chemistry.

(Photos by Amy Knox)

The Center sponsored the Tennessee Tech broadcast of the American Water Works Association (AWWA) Web cast, titled "Down the Drain and Into the Water Supply: The Facts about Endocrine Disruptors, Pharmaceuticals and Personal Care Products in Drinking Water," last May. The on-campus viewing was coordinated by environmental chemist Martha J.M. Wells.

"This issue is becoming more and more prevalent in modern society," Dennis George, Center director, said. "And events like this are important in keeping the public informed and aware. I'm glad one of our faculty took part in bringing this message to campus."

Faculty, staff, students and regional water utility personnel were invited to attend.

Over the last decade, endocrine disrupting compounds and pharmaceuticals and personal care products (PPCPs) have received growing attention from the scientific community, regulatory agencies and the general public. Results of several recent studies indicate that the discharge of wastewaters and agricultural runoff into the environ-

ment yields a large number of these compounds. Public interest in this issue continues to increase, and the U.S. Environmental Protection Agency has been mandated to conduct a screening program for them.

The Web cast provided information on the regulatory background, the source and occurrence of emerging contaminants in U.S. waters, and the analytical methods and treatment options. Presenters included Djanette Khiari, project manager with the AWWA Research Foundation; J. Alan Roberson, AWWA director of Regulatory Affairs; Dana Kolpin, from the U.S. Geological Survey (USGS); and Shane Snyder, of the Southern Nevada Water Authority.

*"The immediate environmental effect of these chemicals [PPCPs] is hard to determine, but their presence in water...can be detrimental." -- EPA*

According to a research paper by the EPA's National Exposure Research Laboratory, the

PPCP classification covers a broad range of products, from prescription and over-the-counter drugs to fragrances, like musks. The immediate environmental effect of these chemicals is hard to determine, but their presence in water over long periods can be detrimental. More than 50 distinct PPCPs or metabolites had been identified at the time of the paper's publication in 1999.

## Environmental Chemist M.J.M. Wells Dedicates Years to Serving the American Chemical Society

### Wells Emphasizes Importance of Getting Involved in Professional Service Activities to Advance Research Career

Environmental chemist Martha J.M. Wells has been a member of the American Chemical Society (ACS) for 29 years and has served as an officer for the last 14 years. Wells' most recent position has been that of councilor for the Division of Environmental Chemistry, Inc. (ENVR). She realizes the importance, as a researcher and faculty member, of serving in a professional organization.

"As a student, I was encouraged to join societies like this," Wells said. "Through ACS, I have formed relationships with people who have not only helped further my career, but have also become my friends."

According to Wells, it is valuable to make these types of contacts with people who could later be reviewing your papers and proposals. "It's a tremendous networking opportunity and helps keep me at the forefront of research," Wells said.

Wells also served as chair of the Environmental Chemistry Division from 2000 to 2001, a position for which she was honored with the ACS Award for Outstanding Service.

"As you get into the governance

aspects of organizational service," Wells said, "you get to know people on a closer level and develop a sense of camaraderie."

These higher level positions are not



*Environmental chemist Martha J.M. Wells  
(Photo by Amy Knox)*

without their challenges, though. Wells says that it can be difficult dealing with the varying personalities, and conducting and controlling meetings can sometimes require patience. Wells obviously overcame those challenges, for she has been integral in working with other members to bring the ENVR into the Electronic Age.

"In the mid 1990s, the division was completely dependent on paper," Wells said. "Now it relies totally on electronic delivery of information."

Wells established the first ACS Web site for the ENVR and was responsible for the first digital posting of extended abstracts.

"All ENVR materials are now digital and on CD-ROMs," Wells said. "This cuts mailing costs and has allowed us to keep dues lower."

Wells' efforts at moving the ACS into the Electronic Age culminated in the first-ever Web broadcast of one of its meetings in August 2004. Wells was one of the leading coordinators of the event that focused on PPCPs in the environment. (Visit [www.tntech.edu/wrc/pdfs/Wint04Fin.pdf](http://www.tntech.edu/wrc/pdfs/Wint04Fin.pdf) for more information.)

The ACS was founded in 1876 and is comprised of nearly 160,000 members, who represent various degree levels in all fields of chemistry. According to its information statement, the ACS "provides a broad range of opportunities for peer interaction and career development, regardless of professional or scientific interests."

"As an officer, I've enjoyed influencing the direction of the society and making sure it's fair and equitable in its programming," Wells said.

# Center Expands Environmental Quality Lab Staff

## Research Assistants Ensor & Kuley Hired for Water Quality Analysis

The Center recently added the expertise of two water quality analysts, Ginger Ensor and Michael Kuley, to its team of professionals in the Environmental Quality Laboratory. And they've already been tested as they prepared for the lab's three-year state certification.

"We have to make sure that the lab meets the procedural conformity guidelines required by the state," Kuley said.

Ensor, research assistant II and metals analyst who previously worked with the Center through grant-funded projects and served as interim research assistant II while the search process ensued, holds more than 25 years of experience in analytical chemistry. Kuley, who most recently held a project manager position with Microbac Laboratories in Knoxville, has worked in the environmental analytical field since 2000.

Ensor earned a bachelor's in chemistry from the University of North Carolina, Greensboro. She has taught in High Point, North Carolina; Tallahassee, Florida; and Oak Ridge, Tennessee. She and



*Ginger Ensor, research assistant II, and Michael Kuley, research assistant I, joined the Center to enhance the laboratory capabilities. (Photos by Amy Knox)*

her husband, Dale--who is a chemistry professor at Tennessee Tech--moved to Cookeville in 1978. Once here, she took a job with Tennessee Tech in the School of Agriculture and later moved to the Biology Department. Ensor set up a lab there and began overseeing water quality analysis for grant-funded projects through the Tennessee Department of Transportation.

"We like the people and the atmosphere at Tennessee Tech," Ensor said.

When not performing analytical testing at the Center, Ensor is active in her church and is a bird enthusiast, proving it by taking an ornithology class and participating in local bird counts.

Kuley, who earned a bachelor's in biology/marine biology at the University of Tampa, Florida, says that this job is more varied than the

other jobs he's held. Previously, he worked as an organic extractionist, waste coordinator and sample manager at PEL Laboratories in Tampa; stack-sampler at Environmental Quality Management in Cincinnati, Ohio; and ICP/ICPMS/mercury analyst at GEL Laboratories, also in Cincinnati.

"I'm learning a lot of procedures and processes all at one time," Kuley said. "The job also requires me to continue my education as I audit a microscopy class taught by microbiologist Dr. Sharon Berk."

Kuley says that he wanted to get back into academia, and this has been a good opportunity for that.

"I hope to pursue my master's in chemistry while I'm here," Kuley said.

Kuley, who is newly married, is also interested in wood working, hiking and canoeing.

## 6 Fisheries Biologist Hayden Mattingly Focuses on Freshwater Streams

For fisheries biologist Hayden Mattingly, a faculty associate of the Center, studying freshwater streams, especially focusing on preserving endangered fish species, holds a special interest for him. All of the projects on which he is working fall within that category.

One such project, which deals with the federally listed threatened blackside dace fish species, just received continued funding from the U.S. Fish and Wildlife Service (USFWS) and the USGS.

"We're estimating the blackside dace populations at an additional 26 streams, mainly in East Tennessee, in this phase," Mattingly said. "We're hoping to increase stewardship of these fish as well."

Mattingly says that the research should enhance awareness among private landowners, who possess several of the streams being studied.

"Several different species of fish occur in these streams, but many people don't realize it," Mattingly said. "We're planning to prepare a scaled-down report of our work to give to the private landowners."

Another of Mattingly's projects focuses on the Barrens topminnow, another rare fish species. The researchers are in the second phase of this project, which is funded by the

USFWS, Tennessee Wildlife Resources Agency and the Arnold Engineering Development Center.

"Mosquitofish are considered an 'invasive species' and are one of the biggest threats to the topminnow," Mattingly said. "When mosquitofish are introduced to the topminnow habitat, the topminnows decline."

According to Mattingly, the mosquitofish prey on the young Barrens topminnows, which do not appear to live past the larval stage when mosquitofish are present.

"It's too expensive and difficult to restock adult topminnows every year," Mattingly said. "In this project, we're trying to develop an ecologically sensitive barrier to exclude mosquitofish but allow the topminnows in the habitat."

Hydrologist and environmental engineer Vincent Neary's expertise is helpful in this aspect of the project. He and his students are developing a barrier that will take advantage of the fact that mosquitofish are not very strong swimmers.

"The first step in creating this barrier is understanding at what water velocity the mosquitofish are unable to swim through," Mattingly said.

The researchers also hope to learn whether or not the two fish species



Graduate student Tyler Black, left foreground, and technician Jason Hunt, right foreground, used backpack electrofishing gear to collect blackside dace in a Kentucky stream in July 2005. (Photo by Victoria Bishop)

can co-exist if their habitat is modified biologically, creating an environment in which the mosquitofish are prey to larger fish. At Pond Spring, the mosquitofish and topminnows have lived together for decades. Mattingly and his team want to understand what makes this possible and try to recreate those conditions.

"The size of the spring could be a factor," Mattingly said. "The habitat is also variable and has larger predator fish living there too. These may keep the mosquitofish in check and allow the topminnows to survive."

Mattingly and his graduate student Jason Detar also won a Best Paper Award for a smaller project that has stemmed from the other research. Mattingly and Detar are studying the use of clove oil, as opposed to the MS-222 that is traditionally used, as an anesthetic to sedate fish for scientific research.



The Center's research and development engineer, Yvette Clark (left photo, by Amy Knox), and environmental chemist Martha J.M. Wells (right photo, by Tony Marable) taught GIS and chemistry workshops, respectively, during this year's President's Academy.

# President's Academy for Emerging Technologies

The Center is known for lending its talent and expertise to furthering other initiatives on campus. This past spring and summer, a Center faculty member and the research and development engineer assisted in the President's Academy for Emerging Technologies. Environmental chemist Martha J.M. Wells and civil engineer Yvette Clark taught workshops during the event, which is designed to excite high school students about engineering, technology, science and mathematics. Dan Dodson, the Center's Environmental Quality Lab manager, provided tours of the lab facilities.

The President's Academy is focused on incorporating emerging technologies, like nanotechnology, biotechnology, information technology and other supporting technologies, in K-12 curricula to help students prepare for the future. The spring workshop

guided teachers in how they can include emerging technologies in their lesson plans. Wells presented "We All Live in a Watershed--Using Environmental Issues to Teach Science and Engineering Relevance," which focused on the chemistry aspects of nanotechnology and biotechnology, and Clark presented "Graphical Information Systems in Education," which incorporated information technologies, to the more than 80 teachers and school administrators who participated.

A total of 73 students in grades 9-12 were chosen to participate in the two summer sessions. They learned through a variety of structured classroom and laboratory exercises, which were led by Wells and Clark; faculty from the Center for Manufacturing Research, English Department and Industrial Engineering; and faculty from Vanderbilt's Institute for Nanoscale Science and

Engineering (VINSE). Field trips included a visit to the Oak Ridge National Laboratory and Chattanooga.

"Teaching kids this age can be challenging as well as rewarding," Clark said. "It's exciting when you see that the students are really interested in learning this."

The program is directed by Ken Hunter, Basic Engineering associate professor, and is funded through private contributions, allowing students to participate free of charge. The event was held through the collaboration of Tennessee Tech's School of Interdisciplinary Studies and Extended Education, Columbia State Community College, Motlow State Community College, and school systems from Giles, Lawrence, Maury, Warren and Williamson Counties.

## Sam Huddleston Went from Being a Center Student to an Environmental Engineer with the City of Murfreesboro

# alumnus spotlight

Former Center student Sam Huddleston knows what it's like fighting to be recognized by employers among a sea of qualified and eager college graduates. But experiences like working for the Center, he believes, helped set him apart. He is now an environmental engineer for the City of Murfreesboro Engineering Department.

"My experience at the [Water] Center definitely enhanced my marketability when I looked for a job," Huddleston said. "At the Center, I earned hands-on research experience by working on an externally funded project and working in the Center's Environmental Quality Laboratory."

Huddleston says that he was able to highlight that significant work experience when the time came to meet with employers.

He earned both his bachelor's and

master's from Tennessee Tech in civil engineering, with an emphasis on the environment. Before joining the City of Murfreesboro, he was an environmental consultant on hazardous waste for more than 11 years. At Murfreesboro, his duties are varied, but he is especially involved with site reviews and approvals for roads and drainage areas. He also assists with other environmental issues like emergency response, spill cleanup, hazardous waste disposal and sinkholes.

His advice to students pursuing degrees in environmental fields is twofold, "Finish your education and degrees before you accept a job. It's difficult to complete graduate-level studies while working more than 40 hours a week."

It's also important for students to do something that sets them apart.

"Enhance your education by



Sam Huddleston (Photo by TTU Photographic Services)

getting advanced degrees, performing technical and professional society service, and getting involved in co-op opportunities," Huddleston said.

Working with the Center is one of those opportunities that Huddleston believes is important to enhancing a student's appeal in the job force.

"Working on long-term research projects at the Center helps prepare students for some of the multiphase, multiyear projects that are common in the environmental industry," he said.

*If you are an alumnus of the Center, please help us update our records by sending an e-mail to [akknox@tntech.edu](mailto:akknox@tntech.edu) with your current address and employer information.*

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