MISSOURI GEOLOGICAL SURVEY

Earth science for everyone

by Carey Bridges photographs by Scott Myers

A wealth of earth science information for Missouri dating back to the mid-1800s is available from the Missouri Geological Survey, a division of the Missouri Department of Natural Resources.

Documenting, preserving and maintaining geologic information and specimens is critical for understanding Missouri's resources and developing strategies for a sustainable future. Due in part to the longevity of the Missouri Geological Survey and expertise of its staff, the state survey is a valuable source of natural resource information, including occurrence, location, quantity and quality of the resources that lie beneath our feet and provide for Missouri's health, economy and recreation.

(Above) This box of rock core contains magnetite (iron ore) from Pilot Knob and was donated by John Nold, Ph.D., professor emeritus, University of Central Missouri. The McCracken Core Library and Research Center is one of the largest collections of core samples in the nation.

(Left) Ninteenth-century notebooks used by geologists, now available electronically, include drawings, maps, information and observations about Missouri geology and related topics.

McCracken Core Library and Research Center

Since 1989, the Missouri Geological Survey has managed the McCracken Core Library and Research Center, named in honor of geologists Earl and Mary McCracken, whose service to the state survey spanned more than three decades. The 21,000-square-foot facility located in Rolla houses nearly 3,000 drill core samples containing more than two million linear feet of exploration rock cores and cuttings with an estimated replacement value of $100 million.

Cores are cylindrical sections of solid rock obtained by using a hollow-core drill. Drilling may be to depths of 1,000 feet or more. Most of the core is 1⅜ inches in diameter and stored in 2-foot sections. Cuttings are broken pieces of rock obtained as a drill bit advances below the surface.

Core research preserves geological information, leads to a better understanding of subsurface geology, hydrology, water resources and economic geology potential. It yields data useful in solving environmental, industrial and engineering problems. Core available for study comes from many sources throughout Missouri, including highway department construction, oil, gas and mineral exploration drilling, quarries and various subsurface investigations related to landfills and hazardous waste sites.

The center is widely used by industry, consultants, scientists, academia, government representatives and the public to ac-

(Above) Pat Mulvany, Ph.D., Industrial Materials unit chief, uses a stereoscope to view a pair of aerial photographs as a 3-D image. Photographs such as these are used to verify locations of geologic features and to examine changes over time. (Left) Carey Bridges, director of the department's Geological Survey Program, and Cheryl Seeger, Ph.D., Geologic Investigations unit chief, view maps from the state map repository. The repository was established by the state legislature in 1993.

(Above) The Greene Geology Library contains 100,000 aerial photographs used to examine geologic features. (Below) Patrick Scheel, facility operator of the McCracken Core Library and Research Center, uses a core saw to cut rock core that will be used by a customer to conduct research.

cess subsurface information without the costly need to drill new boreholes. This leads to savings of millions of dollars in exploratory costs each year.

"The McCracken Core Library and Research Center is an invaluable asset to the state of Missouri. The historical core allows university researchers to investigate efficient ways to improve the environment for all Missourians," said Doug Gouzie, Ph.D. and associate professor of geology, Missouri State University in Springfield. "Our research team participated in the Missouri Carbon Sequestration Project, during which Missouri Geological Survey staff received and managed the rock core from the three deep boreholes across the state. The well-catalogued core and knowledgeable staff allowed us to make optimal use of our time to examine core in microscopic detail. As a result, we were able to minimize the amount of new drill core needed and improve our understanding of the St. Francois Aquifer … in southwest Missouri," explained Gouzie.

Carbon capture and sequestration is a set of technologies that potentially can reduce CO_2, methane, nitrous oxide and other gas emissions from coal- and gas-fired power plants and large industrial, agricultural and transportation sources.

"The McCracken Core Library and Research Center is of critical importance to the current U.S. Geological Survey Project on Setting and Origin of Iron Oxide-Copper-Cobalt-Gold-Rare Earth Element Deposits of southeast Missouri," said John Slack, a geologist at the U.S. Geological

Survey in Denver. “Many key samples for geochemistry, isotopes, fluid inclusions, and geochronology analyses came from drill cores stored at the facility.”

The St. Francois Mountains region likely has the highest potential for undiscovered large rare earth element deposits in the contiguous United States. Rare earth elements hold vast potential for business, energy and defense technologies.

The center is one of the largest public core repositories in the U.S. You can learn more about the McCracken Core Library and Research Center, and see a list of holdings at dnr.mo.gov/geology/geosrv/geores/mccracken.htm.

Frank C. Greene Geology Library

The Missouri Geological Survey also maintains the Frank C. Greene Geology Library, a technical library at the main offices of the survey in Rolla. The library, named after renowned survey geologist Frank C. Greene, contains thousands of published and unpublished technical books, journals, periodicals, maps and manuscripts. Historic field notebooks and photos about Missouri’s geology, including mineral, energy and water resources also are available for public review.

“Library holdings include everything that has been published by the survey, beginning in 1855 when the “First and Second Reports” volume of the survey was printed,” said Joe Gillman, state geologist and director of the Missouri Geological Survey.

The library also contains bound sets of major geology journals, publications of state geological surveys that are contiguous with Missouri, publications of the U.S. Geological Survey and aerial photographs of the Missouri landscape dating back to 1938. Missouri’s State Mine Map Repository and related geo-referenced digital imagery also are part of the holdings.

Many of the manuscripts are deemed one-of-a-kind or rare. Rare and old items are maintained in a climate-controlled environment adjacent to the main physical library.

“Since 2007, the library has been gradually converted into a digital library to meet the demands of consumers,” said Pat Mulvany, a geologist at the Missouri Geological Survey. “At this time, all survey publications and maps dating back to 1855 have been scanned and included in the digital library.”

Library holdings, paper and digital, are indicated by the survey’s online Missouri Geology Bibliography at dnr.mo.gov/asp/dgls/bibliography/search.asp and by its online Missouri Geologic Map Index at dnr.mo.gov/geology/statemap/missouri-maps.htm.

Much of the information in the library exists nowhere else and is a vital resource for researching the geology of Missouri. Visitors may review original materials, and paper or digital versions of library holdings are available for purchase.

Access and tours of both facilities by interested parties are available by appointment by calling 573-368-2100.

Carey Bridges is director of the Geological Survey Program, Missouri Geological Survey, a division of the Missouri Department of Natural Resources.

Patrick Scheel pulls a box of core samples for examination. Core sample research leads to a better understanding of resources and yields data useful in solving environmental, industrial and engineering problems.