Western Kentucky University

the leading edge

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CWRS Develops and Maintains KyWARN Website.

The Center for Water Resource Studies has the task of developing and maintaining the KyWARN site. The committee is made up of leaders in the water community and state agencies who have joined together to create the Kentucky Water/ Wastewater Response Network otherwise known as KyWARN. This site is a resource to utility companies in a time of emergency. It cuts through the red tape and makes solutions available. The mission of KyWARN is to support and promote statewide emergency preparedness, disaster response, and mutual assistance matters for public and private water and wastewater utilities. It does this by providing its members with emergency planning, response and recovery information before, during and after an emergency. WARN systems are growing and this will make it easier to provide mutual aid to other states as needed. The major part of the site is the emergency equipment database that matches utility resources to a member's needs during an emergency. A member can locate emergency equipment (pumps, generators, chlorinators, evacuators, etc.) and trained personnel (eg. treatment plant operators) that they may need in an emergency.

KyWARN will provide a standard omnibus mutual assistance agreement and process for sharing emergency resources among members statewide, the resources to respond and recover more quickly from a disaster, a mutual assistance program consistent with other statewide mutual aid programs, a forum for developing and maintaining emergency contacts and relationships, and new ideas from lessons learned in disasters.

There are two sides to this Web site. The public side is open to anyone to view which gives you basic information about KyWARN and how to join. The second side, the resource database, is only open to members who have signed the agreement. It is a free service that is available to all water/ wastewater utilities.

~Submitted by Rebecca Humphrey Center for Water Resource Studies, Andrew Ernest, Director

BIOD & BIOTECH: WKU and University of Nairobi cooperate to expand service learning and research opportunities in Kenya

Figure 1: John Lamon surveying the baskets in Kenya.
Figure 2: Surveying of the small businesses in Kenya.

Figure 1

Figure 2

Figure 3

John Lamon is standing under a giant baobab tree, surrounded by baskets and the object of attention of the fifty or so women in the Makwasinyi basket cooperative. The look on his face is of complete puzzlement—'how do I ever choose?' he asks. John is the President of the WKU SIFE (Students in Free Enterprise) chapter, and one of the latest student participants in the multidisciplinary WKU-University of Nairobi (UoN) initiative to involve students in research and service learning in one of the world's most spectacular areas, the wildlife rich Tsavo National Park region in Kenya. He has the unenviable task of choosing about 30 of the most marketable of the 200 or so baskets brought to the site by the hopeful artisans. SIFE is developing a marketing program for the baskets handmade by women in the poverty-stricken villages surrounding our research site. To date, the WKU Department of Biology has sold baskets in the U.S. as a good-will gesture to assist these villages. The proceeds have been used to purchase grain or to pay for school for the large number of orphans in these villages. SIFE will expand this program dramatically, with a target of 5,000 baskets per year sold in the U.S., which could support school fees for some 200 children in the seven villages of the Kasigau location. Involving students in hands-on learning through community service is called service learning, and is a focus for the Ogden College of Science and Engineering and the Applied Research and Technology Program in particular, and an emphasis for WKU.

The Kenyan initiative is led by two ARTP Centers, the Department of Biology's Centers for Biodiversity Studies and Biotechnology. Now in its fourth year, the initiative also includes WKU's Sociology Department, the Gordon Ford College of Business's Center for Entrepreneurship and Innovation, and our partners in Kenya: the University of Nairobi's Faculty of Veterinary Medicine, the village communities in the Kasigau location, and the Kenyan Wildlife Service.

The Kasigau location is in the Taita-Taveta District (the equivalent of a state in the U.S.) in Southeastern Kenya. In this semi-arid area, the Taita people struggle for daily survival with poor crops, few jobs, and a great deal of conflict with the wildlife common in the area. In the field, the WKU-UoN initiative is realized in the African Centre for Biodiversity and Conservation, our field research site located on the 52,000-acre Maungu ranch. The ranch, and our field site is located on the border of Tsavo West National Park, in a migration route for wildlife traveling between Tsavo West and Tsavo East Parks or traveling to Kasigau mountain to take advantage of the water and green vegetation to be found there during dry season. Kasigau mountain rises some 1,000 meters above the surrounding dry plains and is the dominant feature of the landscape. It is a disjunctive peak of the Taita Hills, which are the northernmost extension of the Eastern Arc Mountains, one of 25 recognized global 'biodiversity hotspots'. This area is famous for its large game and also for its spectacular bird diversity. It is within this context that WKU students and faculty and their partners from UoN work each summer.

It is yet another beautiful day as we begin to roll up camp, and Natalie Mountjoy is already having withdrawal symptoms. Natalie is a graduate student in the WKU Biology Department, and this is her fourth and last trip to the African Center for Biodiversity and Conservation. Natalie has just completed data collection for her thesis, which is exciting, but the thought of not returning is depressing--we see this in students frequently, they fall in love

BIOD & BIOTECH: WKU and University of Nairobi cooperate to expand service ...*(continued from page 2)*

With Kenya. Natalie is perhaps the most ambitious thesis project the Biology Department has produced. She is completing a three-phase evaluation of the ecotourism potential in the Kasigau location. Ecotourism is one of the two largest sources of foreign currency for Kenya, but any threat to Kenya's wildlife is also a threat to this vital industry. With a reduction of wildlife of some 50% over the last 30 years, loss of this income is a real possibility. One of the major threats to Kenya's wildlife is poaching, which often takes the form of snaring (trapping with a simple wire loop). There have been many reports of the meat from illegally taken animals (bushmeat) ending up in butcheries and restaurants. An area with an active bushmeat trade is unlikely to be ideal for ecotourism. Also necessary for successful ecotourism is support of the local communities. Natalie has completed a survey of local butcheries, using DNA analysis to determine the species of meat sold there. She has also surveyed nearly 500 local women on community attitudes towards wildlife, bushmeat, tourists, and ecotourism as a future source of income. She has also trekked more than 130 km through the bush in three weeks to survey wildlife in the area for planning and zoning ecotourism activities. Her work represents a unique approach to community development, and when she gave a presentation on her work at the international Society for Conservation Biology meetings in South Africa in June, she lectured to a standing room only audience.

Dr. Jerry Daday of the WKU Sociology Department has been an invaluable asset to designing and conducting wildlife-related community surveys in the villages of Kasigau. Following an exploratory trip last year, he is now enthusiastically dedicated to his own research program in Kenya. This summer, he collected data on the first of what he envisions as many sociological research projects in Kenya. Jerry and his student, Leslie Abell, are investigating the role of small business in the communities, estimating the economic impact of small businesses and determining whether the area is suitable for a micro lending project. To put these businesses into context, the owners earn less than three dollars a day. The amount of money necessary to pay for a year of secondary school is about 400 dollars a year. In Kentucky, we say 'Education Pays', but we are fortunate to live in a place where secondary education is free, and post-secondary education is within reach of most young people. In Kasigau, the primary schools are mud brick structures with no windows, and despite a real thirst for education, few can afford it. An understanding of the penetration of businesses into the life of the community will help in economic planning for future startups and expansion of existing businesses.

These and other students and faculty return each evening to our research camp, which consists of 15 tent sites surrounding a cooking area and shower/toilet block. For those who have never had the luxury of an extended stay in a truly remote area, this is an experience that stays with you for a lifetime. Here, the Milky Way extends from horizon to horizon, and the starscape is dominated by the Southern Cross, not the Northern Star. Lions and hyenas provide the musical accompaniment to the stellar visual display. For those leaving camp early in the morning, an encounter with family groups of the 60 or so elephants that wander around (and through, if we aren't there) camp is a given. They may also see gazelles, dikdik, ostrich, cheetah, impala, baboons and a host of other wildlife. The dedicated birdwatcher may add a hundred species to her life list in just a few days, ranging from the spectacularly large kori bustard, the heaviest flying bird in Africa, to spectacularly colored sunbirds and turacos. To cap off the experience, literally, on a clear day Mt. Kilimanjaro can be seen dominating the southwestern sky. Our students provide real assistance to local communities, learn about the way most of the world lives and learn to conduct scientifically, socially and economically relevant research in a spectacular setting unique to WKU.

Such an enterprise is not inexpensive. Our faculty are constantly involved in grant writing to support the project, and invaluable support comes from the OCSE ARTP, the Departments of Biology and Sociology, and SIFE. This year, the Bowling Green Rotary Club sponsored school fees for six children in the Kasigau region, and local businesses and individuals donated clothing and school supplies to the widows and orphans groups in the villages. Next summer, the Biology Department will expand on our service learning efforts by staffing local clinics with WKU pre-medical students and faculty as well as volunteer physicians from Bowling Green and their counterparts from the University of Nairobi in what will be a singular and transformative experience for the students chosen to participate. The generosity of these organizations and individuals is a wonderful example for our students. We continue to actively seek funding, including endowments, to support these learning activities for our students, and support of the communities that host us. Should anyone have any questions about our projects, we love to talk about them. You can contact Dr. Michael Stokes at Michael.Stokes@wku.edu, or Dr. Jerry Daday at Jerry.Daday@wku.edu.

~written by Michael Stokes
photos by Cheryl Kirby-Stokes and Maggie Mahan

"The Kenyan initiative is led by two ARTP Centers, the Department of Biology's Centers for Biodiversity Studies and Biotechnology."

Figure 4: Surveying the wildlife in Kenya.

Figure 4

Student Research on the Rise in the Biotechnology Center

"The research experience these students have gained is an important preparation for their future careers"

During the 2006-2007 academic year a record 79 students were actively involved with the Biotechnology Center. While some students were just beginning their research projects, others were able to publish their results in peer-reviewed scientific journals or present them at national or international meetings.

Overall, 17 Biotechnology Center-related manuscripts were accepted for publication and 44 student presentations were held at scientific meetings. For example, the undergraduate Mark King and the graduate student Soleil Archila published an article in the journal *Biochemical and Biophysical Research Communications* together with their advisor Dr. Nancy Rice and a collaborator. The undergraduate Daniel Starnes published an article in the journal *Environmental Pollution* together with his advisors Dr. Shivendra Sahi and Dr. Nilesh Sharma. The graduate student Tia Hughes of Dr. Jeffrey Marcus's lab presented her research at the *7th International Workshop on Molecular Biology and Genetics of the Lepidoptera* in Kolympari on the island of Crete, Greece, and the undergraduate Mannie Webb of Dr. Michael Smith's lab presented her results at the *152nd Meeting of the Acoustical Society of America* in Honolulu, Hawaii.

The research experience these students have gained is an important preparation for their future careers; nine of these students are entering Ph.D. programs this fall and five are accepted to medical or dental school.

Current undergraduate researchers at the Biotechnology Center have also been aided this summer by the new BSURE or "Biology Summer Undergraduate Research Experience" program sponsored by the Department of Biology at WKU. This program supports undergraduates with stipends or supply funds. The participants will be presenting their summer research results at a poster session on September 7th in the Biology Department.

~Submitted by Sigrid Jacobshagen, Director, Biotechnology Center, (New Director - Rodney King)

Figure 1

Figure 1: Dr. Jeffrey Marcus (far right) with his students (from right) Tia Hughes, Tim Shehan, and Mollie Johnson recovering from their presentations at the *58th Annual Meeting of the Lepidopterists' Society*, July 11 to 15, 2007, in Bakersfield, CA. They are on a field trip to the Sequoia National Forest organized for participants of the meeting.

Figure 2

Figure 2: Mark King from Dr. Nancy Rice's lab working on his undergraduate research project.

KCC: Teacher Workshop A Success

Enriching lives of others is a common goal between educators and the Kentucky Climate Center. That's why the Kentucky Climate Center is not just about collecting data. We're also using the Kentucky Mesonet and other technologies to further education across the Commonwealth.

While weather may be an important part of our everyday life, it rarely appears in Kentucky's classrooms. The shortage of science and math teachers across the country is affecting our state as well. Thus, in order to foster the development of enhanced, more specialized curriculum in these areas and others, the Kentucky Climate Center in conjunction with the Kentucky Geographic Alliance hosted a workshop for teachers from across Kentucky to educate the educators. The Kentucky Geographic Alliance received a $50,000 grant award from the National Geographic Society to sponsor the joint workshop.

"Our schools are not graduating enough students to meet growing opportunities in the scientific and technical job market," said Dr. Stuart Foster, director of the Climate Center. "We hope that this workshop will help teachers find ways to get kids excited about science and math as they develop essential skills and concepts."

The workshop, created and administered by education outreach specialist, Scott Dobler, ran the week of June 18-22. For these five days, eleven teachers were introduced to weather monitoring equipment used in the Kentucky Mesonet, methods of climatology, and were encouraged to develop lesson plans they could take back to use in the classroom.

Mesonet data is not only relevant to math and science; Mr. Dobler encouraged teachers to find relevance in many different fields. "Geography and the Mesonet data are able to integrate into many different subjects. During our workshop, we've encouraged teachers to consider lessons in all content areas, like math, social studies, language arts, and practical living," said Dobler.

"This is a great asset to local teachers," said Logan County teacher Vicky Mathis. "These are things we can actually use." Mathis, an 8th grade science teacher, had been searching for a way to incorporate math and geography into her lessons. "This is a great resource. Everyone should get involved."

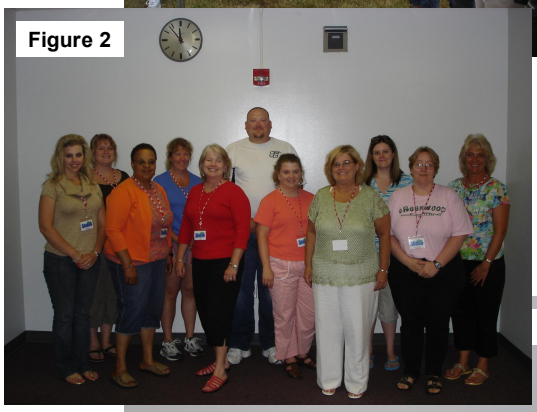
The workshop is not just for teachers in Ms. Mathis' grade level, however. All levels of Kentucky's public school system were represented. "We have teachers from 1st grade to high school, and we've all found ways to adapt the information to our grade level and subject matter," said Donna Howell, a teacher from McLean County.

The workshop also included a visit to the Western Kentucky University Farm for an up close look at the first of many Kentucky Mesonet stations. The participants were introduced to the program, and engaged in a Q & A session with Stephen Struebig, one of the Kentucky Mesonet's meteorology technicians.

Dr. Foster is encouraged to see how teachers are using the Mesonet to develop lesson plans for K-12 students. "As teachers use the Mesonet to get children excited about learning, particularly in areas of science and math, Kentucky will benefit from the Mesonet for years to come."

~Submitted by Stuart Foster, Director, Kentucky Climate Center

Figure 1: Dr. Stuart Foster giving a lecture on instrumentation of a Mesonet tower.
Figure 2: The eleven attendees pose for a group shot.
Figure 3: Mesonet Technician, Stephen Struebig, demonstrates a wind shield at the WKU farm site.
Figure 4: The attendees of the workshop develop lesson plans in one of Western's computer labs.



Hoffman Institute Holds a One Week Training Workshop in China

Figure 1

Figure 2

Figure 3

Figure 1: Undergraduate students attend Nico Goldscheider's presentation *Microbial contamination of drinking water – problems & solutions.* Dr. Goldscheider joined the workshop faculty from the University of Neuchatel, Switzerland.
Figure 2: Graduate students attend a workshop presentation.
Figure 3: Priscilla Baker, Yang Pingheng, and Liu Xian install charcoal receptors at a spring in Qing Muguan valley as part of a groundwater investigation.

In October of 2007 the Hoffman Institute held a one week training workshop, *Current Technology in Karst Hydrology and Water Resources,* at Southwest University of China (SWUC), for graduate and undergraduate students. This workshop was a key component of the China Environmental Health Project, a project in partnership with the United States Agency for International Development, and the ENVIRON Foundation.

The workshop was designed to train China's future scientists and professionals in the most advanced karst and water research techniques available, in order to develop China's capacity to improve water availability and quality for human and environmental health. Millions of people that live in the karst region of Southwest China do not currently have reliable access to clean drinking water.

Hoffman Director Chris Groves and staff member Priscilla Baker traveled to Southwest University in Beibei, to organize and teach at the workshop. Workshop faculty included several of the world's top experts in karst geology and hydrology, and included scientists from the US, Europe, and China. Building upon a foundation of instruction in intensive hydrology, geology and water resources, the workshop strongly emphasized applying technology and research abilities to solving water quality questions and problems.

Applied instruction included: Groundwater tracing techniques, with special emphasis on dye tracing; Analytical measurements of heavy metals; Experimental design and Quality Assurance/Quality Control; Social Science applications; working with local people, respecting and utilizing their knowledge and abilities

WKU chemistry professors Cathleen Webb and Eric Conte joined the faculty, and used their expertise to instruct the graduate students in measurement of heavy metals, gas chromatography, and experimental design.

The course included a field trip to the nearby karst valley of Qing Muguan for a demonstration dye-trace of the underground stream in the valley. It also included a demonstration of the new spectrofluorophotometry lab, recently installed as another part of the China Environmental Health Project. The lab was set-up by Rick Fowler of WKU's Waters Lab.

The one-week workshop trained 40 graduate students, 5 professional provincial Chinese scientists, and more than 200 undergraduate students.

The workshop faculty felt very welcome in China, and were greeted by Southwest University's president, and the dean of the School of Geographical Sciences. We greatly enjoyed experiencing Chinese culture and seeing the landscape-bamboo forests and all. We tried new and sometimes intimidating foods, including the region's famous Huo Guo (Hot Pot) dishes.

-Submitted by
Priscilla Baker
Crawford Hydrology Laboratory Manager
Hoffman Environmental Research Institute

Hoffman Institute Assists Nigerian Government With Cave Protection And Tourism Development

Bowling Green, Ky. - A joint Western Kentucky University folk studies/geography team recently returned from Nigeria in a project to study and help protect cave systems and develop tourism in the country's rural southeast.

The WKU group, led by Folk Studies Associate Professor JAK Njoku, is cooperating with Nigeria's National Commission on Museums and Monuments to explore and document several caves, including the Ancient Cave Temple Complex of Arockuwu, in Abia State near Nigeria's border with Cameroon.

Dr. Njoku was joined by Chris Groves and Pat Kambesis of the Hoffman Environmental Research Institute within WKU's Applied Research and Technology Program. An important goal of the group's effort is to gather documentation on the cave and its history of utilization to support an application, in collaboration with the Nigerian government, to protect the site under the auspices of the United Nations' (UNESCO) World Heritage Program.

Dr. Njoku, whose research documents routes by which Africans were brought from the Nigerian interior to the coast as they were sent into slavery, learned in 2004 about the Arockuwu Cave Temple Complex. The complex contains the "River of Blood," and thousands of Africans may have been hidden within the cave on the way to be sold into slavery. Unfortunately, after reaching the small village near the cave after a 10-hour drive from the country's capital, the tribal king there told the group that due to considerations of traditions following several deaths in the village in the days preceding the visit, a trip to the cave was not possible at the moment and the group was invited to return at another time.

The group then explored another cave in the region, called the House of God, which had beautiful natural bridges, large bats and, according to the local tribal chief who led the group to the cave, a giant python that fortunately did not appear during the visit. The group also learned that during the Nigerian (Biafran) Civil War in the late 1960s, thousands of local residents hid in the caves there for protection.

(continued on Page 8)

Figure 1

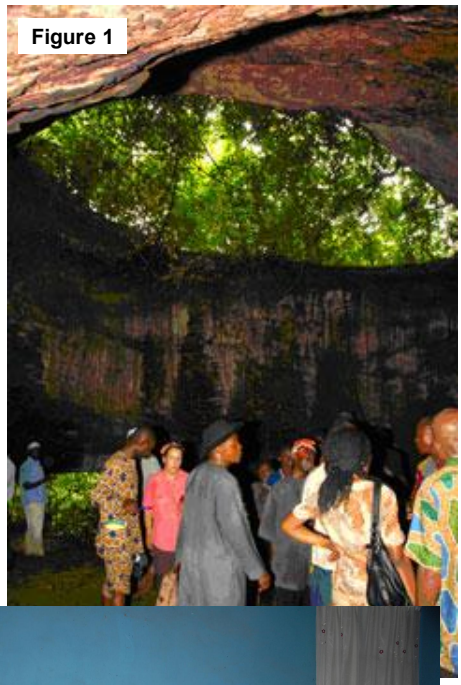


Figure 2

Figure 4

Figure 3

Figure 1: WKU's Pat Kambesis with Nigerian colleagues in a section of the "House of God" cave complex. (photo by Chris Groves).
Figure 2: The WKU team meets with tribal and government officials to obtain permission to visit a field site..
Figure 3: The WKU team and Nigerian colleagues pose in Arockuwu (photo by an unnamed village resident).
Figure 4: Pat Kambesis and colleagues hiking to a site in Abia State.

Hoffman Institute Assists Nigerian Government With Cave Protection ..... *(Continued from page 7)*

Figure 5

Figure 6

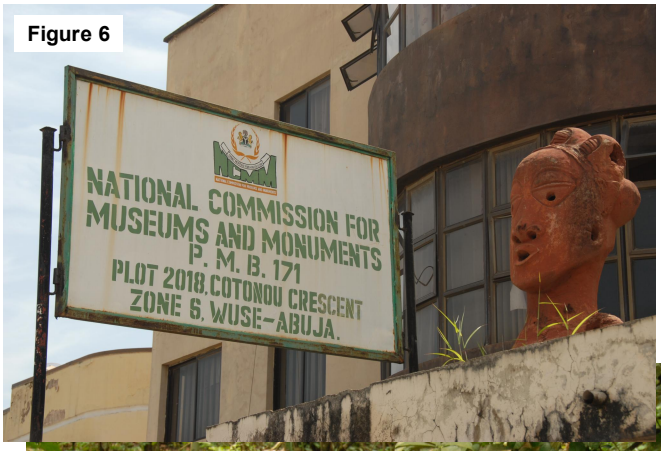


Figure 7

The WKU team was organized last year after Dr. Renae Speck of WKU's Office of Sponsored Programs (OSP) recognized the potential synergy between Dr. Njoku and the Hoffman Institute within the Department of Geography and Geology, whose members have extensive international experience in the mapping and resource evaluation of significant cave systems, as well as experience with UNESCO scientific programs.

The goals of the current phase of the effort are to enhance existing relations between WKU and various national, state and local Nigerian government and tribal entities, as well as with local residents in the vicinity of the Cave Temple Complex, and to gather sufficient information to apply to external funding agencies for support of a major joint US/ Nigerian expedition to survey and document the site in preparation for application to UNESCO for "World Heritage" status.

Dr. David Keeling, Geography and Geology Department Head, noted that "collaboration with colleagues in other disciplines is an important element of the department's international initiatives. Very few problems or challenges facing contemporary societies can be addressed by a single discipline. Partnering with Folk Studies on this project in Nigeria brings fresh perspectives to the various approaches used to evaluate the physical and cultural properties of the cave system."

~WKU News and Events , Nov. 19, 2007
Original Photos and story submitted by Chris Groves, Director, Hoffman Environmental Research Institute

Figure 8

Figure 5: Pat Kambesis and Professor JAK Njoku.
Figure 6: .MCMM Headquarters in the capital city of Abuja.
Figure 7: The team, with a few interested spectators, rests in the jungle near Alayi on the way to a cave site (photo by an unnamed local resident).
Figure 8: One of the entrances of the "House of God" cave complex.

ICSET: 2007 Meeting—China Environmental Health Project

On June 3, 2007, members from the China Environmental Health Project's (CEHP) Air Quality sub-group meeting and Dr. Wei-Ping Pan were led by Drs. Dong (Deputy Mayor of Huainan City) and Zhang (President of Anhui University Science Technology). The purpose was to visit two CEHP power plants (Tianjia'an and Pengwei). News of the visit was posted on the AUST news web site.

Both power plant managers provided the introduction to the plants. At each plant the mangers showed the CEHP group the sampling locations for flue gas and solid sample for this project. One of the notable features is the 350MW unit at Pengwei Power Plant that will be added next year to the wet flue gas desulphurization system (WFGD system), which absorbs SO2. The addition of this system provides a great opportunity to observe the decrease of sulfur dioxide emissions from this unit and to see the impact on the air quality. The new WFGD system already has been installed in the Tianjia'an Power Plant and the sulfur dioxide removal efficiency has reached 99.4%. This will help to improve the air quality of Huainan. This sub-group visit was important to help CEHP achieve one of the project's important goals of informing policymakers on the importance of air pollution control devices (like the WFGD system) to improve the air quality of the city.

These policymakers are aware how China's national goals of lowering SO_2 emissions have not been met. Dr. Pan gave a 60-minute lecture on the Effect of the Environment Pollution on Public Health to the Datong 3rd Elementary School (a Green School). This is the oldest elementary school in Huainan City, which is located near one of the oldest and biggest coal mining areas (the mines have been closed since 1980, but the health impacts can still be felt). News of this lecture was also posted on the web site of the Huainan Environmental Protection Agency and AUST. Of the residents in this area, 30% are unemployed and CEHP Air-Quality Team has done a health survey for this school. This is the second education lecture CEHP has provided to these students. In July the CEHP held an evening meeting with students and parents to provide the survey results and share other health information with them.

On June 4, the CEHP air quality team and Dr. Pan also participated in the 36th World Environmental Day which was held in downtown Huainan City and hosted by the City Government. The AUST green group, which was organized by Professor Cheng (AUST Co-PI for CEHP), created an information display of CEHP, acknowledging USAID support, for the residents of Huainan City.

~Submitted by
Terrill Martin
Operations Associate,
Wei-Ping Pan,
Director,
Institute for Combustion Science and Environmental Technology

Figure 1

Figure 2

Figure 3

Figure 1: On June 3, 2007, members from the China Environmental Health Project's (CEHP) Air Quality sub-group and Dr. Pan were led by Drs. Dong (Deputy Mayor of Huainan City) and Zhang (President of Anhui University Science Technology)
Figure 2: On June 4, 2007, Drs. Liu, Cheng, and Pan gave a 60-minute lecture on the Effect of the Environment Pollution on Public Health to the Datong 3rd Elementary School (A Green School).
Figure 3: On June 4, the CEHP air quality team and Pan also participated in the 36th World Environmental Day which was held in downtown Huainan City.

ICSET Co-Gasification of High Sulfur Coal with Coal-bed Methane to Produce Synthesis Gas with Adjustable H_2/CO Contents for Synthesis of Value-added Chemicals.

"ICSET has been established as a laboratory scale gasification unit with the Kentucky Governor's Office of Energy,…"

ICSET has been established as a laboratory scale gasification unit with the Kentucky Governor's Office of Energy, Eastern Kentucky Power Cooperative and Warren Rural Electric Cooperative. The gasification system has been used to develop a number of important gasification programs, including Advanced Gasification Syngas Multi-Contaminant Cleanup Technologies and Novel Gasification Concepts such as Chemical Looping Gasification and Co-Gasification Technologies. Based on the technical insights of previous and current programs, including some positive preliminary results at ICSET and requirements of Kentucky's Comprehensive Energy Strategy on CBM (coal-bed methane) utilization, a new process is proposed to economically co-gasify coal with CBM to produce synthesis gas with an adjustable H_2/CO ratio.

Additional benefits may include economical abatement of sulfur emissions and the production of the potential mercury sorbent. This process is based on some key chemical reaction mechanisms and their cooperative effects. This project has also strived to develop advanced technologies to reasonably utilize both coal and CBM sources and to reduce their environmental impact as indicated in Governor Ernie Fletcher's 2005 Comprehensive Energy Strategy.

Project Goals are as follows: (1) The concept of producing synthesis gas with a flexible H_2/CO ratio from the co-gasification of coal and CBM will be demonstrated in a modified lab-scale fluidized bed gasifier. (2) The chemical catalytic nature of Kentucky coal ash on methane reforming and partial oxidation will be charac-

Figure 1

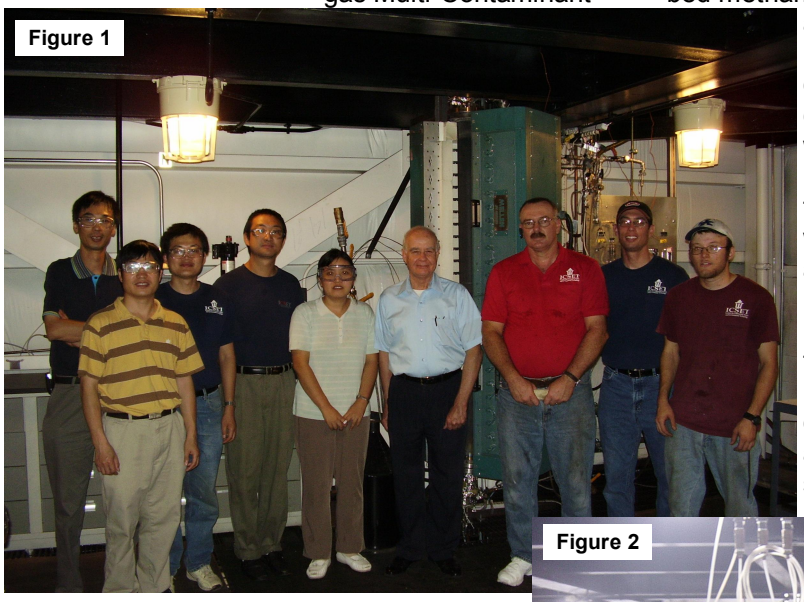


Figure 2

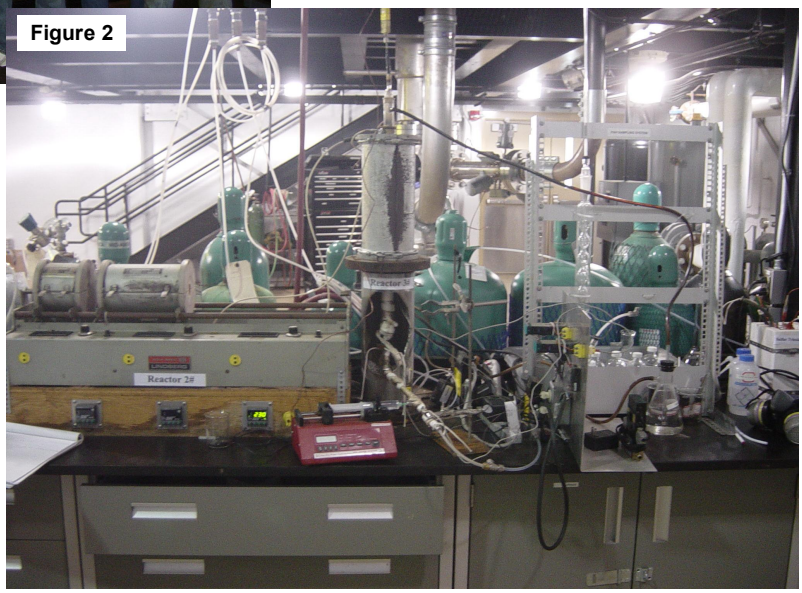


Figure 1: The team members includes Drs. Zhengyang Gao, Dr. Hong Gang Zhou, Dr. Houyin Zhao, Dr. Alice Jin, Martin Cohron, John Smith, Wendall Myers and Richie Botkin.

Figure 2: Equipment used in the co-gasification technology.

ICSET Co-Gasification of High Sulfur Coal .....

(Continued from page 10)

terized and investigated. (3) The coal sulfur occurrence and transformation in the co-gasification process will be investigated. (4) Mercury capture performance of the produced residues in the co-gasification process will be demonstrated in a lab-scale evaluation unit. (5) The process material and heat balance analysis will be set up for further successful demonstration of the overall process.

The proposed research provided a portfolio for economic and environmental utilization of Kentucky CBM and high sulfur coal to produce the feedstock of value-added chemicals. The results help to understand the catalytic nature of Kentucky coal ash and coal chars for gasification of coal and CBM, sulfur transformation; control of high sulfur Kentucky coal and mercury capture mechanism of co-gasification residues. The demonstrated co-gasification technology will not only help to preserve Kentucky's and national environmental quality, but also will open new markets for Kentuckys' coal and CBM. Dr. Yan Cao, Assistant Director for Research & Development leads this gasification team. The team member includes Drs. Zhengyang Gao, Dr. Hong Gang Zhou, Dr. Houyin Zhao, Dr. Alice Jin, Martin Cohron, John Smith, Wendall Myers and Richie Botkin.

~Submitted by Terrill Martin Operations Associate, Wei-Ping Pan, Director, Institute for Combustion Science and Environmental Technology

Figure 3 & Figure 4: Equipment used in the co-gasification technology.

Figure 3

Figure 4

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