

offered by:
The Center for Cave and Karst Studies
Applied Research and Technology Program of Distinction
Department of Geography and Geology
Western Kentucky University &
Mammoth Cave National Park
International Center for Science and Learning



2007 Karst Field Studies at Mammoth Cave



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KARST FIELD STUDIES INFORMATION TO KNOW

General Information: Western Kentucky University, through its Center for Cave and Karst Studies and in cooperation with Mammoth Cave National Park, offers a series of one-week summer courses focusing on caves, karst and caving. While some courses require previous subject knowledge, other courses are designed for those with merely an interest in caves. Course professors have been chosen who are internationally recognized authorities in their fields. These intense field courses combine daily lectures with field observations and excursions. Many of the courses involve rigorous trips into rarely visited portions of Mammoth Cave. The Karst Hydrology course is, however, more surface-oriented and less physically demanding.

Who Should Attend: These courses are not for everyone. You will need an adventurous spirit and good physical conditioning to get the maximum benefit. Participants include undergraduate and graduate students; cave guides, geologists, hydrologists, engineers, teachers and college professors, as well as individuals desiring an exciting and educational vacation experience. **All participants must be high school graduates and in good physical condition.**

Format of Courses: Professors typically lecture in the mornings with cave and surface trips scheduled for the afternoons. Special talks, slide shows, and trips into the cave are often scheduled after dinner. Activities may include: 1) all-day trips into Mammoth Cave, 2) surface trips into the Park and the surrounding area, and 3) laboratory and various field exercises.

Equipment: Detailed information concerning equipment will be sent in an informational packet upon registration.

Accommodations/Locations:

Mammoth Cave, KY Courses: The headquarters for courses taught at Mammoth Cave National Park is the International Center for Science and Learning at Hamilton Valley in Cave City. Students may choose to stay in the group dormitory or camp on the research center grounds. Accommodations are also available at the Park hotel, but participants must make their own reservations. These courses include **Intro to Speleology, Cave Surveying and Cartography, Karst Geology, Exploration of Mammoth Cave and Cave Geomicrobiology**. See *Schedule for dates*.

Bowling Green, KY Courses:

Karst Hydrology Course: This course is taught at the Comfort Inn in Bowling Green. A block of rooms have been reserved at the Comfort Inn at Exit 23 for participants. For reservations, call (270) 843-1163. Ask for the "Hydrology Block" to receive a discount. Detailed information will be sent upon registration. See *Schedule for dates*.

Center for Cave and Karst Studies

Applied Research and Technology Program of Distinction
Department of Geography and Geology
Western Kentucky University

<http://caveandkarst.wku.edu> and <http://www.dyetracing.com>

Nicholas Crawford, Director

The Center for Cave and Karst Studies, established in 1978 at Western Kentucky University, was the first center established primarily to deal with karst problems in the U.S. The Center's offices and labs are located within the Department of Geography and Geology in the Environmental Science and Technology Building at Western.

The Department of Geography and Geology consists of 21 professors with specialties in hydrology, physical geography, geology, meteorology, cartography, GIS, human geography, and planning. In addition to Dr. Crawford, Assistant Director/Research Hydrologist, Adam Coffman, Dye Tracer Laboratory Manager/chemist, Lisa Haynes, Office Coordinator, and 16 graduate and undergraduate research assistants.

The objectives of the Center are:

- To be a research center dealing with all aspects of cave and karst studies, with an emphasis on solving environmental problems associated with karst;
- To provide educational programs concerning cave and karst studies:
 - a) undergraduate and graduate instruction,
 - b) cooperative education program with the Mammoth Cave International Center for Science and Learning,
 - c) workshops, seminars, and scientific meetings;
- To provide public service by assisting individuals, private firms, and government agencies with karst environmental problems.

The Center is involved in virtually all aspects of basic and applied karst research. Although the Center is supported by the University, it is primarily dependent upon external funding provided through grants dealing with groundwater contamination, sinkhole flooding, and sinkhole collapse.

The Center is routinely involved in public service activities by providing consultation and/or field investigation regarding hydrologic problems (groundwater contamination, sinkhole flooding, and sinkhole collapses) for individuals, private firms, and local, state and federal government agencies throughout the U.S. and other countries.

Over the past twenty-eight years, the Center has attracted outstanding undergraduate and graduate students from various parts of the United States. Graduate and undergraduate research assistants are actively involved in the research efforts of the Center. Geoscience graduate and undergraduate students, get "hands-on" experience in dealing with karst groundwater problems through the Center's research for government agencies and private business. Center research associates have been very successful in obtaining positions with both government agencies and private firms.

2007 KARST FIELD STUDIES SCHEDULE

Intro to Speleology

Mammoth Cave, KY

JUNE 3-9

Caves and karst form through the interaction of groundwater and rock. Caves are the home of many kinds of unique organisms and ecosystems. Caves and karst have also greatly influenced human settlement and activity. For these reasons, speleology, the science of caves, is an incredibly interdisciplinary science that draws from geology, hydrology, biology, climatology, physics, archaeology, paleontology, surveying, and many other disciplines. Speleology depends on cave exploration and mapping, and cave exploration benefits from clues derived from understanding speleology. This course will provide an introduction to speleology through a mix of classroom activities and field trips into rarely visited caves in Mammoth Cave National Park. Field trips will focus on such topics as "How did this cave form?", "Where does the water go?", "Why air moves in caves the way it does (and how to use it to find additional cave passages)?", "What are those little bugs I keep seeing while caving and why are they important?", "Why do I see animal bones in caves (and what are they)?", "Who has caved here before and how can I tell?", and "How can I protect the cave while exploring it?" Excellent physical condition; previous caving experience is not required.

Registration: Undergraduate or Workshop

Dr. Rickard Toomey:

Dr. Toomey III, Ph.D. is director of the Mammoth Cave International Center for Science and Learning. The Center, a cooperative effort between Western Kentucky University and Mammoth Cave National Park, promotes research and education in the Mammoth Cave area. From 2001 to 2005 he was Science and Research Manager, as well as Cave Resources Manager for Arizona State Parks. In this position he oversaw research and environmental protection at Karchner Caverns State Park. Prior to 2001, Rick was a geology curator at the Illinois State Museum. His training is as a vertebrate paleontologist, and his specialty is bats and other small mammals from caves. Much of his work centers on identifying historic impacts to cave systems and determining ways to mitigate those impacts. He has been caving for over 15 years and served on the board of and as president of the Cave Research Foundation.

Cave Surveying and Cartography

Mammoth Cave, KY

JUNE 10-16

Cave maps and inventories are fundamental to the understanding of cave and karst environments. This course will focus on in-cave data collection (with an emphasis on sketching), cave resource inventories, constructing survey data/inventory databases, creating maps and transforming the data and maps into GIS format. Techniques for collecting cave survey and inventory databases will be examined with emphasis on obtaining the most useful data in the field. Surface geophysical techniques pertinent to locating and mapping caves (from the ground surface) will also be taught. The class will learn methods to translate data into maps, databases, digital representations, and GIS formats that can be used for exploration, science, and natural resource management purposes. Since field time will be spent underground in the Mammoth Cave System and in nearby caves, participants must be in good physical condition and prepared for strenuous activity each day. This course is designed to accommodate a variety of backgrounds and experience. Participants must be in good physical condition.

Registration: Graduate, Undergraduate or Workshop

Ms. Patricia Kambesis:

Ms. Kambesis, a former president of the Cave Research Foundation, is an experienced cave surveyor and cartographer who has worked extensively in many caves and caves systems all over the United States and internationally. Her experiences encompass both independent cave survey projects and those administered by federal and state agencies. Her cartographic work has been extensively displayed and published. She currently serves as the editor for *Compass & Tape*, the newsletter of Survey and Cartography Section of the NSS. Ms. Kambesis will be the primary instructor in the course with Dr. Crawford and the Center for Cave and Karst Studies staff responsible for microgravity and electrical resistivity for locating and mapping caves from the ground surface and for cave radio techniques for increasing the accuracy of cave maps.

Dr. Nicholas Crawford:

Dr. Crawford is a professor in the Department of Geography and Geology and Director of the Center for Cave and Karst Studies at Western Kentucky University. He has written over 200 articles and technical reports dealing primarily with groundwater contamination of carbonate aquifers. The recipient of over 200 grants and contracts for hydrological research on environmental problems of karst regions, he was awarded Western's highest award for Outstanding Achievement in Research in 1985 and Western's Professional Public Service Award in 1996. He is a fellow and Honorary Life Member of the National Speleological Society. He received the Kentucky Outstanding Geologist Award in 1998 from the American Institute of Professional Geologists. As a consultant specializing in carbonate aquifers for the past twenty-seven years, Dr. Crawford has performed over 2000 dye traces and has worked on numerous groundwater contamination and other karst problems for private firms and for federal, state, and local government agencies.

KARST GEOLOGY

Mammoth Cave, KY

JUNE 10-16

A study of the origin, hydrology, and patterns of caves and other karst features from the standpoint of rock types, geologic structures, water chemistry, and the evolution of the surface landscape. Emphasis is placed on the kinds of observation and measurements needed to interpret the control of geology on karst processes and cave patterns. The geology and origin of Mammoth Cave serves as a reference point of discussions of caves and karst of various kinds throughout the world. Students must be in excellent physical condition. Previous caving experience is highly recommended but not required. Participants should have at least one previous course in geology, although the appropriate concepts will be reviewed during the Karst Geology course.

Registration: Graduate, Undergraduate or Workshop

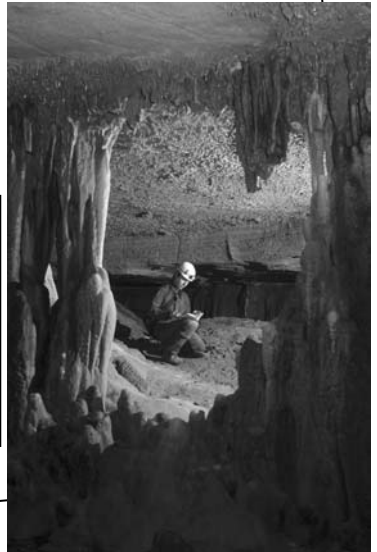
Dr. Arthur N. Palmer:

Dr. Palmer received his Ph.D. in Hydrogeology from Indiana University. He is professor of hydrology, geochemistry, and geophysics at the State University of New York at Oneonta and is Director of the Water Resources Program at that school. He is an honorary member and Science Award recipient of the National Speleological Society, and a member of the Cave Research Foundation. He has also received a lifetime achievement award from the Karst Waters Institute. He is a fellow of the Geological Society of America and a GSA award recipient for his research on cave origin. He and his wife Peggy have been involved in the geologic study of Mammoth Cave for more than 30 years. Dr. Palmer is the author of numerous publications dealing with caves and karst, including "A Geological Guide to Mammoth Cave National Park."

Photo Left:

BY MICHAEL HAYMAN, THE COURIER JOURNAL
A Cave Ecology student taking notes among the formations in White's Cave at Mammoth Cave National Park during the 2004 Karst Field Studies program. The cave is particularly rich in life.

© Courier-Journal, July 10, 2004



KARST HYDROLOGY

Bowling Green, KY

JUNE 18-22

The hydrology of karst terrains is taught from the perspective of integrated drainage basins. Discussion addresses karst landscapes, the hydrogeology of karst aquifers, caves and their importance as records of paleohydrology, karst water chemistry and its use in the analysis of flow systems, water balance, and the physical environmental problems in karst. The course deals with groundwater monitoring techniques, groundwater tracers, and the movement of contaminants through karst aquifers. Field exercises include qualitative and quantitative dye trace tests, and as microgravity, electrical resistivity, color down-hole camera, and cave radio techniques for locating caves for drilling monitoring wells in karst aquifers. A primary objective of this course is to provide "state-of-the-practice" instruction and "hands-on" experience for dealing with groundwater problems of karst regions. Most participants in the course are professional geologists and engineers employed by environmental consulting firms or government agencies who take the course as a workshop. However, undergraduate and graduate students also take the course for credit. **For more information, request our Karst Hydrology brochure.**

Registration: Undergraduate, Graduate or Workshop

Dr. William B. White:

Dr. White is a professor emeritus of geochemistry at the Pennsylvania State University. He holds a B.S. degree in chemistry from Juniata College (PA) and a Ph.D. in geochemistry from Penn State (1962). Dr. White taught an undergraduate course on caves and karst at Penn State for many years. He has supervised 18 M.S. and Ph.D. theses on karst-related subjects and has written 150 papers on karst hydrology and geomorphology. He is the author of "Geomorphology and Hydrology of Karst Terrains" co-editor of "Karst Hydrology: Concepts from the Mammoth Cave Area", and co-editor of "The Encyclopedia of Caves and Karst." Much of his hydrologic work has been in the Mammoth Cave area.

Dr. Nicholas Crawford:

Dr. Crawford is a professor in the Department of Geography and Geology and Director of the Center for Cave and Karst Studies at Western Kentucky University. He has written over 200 articles and technical reports dealing primarily with groundwater contamination of carbonate aquifers. The recipient of over 200 grants and contracts for hydrological research on environmental problems of karst regions, he was awarded Western's highest award for Outstanding Achievement in Research in 1985 and Western's Professional Public Service Award in 1996. He is a fellow and Honorary Life Member of the National Speological Society. He received the Kentucky Outstanding Geologist Award in 1998 from the American Institute of Professional Geologists. As a consultant specializing in carbonate aquifers for the past twenty-six years, Dr. Crawford has performed over 2000 dye traces and has worked on numerous groundwater contamination and other karst problems for private firms and for federal, state, and local government agencies.

EXPLORATION OF MAMMOTH CAVE

Mammoth Cave, KY
JUNE 17-23

This course is an intensive study of the discovery, exploration, and development of the caves and karst features of the Mammoth Cave region that resulted in integration of the caves into the world's longest cave system. The forces that stimulated exploration, such as saltpeter mining, regional commercialization of show caves, national park development, and scientific research are examined. Illustrated lectures, handouts, and maps are used to promote understanding of the caves prior to daily field trips. Many underground trips follow tourist trails closed long ago to the public, while other trips require strenuous walking and crawling in undeveloped passages on trips lasting 6 to 8 hours. This year the course will emphasize recent research on the history of the many regional show caves that competed with Mammoth Cave after the end of the Civil War. Usually the class repeats one of the connection routes made by previous explorers between one entrance and another in Mammoth Cave. Participants must be in good physical condition.

Registration: Undergraduate or Workshop

Dr. Stanley D. Sides:

Dr. Sides received his M.D. at the University of Missouri-Columbia with post-graduate training in Internal Medicine, Hematology, and Medical Oncology at the University of Kentucky. Dr. Sides practices Hematology and Oncology with Cape Girardeau Physician Associates of Cape Girardeau, Missouri. He is a fellow of the American College of Physicians, a Fellow of the National Speleological Society, and former president of the Cave Research Foundation. He has published numerous articles on the history of the Mammoth Cave region as well as the book "Guide to the Surface Trails of Mammoth Cave National Park."

**QUESTIONS?
CONTACT:**

The Center for Cave and Karst Studies
Department of Geography and Geology
Western Kentucky University
Bowling Green, KY 42101
(270)745-3252 (270)745-3961

CAVE GEOMICROBIOLOGY

Mammoth Cave, KY
JUNE 24-30

Microscopic organisms were the first life to evolve on our planet almost 4 billion years ago, shaping the biosphere and global environment in which we live today. Geomicrobiology is the study of the geochemical interactions between microorganisms and Earth materials, combining the techniques of microbiology, chemistry, geology and mathematics. This course is aimed at helping students understand the principles of geomicrobiology, including microbial metabolism, ecology and geochemistry, with an emphasis on cave microbiology and biogeospeleogenesis. Students will also receive hands-on training in basic principles of microbiology and microbial ecology. Participants must have at least one undergrad-level course in CHEM or GEOL.

Registration: Graduate, Undergraduate or Workshop

Dr. Hazel A. Barton:

Dr. Barton is currently the Ashland Endowed Professor of Integrative Science and Assistant Professor of Biological Science at Northern Kentucky University. She received her Ph.D. in microbiology from the University of Colorado Health Sciences Center, receiving post-doctoral training with both Dr. Norman Pace at the University of Colorado and Dr. John Roth at the University of California, Davis. She is a Fellow of the National Speleological Society and a member of the Cave Research Foundation.



COURSE FEES AND REGISTRATION PROCEDURES

Registration Procedures:

Students may enroll in as many as three courses, however, only one course can be taken for graduate or undergraduate credit. Class size is limited, and if the minimum enrollment is not met, the course will be cancelled.

A \$100 registration fee must be sent in with your registration form. Applications without it will not be processed. **This *\$100 nonrefundable deposit will be applied to the total fees for your course.** Students who have not paid fees in full or have not made other arrangements with the Center staff at least 30 days prior to the course will forfeit their place in the program.

Graduate/Undergraduate Credit: Courses are accredited through the Department of Geography and Geology, Western Kentucky University (WKU). Students receive 3 semester credit hours for each course. Students taking courses for credit will be required to complete an independent research project after completing the course. Persons taking courses for credit must remit only the registration form and the ***\$100 nonrefundable fee to the Center.** Please note that students taking a course for credit **must be enrolled at WKU, and the enrollment process for credit must be completed before registration can occur.** Please contact the Registrar's office to enroll in classes for credit. WKU will bill the students taking courses for credit. Contact the registrar's office at (270) 745-3351 for an application for admission or further information on enrollment at WKU. Note that WKU reserves the right to change tuition rates without notice.

Workshop: Students not wishing to take courses for credit may take courses for the workshop designation. Participants taking courses as workshops should remit the registration form and fees to the Center for Cave and Karst Studies.

***Continuous Education Units for Workshop Participants:** Follow the same procedures as the workshop, and **add \$20.00 to the total fees due.** Please check the designated area on the registration form.
 (*NOTE: If classes are cancelled the \$100 deposit and CEU Fee will be refunded)

COURSE FEES:	Intro to Speleology, Cave Surveying & Cartography, Karst Geology, Exploration of Mammoth Cave, Cave Geomicrobiology, <i>(Workshop Fee)</i>	Karst Hydrology <i>(Workshop Fee)</i>	Undergraduate Tuition <i>(Any Course *Except Cave Photography)</i>	Graduate Tuition <i>(Any Course *Except Exploration of MC)</i>
Ky. Resident:	\$425.00	\$895.00	\$744.00	\$978.00
Non-Resident:	\$425.00	\$895.00	\$1800.00	\$1071.00
Lab Fees:	N/A	N/A	\$100.00	\$100.00
CEU Credit:	\$20.00	\$20.00	N/A	N/A

2007 REGISTRATION FORM

Please complete this form and mail along with \$100 deposit to:

The Center for Cave and Karst Studies

Department of Geography and Geology

Western Kentucky University

1906 College Heights Blvd. #31066

Bowling Green, KY 42101-1066

PLEASE PRINT OR TYPE:

FULL NAME _____

DATE OF BIRTH _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

HOME PHONE _____

WORK PHONE _____ E-MAIL _____

METHOD OF PAYMENT

Check or Money Order: Amount Enclosed _____

(Check One)

Credit Card: **Amount Authorized:** \$100 Deposit _____ Total Workshop Fee _____

(Check One) MasterCard ___ Visa ___

Card Number _____

Expiration Date _____

Print Cardholder's Name: _____

Authorized Signature: _____

I WISH TO ENROLL IN THE FOLLOWING COURSE(S): (Check Box \checkmark)

		Undergraduate	Graduate	Workshop
JUNE 3-9	Intro to Speleology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JUNE 10-16	Cave Surveying & Cartography	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JUNE 10-16	Karst Geology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JUNE 18-22	Karst Hydrology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JUNE 17-23	Exploration of MC	<input type="checkbox"/>	N/A	<input type="checkbox"/>
JUNE 24-30	Cave Geomicrobiology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Are you seeking Continuing Education Credit? Yes _ No _

(If yes, add \$20.00 to the cost of the deposit.)

(You will be sent a form in your packet to send back)

***Note:** All participants must carry Health Insurance and must include a copy of your insurance card with registration. You must also sign a WKU Liability Waiver Form which will be sent to you with your registration information.

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