applied research and technology program

Western Kentucky University

the leading edge

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BIOTECH and BISC Professors are chosen to participate in Innovative Science Education Forum

WKU Biology Professors Chosen To Participate In Innovative Science Education Forum – Biotechnology Center meets Bioinformatics Center.
January 08, 2009
Bowling Green, Ky. - Two Western Kentucky University biology faculty members have been invited to participate in the Howard Hughes Medical Institute (HHMI) National Genomics Research Initiative.

Dr. Rodney King, associate professor of biology and director of the WKU Biotechnology Center, and Dr. Claire Rinehart, professor of biology and director of the Bioinformatics and Information Science Center (BISC), each have expertise in virology, biotechnology and bioinformatics and will use their experience to engage freshmen students in the yearlong HHMI program in scientific discovery.

Figure 1

Figure 2

Fig 1: Dr. Rodney King
Fig 2: Dr. Claire Rinehart

The genomics research program will start in the fall of 2009 and all entering freshmen who have an interest in science will have an opportunity to apply.

WKU is one of 12 college and universities selected this year to join HHMI's Science Education Alliance (SEA) which was launched last year when 12 other colleges and universities joined the group in an education experiment with an ambitious agenda -- teach science to students by involving them in scientific discovery on a national scale.

Interactive lab experiences are a key component of the WKU Biology Department curriculum and we are continually exploring new ways to engage students," Dr. King said. "We recently implemented a new curriculum, Investigative Biotechnology, which introduces student-directed, problem-based learning at the introductory level. The HHMI science education program will expand our efforts to provide opportunities for our students to become engaged in meaningful original research at the introductory level. In addition, the national scope of the program will facilitate collaboration with other scientists/educators throughout the country."

WKU's Bioinformatics and Information Science Center (BISC) also is exploring the development of a certificate and a minor in Bioinformatics, Dr. King said. This is a cross-disciplinary initiative involving the departments of Biology, Mathematics and Computer Science. One course in Bioinformatics and several in statistics and data mining have recently been introduced into the curriculum to support this initiative and there are plans to add additional courses.

"The HHMI program will help us create an introductory pipeline to research experiences that will complement our existing and planned instructional programs and allow WKU freshman to engage in the thrill of discovery," Dr. King said.

HHMI (www.hhmi.org) created the Science Education Alliance in 2007 in the hope that it would become a resource for science educators from across the nation. It allows faculty to work together to deliver innovative science education programs and bring the excitement of the doing of science directly to students in a novel, collaborative way. The Institute has committed $4 million over four years to the Alliance.

The SEA's first project is the National Genomics Research Initiative, a two-part, year-long research course offered by colleges and universities selected through a national competition. The course is aimed exclusively at beginning college students, who make real discoveries by doing research on bacterial viruses, called phage.

(Continued on Page 2)

BIOTECH and BISC — *(Continued from Page 1)*

In the first term, the students isolate colonies of phage from locally collected soil samples. Given the diversity of phage, each one is almost certain to be unique, so the students get to name their newly identified life form. They then spend the rest of the term purifying and characterizing their phage and extracting its DNA.

Between terms, the purified DNA is sent to the Joint Genome Institute-Los Alamos National Laboratory in New Mexico, where it is sequenced. In the second term, the students receive files containing their phage's DNA sequence. The students then use bioinformatics tools to analyze and annotate the DNA from their phage.

WKU and the 11 other new SEA colleges and universities were chosen from among 33 applicants. The schools, ranging from small private colleges to large research universities, will start offering the course in fall 2009. HHMI provides research and laboratory materials and the support from the SEA's director and a dedicated HHMI staff.

Another four colleges will join the Alliance as associate members. They will attend training sessions that will allow them to implement this research experience in laboratory classes on their campuses. Eventually, HHMI will select at least 36 schools to participate in the genomics research initiative as full members.

The first 12 schools, chosen in 2007, began offering the course in fall 2008. After one term of the course, many faculty who have been teaching the Alliance's innovative genomics research course to freshmen are now realizing they may never again teach science courses the same way.

"When you visit these schools, you can see that institutional transformation is occurring," said Dr. Tuajuanda Jordan, director of the SEA program at HHMI. "We have given these educators ammunition to show their colleagues that research courses are a viable way to engage students and possibly retain them in the sciences."

The new participants in the National Genome Research Initiative are: Brigham Young University, Provo, Utah; Cabrini College, Radnor, Pa.; Calvin College, Grand Rapids, Mich.; Georgia State University, Atlanta; Lehigh University, Bethlehem, Pa.; North Carolina State University, Raleigh, N.C.; St. Joseph's University, Philadelphia; University of Colorado, Boulder, Colo.; University of Montana, Missoula, Mont.; University of North Texas, Denton, Texas; University of Puerto Rico, Cayey, Puerto Rico; Western Kentucky University, Bowling Green.

The associate members are: Alabama A&M University, Normal, Ala.; City University of New York, Queen's College; Culver-Stockton College, Canton, Mo.; Virginia Commonwealth University, Richmond, Va. (A news release about the project from HHMI is available online at http://www.hhmi.org/news/20090108sea.html)

~Submitted by Dr. Claire Rinehart, BISC Director

CWRS Hosts a Water & Wastewater Technician Training Institute

According to statistics from the U.S. Department of Labor, in 2006 there were 111,000 individuals working in the water and wastewater industry. In its ten year outlook, it estimates that about 35,000 positions will become available in the industry due to the retirement of the 'baby boomers' and growth in the industry. Information gathered from other sources show a more dismal outlook. According to the 2008 State of the Industry Report, in the Journal of the AWWA, "The effects of the retiring Baby Boomer generation have been exacerbated in the water industry. Not only are older industry professionals retiring, but their younger colleagues are being lured away by higher-paying, higher-prestige jobs in consulting and other technical industries such as petroleum. Meanwhile, competition for employees entering the workforce from college and trade schools is fierce." Workforce issues, particularly the impending retirement of baby boomers and the increased competition for employees, have been in the top five concerns among water professionals surveyed over the past four years.

The looming 'brain drain' coupled with non-competitive wages, an increasing training burden, and the perception that water and wastewater operator and technician positions are professions of last resort, create a challenge acknowledged by both state regulatory agencies and the water resource professionals charged with maintaining capacity. To address the water and wastewater operator shortage anticipated over the next few years, The Center for Water Resource Studies (CWRS) and Bowling Green Community College (BGCC) of Western Kentucky University (WKU) have formed a partnership and developed an Associate Degree program. The Water & Wastewater Technician Training Institute (WTTI) was formed as the result of a collaboration between the employment sector (a growing number of water and wastewater utilities, municipalities, and districts), state primacy agencies, technical assistance providers and trade associations which have refined an industry needs driven curriculum.

About WTTI

The WTTI Steering Committee, which includes representatives from the Western Kentucky University, Center for Water Resource Studies, Bowling Green Community College, Kentucky Department of Environmental Protection (both Division of Compliance Assistance and Division of Water), Tennessee Department of Environment & Conservation, Tennessee Association of Utility Districts, Kentucky Rural Water Association, Kentucky Water & Wastewater Operators Association, Fleming Training Center, and the Kentucky/Tennessee Section of the American Water Works Association and several utilities in both Kentucky and Tennessee, has been active since January 2007. Several subcommittees have been formed including: Curriculum and Faculty Development, Recruitment and Student Success. The Curriculum and Faculty Development subcommittee met in late summer of 2007 and developed a 63-hour curriculum for the WTTI Water & Wastewater Operations Track.

A gradual and strategic elevation of the perception, both internal and external, of water and wastewater professions, through a combination of increased capacity, mobility, and accountability will be used to attract high school students whose interest and scholarly record fall between the traditional trades/vocations and academically-based professions. Partnering utilities and municipalities are developing internship and co-operative educational opportunities to ensure work-based experiences for students in the program. In addition, the trade associations have committed to developing scholarship programs to lessen the financial disincentive for potential students.

The WTTI Water & Wastewater Operations Track Associate Degree utilizes an on-line course delivery system to provide options for both traditional and non-traditional students. The on-line environment allows current operators to participate as both mentors and as students pursuing career advancement goals. According to the U.S. Department of Education, distance education is gaining in popularity. Approximately one-third of all public school districts have students enrolled in distance education courses, with the courses providing more course options to students, especially in rural areas. So, current high school students and beginning college freshmen (the Millennials) are well adapted to the on-line learning environment. In addition, 56% of all two- and four-year secondary education institutions offer on-line courses to their students. Adult (non-traditional) learners currently comprise about 44% of all U.S. post-secondary students. The flexibility and convenience of on-line classes makes these courses particularly attractive to non-traditional students.

Accredited on-line courses and degree programs equal traditional face-to-face programs in meeting students' needs, access to faculty, and interaction with other students. On-line courses offer students unparalleled flexibility with no set class schedule and no travel time. Academically, on-line courses are equally as rigorous as face-to-face classes. On-line courses also give students several advantages in their professional development: students are exposed to technology that they will use as tools in their current or future jobs, learn to manage deadlines, and play a key role in their own learning process. In addition, transcripts, certificates, and diplomas from accredited colleges and universities do not differentiate between residential and distance learning students.

WTTI Associate Degree Program

The WTTI Water & Wastewater Operations Track curriculum is built around a 21-credit-hour business core which includes Introduction to Computers, Basic Accounting, Business Communication, and Supervisory Management. The 21-credit-hour General Education requirements include Introduction to College Writing, Business & Professional Speaking, Economics, Algebra, Microbiology, Chemistry, and a Humanities course.

(Continued on Page 4)

Figure 1

Figure 1: Christal Wade, W*TTI Education Coordinator, Center for Water Resource Studies*

Figure 2: *Sceenshot of the WTTI website*

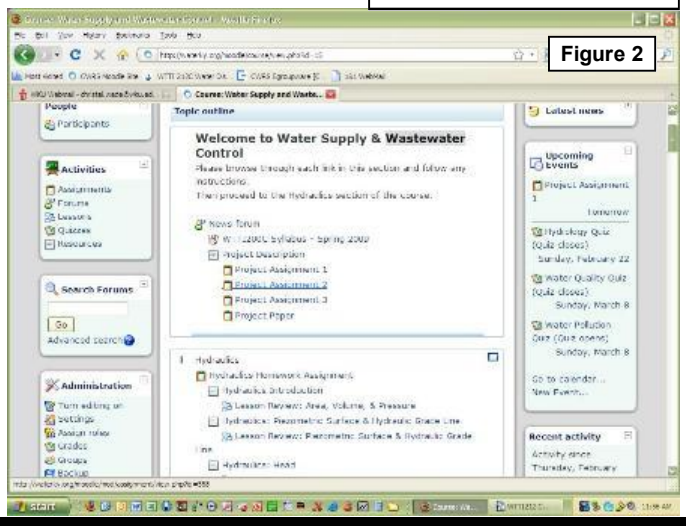

Figure 2

CWRS — *(Continued from Page 3)*

The 18-credit-hour Water & Wastewater Operations Track requirements include an introductory class in Water Supply & Wastewater Control, Water Distribution & Wastewater Collection, and Instrumentation & Control. Additional courses include Introductory and Advanced Water Treatment, Introductory and Advanced Wastewater Treatment, and Calculations and Hydraulics for both Water and Wastewater. For students already employed in the industry that may not want the Business Technology core and General Education courses, Certificate Programs that includes just the Water & Wastewater classes are being developed.

Study materials for operator certification examination are being integrated into the curriculum and Continuing Education Units are being pursued from the various certification boards as the courses are being developed. The first class in the series, Water Supply & Wastewater Control opened for enrollment during the Fall semester 2008. This class has been approved by the Kentucky Wastewater Certification Board for 36 CEUs (24 of which are process control) and is awaiting approval by the Drinking Water Certification Board. You are invited to explore the layout and content of the class. By visiting the WTTI course website at http://waterky.org/moodle and clicking on the Water Supply & Wastewater Control link, you will be allowed access to the site as a guest. Both the Water Supply & Wastewater Control and the Water Distribution & Wastewater Collection classes will be open for enrollment during the Spring 2009 semester.

Educating the Workforce

The Partnership for 21st Century Skills has developed a list of Applied Skills that are important for workers entering the workforce today as well as for seasoned employees. This list includes:

- Oral Communications – the ability to articulate thoughts and ideas clearly and effectively, and have public speaking skills
- Written Communications – the ability to write memos, letters, and complex technical reports clearly and effectively
- Diversity – the ability to learn from and work collaboratively with individuals representing diverse cultures, races, ages, gender, religions, lifestyles, and viewpoints
- Teamwork/Collaboration – the ability to build collaborative relationships with colleagues and customers, and the ability to work with diverse teams, negotiate and manage conflicts
- Critical Thinking and Problem Solving – the ability to exercise sound reasoning and analytical thinking, and to use knowledge, facts, and data to solve workplace problems
- Information Technology Application – the ability to select and use appropriate technology to accomplish a given task and apply computing skills to problem-solving
- Creativity and Innovation – the ability to demonstrate originality and inventiveness in work and to communicate new ideas to others while integrating knowledge from different disciplines
- Leadership – the ability to leverage the strengths of others to achieve common goals and to use interpersonal skills to coach and develop others
- Professional Work Ethic – the ability to demonstrate personal accountability and effective work habits such as punctuality, time and workload management
- Ethics and Social Responsibility – the ability to demonstrate integrity and ethical behavior and to act responsibly with the interests of the larger community in mind
- Lifelong Learning and Self Direction – the ability to continuously acquire new knowledge and skills and to monitor one's own learning needs

Post-secondary education is the key to acquiring the skills needed in today's workforce. As regulations in the water and wastewater industry become more stringent, operators face increased expectations in occupational and professional competencies. As a result, operators are required to take on increasing responsibilities and to understand complex regulatory issues. The WTTI Associate Degree program offers focused content, while integrating a balanced core program which allows for a more well-rounded employee and a more professional workforce. Graduates of the program are expected to possess critical-thinking skills with the foresight to recognize potential problems, and be more adaptable to change. Furthermore, the program offers the opportunity for students to enhance their communication skills, both oral and written. The ability to communicate effectively allows for a valuable interface between operators, managers, and engineers, as well as the ability to educate people outside the industry. In addition, the WTTI program holds the potential to make succession planning easier for employers. Entities that encourage operators to pursue an education and that hire educated operators have the ability to prepare and promote quality personnel from within their organization.

For more information about the Center for Water Resource Studies or the Water & Wastewater Technician Training Institute, please contact CWRS by phone at 270.745.8895 or by email at cwrs@waterky.org. More information is also available at our website at http://www.waterky.org.

~Submitted by
Christal Wade
WTTI Education Coordinator
Center for Water Resource Studies

Hoffman Institute Graduate Students Present Research in Slovenia

Western Kentucky University geoscience graduate students Brian Ham, Julie Schenck-Brown and Mark Tracy traveled to the Central European country of Slovenia to present research at the 16th International Karstological School Workshop on Karst Sediments in June 2008.

Ham (from Nashville, Tenn.), Schenck-Brown (from Gurley, Ala.) and Tracy (from Cobleskill, N.Y.) are working on master's degrees in geoscience at WKU. Their master's theses involve research on karst landscapes like those of south central Kentucky where caves and underground rivers are common, and within which water-related environmental problems are common.

The international conference is sponsored each year by the Slovenia Karst Research Institute in Postojna, one of the world's premier locations for such research.

"Scientists around the world consider Slovenia to be the classic home of karst landscapes, and some of the earliest major scientific research about them took place there," said Chris Groves, director of WKU's Hoffman Environmental Research Institute and Tracy's research advisor. "Even the term karst itself has roots in the Slovenian language."

Travel was made possible by grants received by the students from the European Commission's 6th Framework Programme for Research and Development.

The three students gave presentations on current research during the week, in between a busy schedule of lectures from an international collection of scientists and several field excursions.

Because of the strong common interests between WKU, the Slovenian karst research group and the Mammoth Cave International Center for Science and Learning, an active cooperative relationship is evolving.

This trip follows a visit by Dr. Martin Knez to WKU in 2007 and by 14 WKU students and faculty who visited the Slovenia Research Institute earlier this June as part of a study abroad trip to the Eastern Mediterranean region led by Geography and Geology Department Head Dr. David Keeling.

"These students have a wonderful opportunity to present their research in one of the most spectacular karst areas on the planet," Dr. Keeling said. "A key goal of the Hoffman Institute and of the department is to engage students in communities other than their own, and this visit to Slovenia continues the tradition of supporting students to participate in conferences and field research around the world."

~Dr. Chris Groves
Director
Hoffman Environmental Research Institute
~Published
June 16, 2008
WKU News and Events

Figure 1: Brian Ham, Mark Tracy and Brandon Taylor in Slovenia showing off the flag.

Figure 2: Brian Ham, Mark Tracy and Brandon Taylor on a train in Slovenia.

Figure 1

Figure 2

Hoffman Institute Sponsors Project for Faculty and Students to Analyze Community in Columbia

Faculty and students from Western Kentucky University's Department of Geography and Geology spent 10 days in Colombia studying community change in Medellín in July 2008.

Department Head Dr. David Keeling is the lead investigator for the American Geographical Society's Bowman Expedition to Colombia, now ending its first full year of analysis. This project is in part sponsored by WKU's Hoffman Environmental Research Institute. The Hoffman Institute (http://hoffman.wku.edu/), supported by the Ogden College of Science and Engineering's Applied Research and Technology Program (ARTP) and directed by Dr. Chris Groves, has research projects in China, England, Nigeria and Slovenia. This latest project in Colombia is in partnership with the American Geographical Society (www.amergeog.org) and has been designated the "Bowman Expedition to Colombia."

The AGS Bowman Expeditions were established in 2005 as part of the Society's broader goal of combating geographic ignorance in all sectors of society. The Bowman Expedition to Colombia is the third of these projects, following successful research in Mexico and the Antilles.

With full funding, the AGS would send a geography professor and two or three graduate students to every country in the world for a full semester each year, with teams rotating on a five-year cycle so that each country could be understood by five separate teams. Each team would collect open source GIS data and conduct one research project of the investigator's choice.

Accompanying Dr. Keeling to Medellín were History Instructor John Dizgun and Brian Blickenstaff of Claremont, Calif., a Southern Mississippi University geography graduate student, as well as researchers from the WKU-GEOSCIRE Research Center in Bogotá.

Dr. Jerry Dobson, professor of geography at Kansas University and president of the American Geographical Society, along with Dr. Geoff Demarest from the Foreign Military Studies Office at Ft. Leavenworth, Kan., also joined the WKU team in the field. The research team met with the mayor of Medellín, government officials in planning, housing, security, transportation, and reconstruction, and with neighborhood leaders in Comuna 13.

The goal of the Medellín project is to create a virtual geographic and historical Atlas of Comuna 13, a neighborhood in the city afflicted by terrible violence over the past 20 years. During the late 1980s and early 1990s, a period when narcotraffickers such as the infamous Pablo Escobar terrorized the city, murder rates in the neighborhood of Comuna 13 soared past 400 per 100,000 inhabitants (the world average is eight per 100,000).

After the death of Escobar in 1993, paramilitary gangs and guerilla groups like the FARC (Armed Revolutionary Forces of Colombia), ELN and CAP, among others, seized control of the community and murder rates again soared. An alliance of national police, military and local security forces finally broke these groups' stranglehold on the neighborhood with a series of operations in 2001 and 2002, culminating in Operation Orion.

Since 2003, the neighborhood of Comuna 13 in Medellín has enjoyed a minor renaissance, with enhanced security through local policing, new schools and medical clinics, a community library, and other infrastructural improvements. The WKU-led AGS project in Medellín will assess these changes in the context of the neighborhood's geography and history, with the goal of producing the virtual atlas and several academic journal articles.

More information about the project is available online at www.amergeog.org/bowman-colombia.htm.

~Dr. Chris Groves
Director
Hoffman Environmental Research Institute
~Published
July 21, 2008
WKU News and Events

Pictured: ***The team going on the Bowman Expedition to Columbia:*** *(Left to Right)* David Keeling, WKU Department of Geography and Geology Dept. Head; John Dizgun a History Instructor; Brian Blickenstaff of Claremont Calif, a Southern Mississippi University Geography Graduate Student; Dr. Jerry Dobson, Professor of Geography at Kansas University and President of AGS; Dr. Geoff Demarest, Foreign Military Studies Office at Ft. Leavenworth, Kansas.

HERI and ICSET Join Forces to Address Public Health Issues in China

Dr. Groves, Director of the Hoffman Environmental Research Institute and Dr. Pan, who directs WKU's Institute for Combustion Science and Environmental Technology (ICSET), both part of Ogden College's Applied Research and Technology Program, have been collaborating for just over a year on the China Environmental Health Project (CEHP), with major support from the U.S. Agency for International Development (USAID) and the ENVIRON Foundation. USAID support was made possible by Sen. Mitch McConnell (R-Ky.).

The purpose of the CEHP is to develop US-Chinese University partnerships to enhance the quality of public health in China by building sustainable capacity through the engagement of Chinese scientists, students, local governments, and citizens in hands-on training.

To enhance the implementation of solutions to the complex environmentally-related public health problems of southwest China, two workshops addressing water and air quality issues were held in September 2008.

The Hoffman Institute presented the *Current Technology in Groundwater Monitoring and Tracing Workshop* at Southwest University of China in Chongqing, for provincial scientists and environmental officials of Yunnan and Guangxi Provinces, as well as Chinese students from several universities.

The second workshop of its kind, it complimented last year's by offering more applied technology with an emphasis in dye tracing and was delivered jointly by CEHP staff and Chinese students and scientists who have participated in CEHP training over the first two years of the Project.

The second workshop *Air Emissions and Air Quality* was held at Anhui University of Science and Technology in Huainan City, China. The workshop directly addressed goals of the CEHP by building and enhancing Chinese university partnerships to improve public health in China by focusing on impacts of coal combustion on air quality. WKU's China Environmental Health Project is filling an urgent need in China to enhance scientific capacity to measure coal emissions, which are the leading cause of respiratory illnesses and a growing source of ecological harm within China and beyond. The workshop was attended by over 300 Chinese scientists and students and included tours of the Huainan Environmental Automatic Monitoring Center and Pingwei Power Plant.

For more information, visit the China Environmental Health Project website at www.wku.edu/cehp/ or contact Chris Groves at (270) 745-5201 or chris.groves@wku.edu.

~Dr. Chris Groves, Director, The Hoffman Institute
~Dr. Wei-Ping Pan, Director, ICSET

Figure 1

Figure 2

Figure 3

Figure 4

Figure 1: Dr. Chris Groves with the SWU workshop group
Figure 2: Priscilla Baker, Laboratory Manager from The Hoffman Institute demonstrates how to calibrate a pH meter to the CEHP Workshop participants
Figure 3: Priscilla Baker instructing a workshop participant how to use the Spectrophotometer
Figure 4: Workshop participant injecting dye receptor

Hoffman Director is Appointed To Board of U.N. Karst Program

Dr. Chris Groves, Director of the Hoffman Environmental Research Institute

Bowling Green, Ky. - Dr. Chris Groves, geography professor and director of Western Kentucky University's Hoffman Environmental Research Institute, was appointed this week to the Governing Board of the International Research Center for Caves and Karst (IRCK), recently established by the United Nations Educational, Scientific, and Cultural Organization (UNESCO).

In December, Dr. Groves will attend the IRCK opening ceremony and the Governing Board's first assembly in Guilin, China. The invitation to this position from the IRCK and UNESCO scientific leadership cited Dr. Groves' "outstanding achievements … in geosciences and … contributions to international scientific organizations." The appointment will run for six years, through 2014.

The IRCK was established in October 2007 at the 34th Session of the UNESCO General Conference in Paris, France. The principal goals of the IRCK are to promote international cooperation in advanced scientific research on karst dynamics, monitoring and modeling, and to use this information to develop strategies for the sustainable development of karst regions. It has been estimated that more than a billion people rely on karst aquifers for drinking water, and many of these are in developing countries.

Dr. Groves has been active in the international karst scientific community for many years, having participated since 1995 in three scientific programs under the auspices of UNESCO's International Geoscience Program and the International Union of Geological Sciences. He has one remaining year of a five-year appointment as Project Leader of the most recent of these, "Global Study of Karst Aquifers and Water Resources."

"Dr. Groves has been a leader for many years in expanding WKU's international reach and promoting applied research that benefits millions of people potentially," said Dr. David Keeling, head of WKU's Department of Geography and Geology. "This UNESCO appointment is well-deserved recognition of Chris' commitment to karst research and of his focus on meaningful sustainable development here in Kentucky and across the planet."

~Chris Groves, Director
Hoffman Environmental Research Institute
~Published
November 05, 2008
WKU News and Events

Check out Hoffman's website for more information: http://hoffman.wku.edu

Hoffman Environmental Research Institute

Hoffman Institute Announces the 2009 Karst Field Studies Program and Celebrates its 30th Anniversary

The 2009 Karst Field Studies program sponsored by the Hoffman Environmental Research Institute and the Mammoth Cave International Center for Science and Learning returns for the 30th year through Western Kentucky University and Mammoth Cave National Park.

The classes are offered as a series of week-long field classes focusing on cave and karst science and caving. Each class is offered for workshop, undergraduate and graduate credit and CEU credit.

The schedule for this year's program include the following:

Cave Ecology - June 6-12
Mammoth Cave, KY
Study of cave organisms and their environment including lectures and field trips observing surface and subsurface ecosystems of the Mammoth Cave System.

Exploration of Mammoth Cave—June 6-12
Mammoth Cave, KY
An intensive study and discovery of the exploration and development of the caves and karst features of the Mammoth Cave region and its history.

Karst Hydrology—June 8-12
Bowling Green, KY
A hydrological study of karst terrain addressing karst landscapes and groundwater monitoring techniques. The class includes lectures and field trips.

Karst Geology—June 14-19
Mammoth Cave, KY
The 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. The class includes lectures and field trips.

Speleology—June 14-20
Mammoth Cave, KY
This course delves into the basics of cave science that leads to insight and understanding essentials in making discoveries. The class includes lectures and extensive cave trips to tie together hydrology, geology, biology, and ecology by the use of discovery techniques.

Karst GIS—June 15-19
Bowling Green, KY
This course is an accelerated study of Geographic Information Systems (GIS) and their application towards documentation, exploration and management of cave and karst systems. This class is taught on campus at WKU.

Cave Archaeology—July 5-10
Mammoth Cave, KY
This course provides an introduction to the archaeology of caves from a broad perspective. The class includes lectures and field trips.

Cave Geomicrobiology—July 11-5, Mammoth Cave, KY
This course is an introduction to both microbiology and the types of organisms found in caves, discussing their role and their ecosystem. This course includes lectures and field trips.

~For more information contact the Karst Field Studies Coordinator at karst.field.studies@wku.edu http://caveandkarst.wku.edu

Figure 1

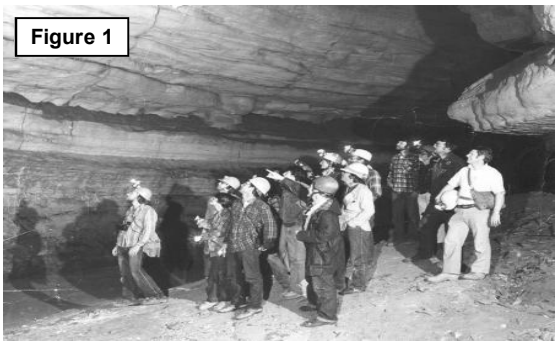

Figure 2

Figure 3

Figure 4

Figure 1: Photo taken during the 1981 Karst Field Studies Program.
Figure 2: Karst Hydrology participants and Instructors during a field exercise from the 2003 program.
Figure 3: Cave Surveying and Cartography class participants doing cave surveying during the program.
Figure 4: Participants from the 2005 Cave Ecology class.

Hoffman Institute Team Documents Longest Cave In Haiti

Bowling Green, Ky. - In December, the Haitian Ministry of Tourism invited a team from Western Kentucky University's Hoffman Environmental Research Institute to continue an ongoing cave research project started in 2007 in Port-a-Piment on the southern peninsula of Haiti.

Figure 3

The project involves assessing and documenting one of Haiti's most significant cave and karst areas, and providing management recommendations for resource protection, scientific research and touristic development.

The Hoffman Environmental Research Institute (http://hoffman.wku.edu/) is part of WKU's Applied Research and Technology Program within Ogden College of Science and Engineering.

Hoffman Institute assistant director Pat Kambesis, adjunct associate Mike Lace and WKU geoscience graduate students Ben Miller and Dan Nolfi continued work started in 2007 by the department. The team worked with local officials and representatives from the Haitian Ministry of Tourism to determine the extent and scientific significance of the cave system. During the survey of the cave, Grotte Marie-Jeanne was established as the longest cave in Haiti at 2 km, with more passages as yet undocumented. The team discovered a previously unknown lower level of the cave, which accesses the local groundwater table. This was an important find in a karst area that typically has very little surface drainage.

A cursory biologic inventory revealed a number of troblobitic organisms including millipedes, snails and pseudoscorpions that have not yet been identified. A large bat colony was also found in the lower reaches of the cave.

Additional caves were also located and documented in the Marie-Jeanne karst that are indicators of ancient sea levels and elevations of a paleo freshwater lens, both important indicators about the development of the coastal hydrology of the southern peninsula of Haiti.

Figure 2

The base map, karst feature inventory and management plans that were developed in 2007 are being updated and compiled into a research/management plan for the cave and surrounding area. The results of the team's work have already aided in the establishment of development partnerships between Haitian and Irish investors who are interested in the touristic potential of the southern peninsula.

"The Hoffman Institute's research in Haiti, which is by far the most impoverished society in the Western hemisphere, is part of the department's global outreach strategy and aims to help Haitians develop a natural resource for sustainable economic benefit," said Geography and Geology Department Head Dr. David Keeling.

"With ongoing research projects in North and South America, Asia, Africa and Europe, the department's international reach continues to grow, with substantial applied learning benefits for students."

~Written by Pat Kambesis
Assistant Director
Hoffman Environmental
Research Institute
~Published
January 08, 2009
WKU News and Events

Figure 2: Pat Kambesis, Standing inside Grotte Marie-Jeanne cave in Haiti.
Figure 3: Dan Nolfi, Pat Kambesis and Ben Miller holding the Big Red Towel in front of a sea cave at Port-à-Piment in Haiti

ICSET: Circulating Fluidized-Bed System (CFB)

The Combustion Laboratory at Western Kentucky University (WKU) has been awarded a two million dollar grant from the U.S. Department of energy for their project "Establishment of an Environmental Control Technology Laboratory with a Circulating Fluidized Bed Combustion System." The grant was awarded in open competition throughout the U.S. under the Broad-based Agency Solicitation Program (Solicitation No. DE-PS26-02NT41613). This is the largest grant ever received by ICSET. The final reports and testing ended 5/31/08.

Benefits

- Performs a wide variety of combustion tests using a wide range of fuels (high-sulfur coals, low-rank coals, MSW, agricultural waste, and RDF) under varying co-firing conditions to analyze and monitor air pollutant emissions；Performs multi-pollutants control studies to find out synergistic effects of control methods. Provides scientific data for atmospheric pollutants and the methodologies required to reduce pollutant emissions.
- Integration with a selective catalytic reduction (SCR) slipstream unit will allow the effect of flue gas composition, including trace metals, on the performance of the SCR catalyst to be investigated. A flue gas desulfurization (FGD) slipstream will allow the effects of multi-pollutants control of SO_x, mercury re-emission and multi-trace-metals to be studied.
- Modification of the bench-scale CFBC system will allow advanced combustion technologies such as "chemical looping" and "oxygen-enhanced" combustion, to be investigated.
- "Chemical looping" is a process by which the combustion of a hydrocarbon occurs in two stages. In the first stage, air is used to oxidize a metal "carrier" to a metal oxide "carrier, and in the second stage, the metal oxide "carrier" is used to oxidize a fuel as it is reduced to its original metal "carrier" form. Studies, for this first stage of the process, will focus on utilization of solid fuels or liquid fuels, which are rich in resources but not easily integrated into this advanced system. Studies, for the second stage of process, will focus on the development of cooper-based oxygen carrier, which has been verified to be favored in thermodynamics equilibrium (CO_2 purity), energy transfer (mild exothermic reaction) and kinetics. Canada EnCana has been cooperative with ICSET for the development of bitumen-fueled chemical looping steam generation technology in oil shale extraction.
- "Oxygen-enhanced" combustion occurs in a gas mixture of oxygen and recycled carbon dioxide. The carbon dioxide functions as a heat sink for combustion, much like the nitrogen in air, but produces a flue gas that is made up of carbon dioxide and water vapor. Removal of the water vapor results in a sequestration-ready, concentrated carbon dioxide stream. Studies will focus on combustion performance control, evaluation of corrosion-resistance performance of system material, heat transfer capability and properties of fly ahs and air pollutants under high CO_2 atmosphere.
- Modification of the bench-scale CFBC system will allow advanced circulating fluidized bed gasification technologies such as "chemical looping gasification" and "quasi-heat-carrying cyclic co-gasification", to be investigated.

~Submitted by
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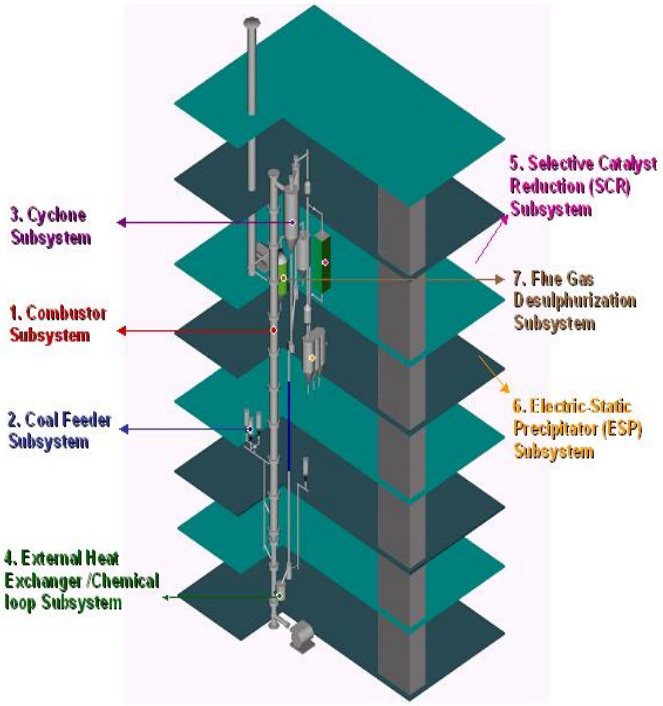

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