Kentucky Cross Section
Earth Resources—Our Common Wealth
Fall 2016

Haneberg selected as new state geologist, director of Kentucky Geological Survey

Dr. William C. Haneberg became Kentucky's 13th state geologist and KGS director on September 1, succeeding Jim Cobb, who had held the position until his retirement in July 2014. An engineering geologist with a wide range of research, academic, and applied experience, Haneberg will also hold a parallel appointment as a research professor in the University of Kentucky Department of Earth and Environmental Sciences.

Haneberg is a native of Cleveland, Ohio, with more than 25 years of experience as a university geology teacher, researcher and administrator in the office of the state geologist in New Mexico, and in geologic consulting. Since October 2011, he worked in Houston for an American subsidiary of the Dutch geoscience and engineering firm Fugro, N.V., for which he was a senior consultant and quantitative geohazards group leader.

"I'm honored and excited to take on the challenge of leading an organization with such a distinguished history of service to the commonwealth, and look forward to exploring new ways to partner with government agencies, universities, public interest groups, and industry as we all work to continue making Kentucky a great place to live and work," said Haneberg.

Haneberg earned a doctorate in geology from the University of Cincinnati in 1989. His expertise includes geologic hazard and risk assessment, structural geology, hydrogeology, and the use of geologic information to support planning and policy decision-making. He is an author or co-author of well over 100 published technical abstracts and papers on topics ranging from deep-sea landslides to Himalayan glaciation. Haneberg received the 2006 Claire P. Holdredge Award from the Association of Environmental and Engineering Geologists for his 2004 book, "Computational Geosciences with Mathematica." He was the 2011 Richard H. Jahns Distinguished Lecturer in Engineering Geology and is an elected Fellow of the Geological Society of America.

Bill Haneberg

An avid cyclist, Haneberg also enjoys running, high-altitude mountain trekking, and other outdoor pursuits in his free time. His wife, Lisa, is a senior human resources expert with a major health-care organization, speaker, and author of 14 business books who is currently finishing her first novel.❖

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KGS, UK Earth and Environmental Sciences Department acquire scanning electron microscope

KGS research staff, professors and students from the UK Department of Earth and Environmental Sciences, and high school students in Fayette County will benefit from the recent purchase of a scanning electron microscope. The instrument, located on the first floor of the Mining and Mineral Resources Building, will be jointly operated by the department and KGS. Department chair Dave Moecher says he and Energy and Minerals Section Head Dave Harris had discussed acquiring the instrument for several years. Moecher successfully applied for a grant from the National Science Foundation for it, and KGS was authorized to use fund-

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Last *Kentucky Cross Section*

This will be the final printed *Kentucky Cross Section,* as KGS switches to exclusively online distribution of the information you have been reading in this newsletter. Watch our website (www.uky.edu/KGS) for an update to our home page and a continuous feed of information, research news, and promotion of KGS events.

Director's Desk

It was an honor to begin my tenure as state geologist and director of the Kentucky Geological Survey on September 1. I am the 13th in a succession of geologists to have held the position, beginning with William Williams Mather, a pioneer of American geology who surveyed the mineral resources of Kentucky in 1838-39, and culminating with my immediate predecessor, Jim Cobb. And, I cannot ignore the contribution of Jerry Weisenfluh, who served in an interim role for two years following Jim's retirement.

We have come a long way since the days of Mather. Brass surveying instruments in wooden boxes and simple chemical tests have given way to GPS receivers, laser scanners, computer mapping software, and electron microprobes. Yet the fundamental questions remain much the same: What lies beneath our feet? And, how can we best use knowledge of Kentucky's geology to benefit the practical well-being of its people?

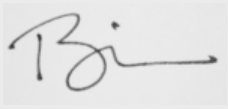
In Kentucky, we have an abundance of geologic information due in no small part to the foresight of my predecessors, who collaborated with the U.S. Geological Survey to make ours the first of the larger U.S. states to be completely covered by modern bedrock geology maps. Jim Cobb also made the visionary decision to make our publications, reports, maps, and databases freely available on the Internet. And, by free, I mean free. There is no charge. We are still scanning some older records, so not every document is available yet, but our intention is to make available essentially everything we have in final form. Individuals, community and nonprofit groups, and students have the same access to our data as professional geologists, engineering consultants, and multinational corporations. One of our challenges is to learn how best to make this increasingly complicated data easily accessible to as many people as possible, including exciting possibilities like a transition from traditional 2D maps to interactive online 3D earth models.

KGS scientists are developing a groundwater monitoring and sampling network, running a seismograph network to record any secondary effects of hydraulic fracturing for oil and gas production, understanding the causes of potentially damaging landslides, working with the UK College of Nursing to assess the relationship between geology and carcinogenic radon gas, evaluating carbon sequestration alternatives, and more. Ongoing mapping of surficial geologic deposits in key areas of the state will provide the information necessary to support a robust and sustainable economic base as Kentucky moves forward into the 21st century. We also preserve and curate well samples and cores, primarily from oil and gas wells, that are an invaluable source of information for anyone interested in Kentucky's subsurface geology.

Bill Haneberg

Doing these things requires motivated scientists of exceptional caliber, and KGS scientists are leaders in their fields. Some of them will be speaking at the American Association of Petroleum Geologists Eastern Section meeting, the Geological Society of America annual meeting, and the International Radon Symposium, all in September. Their presentations will be about digital data acquisition, rare earth elements, landslide hazards, the geologic history of the Ohio River relevant to geotechnical engineering and earthquake hazard assessment in western Kentucky, and new ways of communicating radon gas hazards.

Our focus is, and always will be, doing the best science possible for the benefit of all Kentuckians.❖



Henry Francis

Former KGS laboratory manager Henry Francis dies at 74

Retired KGS laboratory manager Henry Francis died on August 26 in hospice care in Lexington. Francis, a native of Glasgow, Ky., joined KGS as the lab manager in April 1988, after working in a similar position in the University of Kentucky's Chemical Engineering Department. He had previously taught chemistry at Eastern Kentucky University and worked as a research scientist at the Institute for Mining and Minerals Research at UK, which eventually became the Center for Applied Energy Research. He

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Scanning electron microscope—*continued from p. 1*

ing remaining from a State-sponsored project for the purchase.

Moecher, had been using an electron microprobe for quantitative analysis and other uses, but state-of-the-art analysis has moved well beyond its capabilities. He already had two active research grants that required the use of an SEM. "And part of what made the proposal attractive to NSF is that you have to have what are called 'broader impacts' or 'broader relevance,' such as student training and outreach. So we're going to invite eight high school teachers next summer to do a one-week short course to learn how to use the instrument and come up with projects and units to incorporate into their science curriculum." The instrument is remote-capable, so the teachers and their students will be able to access it for their projects from their schools. Mike Ellis, of the KGS Geoscience Information Management Section, helped develop a method for schools to get remote access to the instrument.

"The new scanning electron microscope is a perfect example of leveraging expertise and funding between KGS and DEES to obtain an important research tool that would have been very difficult to acquire independently," says Harris. "Sharing responsibility for training and maintenance of the instrument also reduces costs for both." He adds that it will improve KGS's capability to characterize fine-grained rocks, mineral deposits, and pore systems in subsurface reservoirs.

George Risk of JEOL, which made the scanning electron microscope, trains Energy and Minerals Section Head Dave Harris on the operation of the instrument.

Harris expects KGS researchers to make good use of the microscope for examining samples from tight sandstone reservoirs such as the Berea Sandstone, characterizing carbon storage injection zones and deep shale gas reservoirs such as the Rogersville Shale, and for mineral exploration. "SEM imaging and analysis have become standard tools in the evaluation of nano-scale pore systems in unconventional reservoirs," he says. "Features of this instrument will allow elemental composition to be quickly determined."

Moecher believes the instrument, made by JEOL USA Inc., a wholly owned subsidiary of JEOL Ltd. of Japan, fits the purposes for which it will be used. "We wanted a simple instrument that is easy to maintain and that is hard to break, and does everything we need it to do. It's amazing what you can see on the SEM images compared to the microprobe. It's so easy to use. Literally two clicks and you've got an image. It's auto-focused, auto-contrast, auto-everything!"❖

Henry Francis—*continued from p. 2*

earned a bachelor's degree in chemistry from Western Kentucky University in 1966 and did graduate work at UK in chemical analysis methods and spectroscopy.

During his years at the KGS laboratory, he was involved in water-quality projects across Kentucky, both through partnerships with UK institutes and with Kentucky Watershed Watch. Henry stayed active in such volunteer efforts after his retirement. His official retirement from KGS was January 2, 2009, but he was still regularly in the Mining and Mineral Resources Building, working at the KGS lab and a coal lab operated by the UK Department of Mining Engineering.

"Henry was instrumental in equipping the X-ray and mineral analytical lab that is housed here at KGS and is currently utilized by dozens of students and faculty from many departments at the University of Kentucky," said Jason Backus, who succeeded Henry as laboratory manager. "His dedication and knowledge of analytical chemistry in geological samples and his willingness to share his experience will be missed."

In 2008, Francis received an Award of Merit from the Committee on Coal and Coke of ASTM International (originally known as the American Society for Testing and Materials). The Award of Merit and accompanying title of "fellow" is the highest organizational honor for individual contributions to standards activities. He was also recognized by ASTM International with the 1994 R.A. Glenn Award for outstanding

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First days of the 13th Survey

On September 12, Bill Haneberg attended his first meeting of the KGS Advisory Board. Several members of the board served on the selection committee that chose Haneberg as the 13th state geologist and KGS director.

Haneberg made his first presentation to Survey staff as KGS director on September 2. He talked about his education and experience, including serving as senior engineering geologist and assistant director in the New Mexico Office of State Geologist. Haneberg began meeting Survey staff after his remarks. Within a few days, he began meetings with KGS sections. His predecessor, Jim Cobb, presented him with a ceremonial state geologist's hammer.

Left: UK Vice President for Research Lisa Cassis chats with Haneberg at a reception after the Advisory Board meeting. He met invited University officials, representatives of State agencies, and officers of professional groups and associations, including Matt Sawyers, executive director of the Kentucky Oil & Gas Association (right).

Groundwater music at Lexington's Jacobson Park

The sounds of pipes could be heard near the newly constructed playground by the lake at Lexington's Jacobson Park on June 11. It wasn't the skirl of bagpipes, but rather melodious tones from fluorescent-green 8-inch steel pipes coming out of the ground, with built-in speakers playing music generated by groundwater, the underground waters flowing through Kentucky's limestone and fractured bedrock aquifers and discharging from some of the state's many natural springs.

Called "Livestream," the new structure is a unique collaboration between art, science, and technology that has been two years in the making. In 2013, Kiersten Nash founded Public Works as a platform for creative civic engagement. For the development of Livestream, she assembled a group that included Lexington-based cellist Ben Sollee, among others. This group collaborated with staff of the KGS Water Resources Section to incorporate groundwater data collected at three springs located in different regions of Kentucky into a musical sculpture that the public can enjoy and learn from.

Nash's company, Public Works Collaborative in New York, was awarded a grant and developed Livestream to help raise groundwater awareness in Kentucky.

Groundwater data collected over many years by State and federal agencies, including KGS, are stored in the Kentucky Groundwater Data Repository maintained by KGS.

The Livestream installation uses repository data for Bluehole Spring in McConnell Springs Park in Lexington, Lost River Rise Spring in Bowling Green, and Cold Spring in Bledsoe (Harlan County). These data were collected over a period of 10 years, primarily by the Kentucky Division of Water, and provided to the repository. Three parameters that are indicative of the natural variability of groundwater discharging from springs—flow, temperature, and conductivity—were selected to be converted to musical tones by means of a sound library (one tone per value) generated by Sollee. The tones rise and fall according to the higher or lower data values recorded for each of the three parameters obtained from periodic sampling.

Families enjoying the Livestream pipes and speakers constructed by the Public Works Collaborative through a grant by LexArts and the Lexington Department of Environmental Quality and Public Works.

Nash's intent for the project is to challenge people's perceptions and, hence, understanding of groundwater. The speakers that generate the sounds each have a small computer and a proximity detector, so they only emit sounds as a person draws near them, and increase in volume the closer the person gets. A master computer junction box located near the pipes displays a sign describing Livestream and compiles metadata on which speakers have played and how often.❖

***Henry Francis**—continued from p. 3*

contribution to ASTM standards for coal and coke and a Service Award in 1998.

After his retirement Francis was presented the 2012 Bob Lauderdale Award for Water Quality at the annual meeting of the Kentucky Water Resources Research Institute, recognizing his long service to the Kentucky water-resources community.

Francis is survived by his son, Walter R. Francis; daughter-in-law, Karen Francis; and granddaughter, Emma Francis. A memorial service was held Sept. 2 at Trinity Baptist Church in Lexington.❖

Landslide researcher Matt Crawford of the Geologic Hazards Section spent a couple of days in July measuring electrical resistivity on an active deep-seated rockslide in Pittsburgh, Pa., in collaboration with the USGS. The slide is on public land near Interstate 79.

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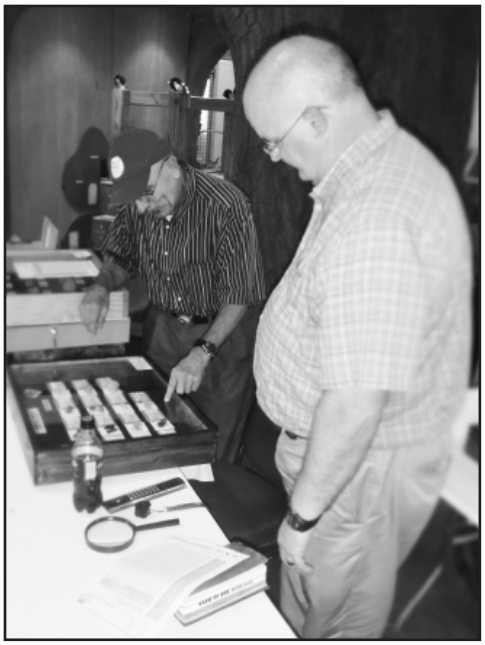
KGS seismologist Seth Carpenter led a July 6 field trip for Kentucky Governor's Scholars in the New Madrid Seismic Zone. The trip included stops at the Reelfoot Scarp and Reelfoot Lake in northwestern Tennessee, the Central U.S. Seismic Observatory site in western Kentucky, and the city of Hickman, where the students viewed landslide-prone bluffs near the Mississippi River.



KGS geologists Richard Smath and Bart Davidson judged the annual 4-H rock, mineral, and fossil collections at the Kentucky State Fair in August. Steve Greb also served as judge and took the photo. KGS staff have judged the 4-H collections for at least two decades.