

The Leading Edge

Agricultural Research and Education Complex

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 (October—November—December 2011)

The Agriculture Research and Education Center (AREC) is dedicated to providing research and educational experiences for our students that will enable them to be knowledgeable practitioners in the workplace as well as continuous learners throughout their future careers. Further, AREC is committed to meeting the needs of our stakeholders in the agricultural industry and related fields. To that end AREC supports projects that involve professional experiences and exposure of students and faculty.

A long-standing feature of our international program has been the exchange AREC has had with the fascinating and varied agriculture of Kentucky's Partner in the Americas, Ecuador. Dr. David Coffey has led more than 30 study abroad trips to that country. Several students traveled with him and instructor Kristie Guffey (Glasgow campus) for a January term class that studied banana, pineapple, coco and tropical livestock enterprises, among other topics. Beef production in the tropics relies on the Zebu (*Bos indicus*) bovine genetics to provide important heat tolerance and insect and disease tolerance (Fig. 1).

Exciting developments have been underway for AREC, with the addition of the florist shop at the corner of Mimosa Alley and Regent's Drive. The renovations of the facility to make it functional as both a retail establishment and design workshop/classroom for student learning are still in progress. This is an integral part of the Horticulture program. Mr. Roger Dennis (AAF, AIFD, CFD, PFCI, KMF floral designer), together with Dr. Todd Willian, Mr. Larry Kramer (AIFD floral designer) and Ms. Debbie Gabbard (WKU Floral Shop Coordinator) led a group of 14 in December 2010 to study flower, fruit and vegetable production in California (Fig. 2.). In addition, students had the unique experience of designing and building floats for the Rose Bowl Parade for New Year's Day 2011 under the tutelage of Mr. Dennis.



Figure 1: Zebu cattle in the tropical lowlands of Ecuador. (Photo courtesy of Kayla Buntin)

Figure 2: Vineyards in the Napa Valley of California. (Photo courtesy of Cortney Scott)



Figure 3: Agriculture students Whitney Churchman and Brandon Gabbard were two of over a dozen WKU students creating floats for the Rose Bowl Parade for New Year's Day 2011. (Photo courtesy of Cortney Scott)

FEATURE
 ARTICLE I

Institute for Combustion Science and Environmental Technology

The 2010 year was another good year for the Institute for Combustion Science and Environmental Technology (ICSET). ICSET continued to be a leader in combustion studies, emissions monitoring, and thermal analysis. ICSET has developed methods to measure and reduce mercury emissions from industrial settings, and these methods have been employed at more than 175 coal-fired power plants. Mercury measurement has also branched out to other areas, such as power plants using municipal waste as the fuel. A working model that demonstrates chemical looping combustion technology has also been developed. This model concentrates and captures carbon dioxide during combustion instead of post-combustion. An ammonia scrubbing technology to capture carbon dioxide has also been tested.

The Thermal Analysis Laboratory, once again, held its annual hands-on short course, which has been gaining in popularity. A total of eighteen individuals from academia, industry, and government came to ICSET to get hands-on experience with thermal analysis techniques. The TA Lab also continues to support many commercial and academic projects by finding answers to their materials questions. The work done in the TA Lab has proven very useful to the scientific community, as evidenced by one of the research papers, "Thermal Degradation Chemistry of Alkyl Quaternary Ammonium Montmorillonite", being cited 345 times.

The Institute continues to develop and strengthen relationships with governmental agencies, such as DOE and USDA, as well as with commercial companies. Currently ICSET has 2 USDA-ARS funded projects—"Evaluation of the benefit of using coal combustion byproducts for land application" and "Removal of phosphorous and endocrine disrupting chemicals in animal manure for better handling and land application using coal combustion byproducts". We also have 2 DOE funded projects—"Feasibility on process coupling of transesterification and methanol synthesis using cellulose and bio-oil" and "Novel oxygen carriers for coal-fueled chemical looping". Companies regularly call on ICSET to perform unified research projects where answers in several different areas are found and coordinated at one place.

Last year, ICSET graduated one doctoral student through the cooperative WKU-UofL chemistry program. ICSET also has a long history of successful international collaborations with scientists and engineers in China, Taiwan, Japan, and Finland. More than 150 international scientists and engineers have conducted mercury and coal combustion research at ICSET, which provides critically needed hands-on experience. A large number of students enter industry after obtaining degrees, and the project-based curricula involving the partnership of universities and utility industry provided at the institute, eases the transition and increases the probability of our young professionals' success. By partnering with utility industries, students working at ICSET are able to participate in challenging research projects associated with cutting edge technology. Additionally, through these partnerships, industries gain fresh ideas while educating a new employee pool. Cultural exchange opportunities for the visiting scholars and students

included picnics at a local farming operation, where different aspects of farming were on display, a canoe trip, and a collegiate football game.

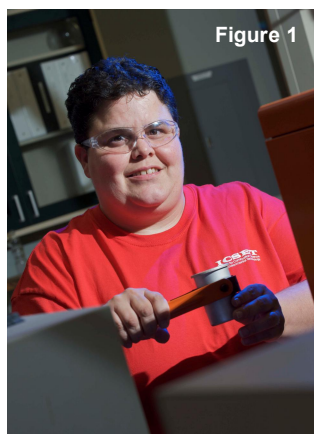


Figure 1

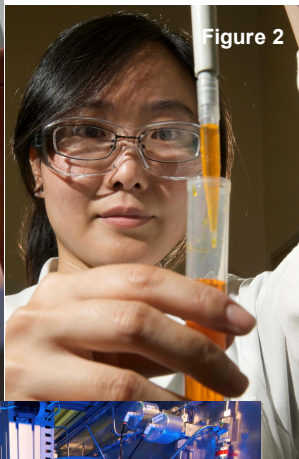


Figure 2



Figure 3

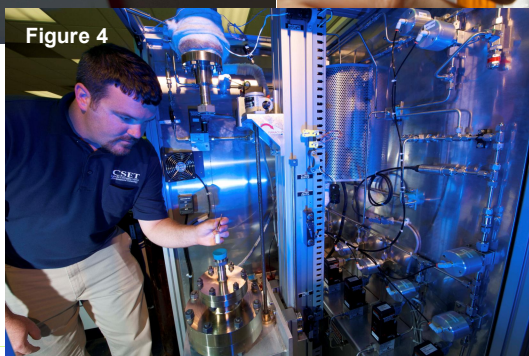


Figure 4

Figure 1: Mara Brasser, undergraduate student working under NSF-REU program for 2010 summer for project of a study of PAH in Green River.

Figure 2: Ms. Ying Wen, graduate student conducting research.

Figure 3: William Orndorff (left) holding wood pellets, and Martin Cohron (right) holding ground coal.

Figure 4: Dr. Quentin Lineberry, WKU graduate, placing a sample in a High Pressure TGA (the only instrument of its kind at an academic institution in the United States).

Photos by Joe Imel

– Applied Research In The News –

IN 'THE NEWS' WESTERN KENTUCKY UNIVERSITY

Agriculture Research and Education Complex

Director:

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- Graduate student Mr. Zheng Wang presented "Effect of Different Schedules of Baby Corn (Zea mays L.) Harvests on Baby Corn Yield, Grain Yield, and Economic Profit Value" at the American Society of Soil Science Annual Meetings in October.
- In separate but related projects, graduate students Lindsey Reynolds and Adam Thomas evaluated consumer acceptability of pork and beef products enhanced with water-based additives.
- The Livestock Judging Team traveled to several locations in the Southern Region to prepare for and participate in judging contests.
- Thirty undergraduate students presented a Floral Showcase at the home of Dr. David Coffey in December.

Applied Physics Institute

Director:

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- Dr. Bruce Kessler received a Kentucky Commercialization Fund grant "Wavelet-Based Elemental Spectrum Analysis Algorithm" from the Kentucky Science & Technology Corporation.
- Dr. Kessler visited Rapiscan Labs in Sunnyvale, CA, and visited Northrup-Grumman to discuss possible use and licensing of the software implementing the patent-pending analysis algorithm.
- Dr. Barzilov received grant from DHS to support the graduate student research and education.
- The nanotechnology core facility development started at the API experimental area (under supervision of Dr. Vlad Dobrokhotoy).

Architectural and Manufacturing Science Institute

Director:

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- There were six students employed this quarter developed 14 Architectural Design projects.
- There were five Architectural Design Projects are under construction.
- AMSI has been invited to participate in the 3rd International Holcim Awards competition for sustainable construction.
- AMSI is working in conjunction with WKU Master Planning Committee & WKU-PDC to update the 2010-2022 Master Plan Growth map.
- AMSI is continuing to perform laser etching services for WKU and local industries.

Center for Biodiversity Studies

Director:

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- Yinu Wang (WKU M.S. Student) won first place for a poster presentation in the Graduate Botany competition at the Kentucky Academy of Science meeting held in Bowling Green in November 2010.
- Jacob Eldridge (WKU M.S. Student) won first place for a poster presentation in the Graduate Zoology competition at the Kentucky Academy of Science meeting held in Bowling Green in November 2010.
- Brenna Tinsley (WKU Undergraduate Student) won first place for a poster presentation in the Undergraduate Zoology competition at the Kentucky Academy of Science meeting held in Bowling Green in November 2010.
- Sydney Combs and Katie Goebel (WKU Undergraduate Students) won first place for a poster presentation in the Undergraduate Zoology competition at the Kentucky Academy of Science meeting held in Bowling Green in November 2010.
- Dr. Scott Grubbs published a paper about headwater stream ecology in the journal Aquatic Ecology.

Biotechnology Center

Director:

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- Biotechnology Center members and their students gave 16 oral presentations and 10 poster presentations at the recent Kentucky Academy of Science (KAS) meeting hosted by WKU.
- To emphasize the multidisciplinary nature of the Biotechnology Center, presentations at the KAS meeting were made in 7 different sections: Botany, Cell and Molecular Biology, Chemistry, Health Science, Microbiology, Physiology and Biochemistry, and Computer and Information Science.
- Seven students of Biotechnology Center members won awards for their presentations at KAS including: Zach Laux (Dakshinamurthy), Ruth Sudbeck (Smith), Jahnvi Kancharla (Sahi), Yajie Wang (Smith), Amanda Webb (Smith), Matt Wood (Philips), and Justin Pile (Sharma).
- Dr. Cheryl Davis published a paper in the Journal of Parasitology on the distribution, prevalence, and genetic characterization of a nematode parasitic round worm of raccoons.
- Dr. Chandra Emani has begun work in the laboratory at the newly opened Centre for Business and Research in Owensboro. The 38,000 sq. ft. business incubator and research facility was established as a cooperative venture between WKU and the Greater Owensboro Economic Development Corporation. A focus of this partnership is plant biotechnology.

Bioinformatics & Information Science Center

Director:

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- The 2010 BISC Research Symposium was held December 10 from 1:00 – 3:00 pm in Snell 2102 and 2113. The Bioinformatics and Information Science Center invited all Ogden College faculty, staff and students to present posters on their research in bioinformatics and information science. This was an opportunity for the informatics community to exchange ideas in a relaxed, yet informative, atmosphere.
- Dr. Ferhan M. Atici and graduate student Sevgi Sengul had their paper entitled "Modeling with fractional difference equations" published in the Journal of Mathematical Analysis and Applications, Volume 369, Issue 1 (2010), pages 1-9. This article is in the list of "Top 10 Articles downloaded from the Journal of Mathematical Analysis and Applications in 2010". A booklet was made of the 10 top articles of 2010 and distributed in the AMS National Conference in New Orleans at the beginning of this month.
- A poster entitled "Statistical analysis of microarray gene expression data from a mouse model of toxoplasmosis" by Shrikant Pawar*, Claire Rinehart, and Cheryl D. Davis, Department of Biology, Bioinformatics and Information Science Center, was presented at the Annual Meeting of the Kentucky Academy of Sciences Meeting, November 12-13, 2010.

Center for Water Resource Studies

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- Dr. Andrew Ernest presented information on the Water Training Institute at the Association of State Drinking Water Administrators (ASDWA) annual conference in Pittsburgh, PA on October 20.
- Two CWRS representatives attended NSF's Advanced Technological Education (ATE) Principal Investigators (PI) conference in Washington, DC from October 27-29.
- Jana Fattic sits on the Green/Tradewater River Basin Team and the Upper Green River Watershed Watch Advisory Committee. She attended meetings for both groups on November 10.
- Rick Fowler was invited to China to lecture on WATERS Lab source tracking methods at the Karst Water Resources workshop on December 4-6 at Southwestern University in Chongqing, followed by a lecture and service on the student evaluation panel at the International Training Course on Karst Hydrogeology and Karst Carbon Cycle Monitoring on December 8-10 at the International Research Center on Karst in Guilin.
- Three CWRS representatives attended a DHS review conference in Washington, DC from December 7-9 and presented information on the current project "Best Practice Protocols for Response and Recovery Operations in Contaminated Water Systems".

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Engineering Services Center

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- EE Seniors continue working on: Elephant Forage Disruption System and Hybrid vehicle conversion to Plug-In Hybrid.
- ME Seniors completed designs for: Paper Media Separation project for the GM Corvette and Overhead Crane Maintenance Awareness Barrier project for Logan Aluminum. Both projects were funded for implementation.
- EE Juniors worked on Automated Bikes for Big Red project, CNC Concrete Engraver Device and Lunabotics Robotic modification project.
- EE and ME students worked with Ron Rizzo on Disposable Remotely Operated Submersible and on Solar Reflective Index measurement device projects.
- The Department of Engineering conducted the 10th annual Kentucky Bluegrass Robotics Competition. Nearly 100 students on 14 teams from a 10 area schools participated by building a robot to collect, relocate and deposit material on a simulated lunar surface.
- R. Choate attended the InfraMation 2010 conference in Las Vegas, Nevada. He presented "Using Thermal Imaging to Evaluate University Campus Structures in Preparation for Weatherization Repair."
- M. McIntyre attended the 49th IEEE Conference on Decision and Control in Atlanta, GA.

Institute for Combustion Science and Environmental Technology

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- Yao-Wen Cui, Limeimei Xu and Kelin Wang are graduate students directed by Dr. Yan Cao (Associate Director), presented the following topics at the 96th Kentucky Academic Science Annual Meeting, Western Kentucky University, Bowling Green, KY, November 13, 2010:
 - ♦ "The preparation of copper-based oxygen carrier using co-precipitation method".
 - ♦ "The research of particulate bond mercury in urban city of Huainan".
 - ♦ "Decreasing content of toxic element in coal combustion by-product by oxalate".
 - ♦ Dr. Yan Cao presented the following at the 3rd US-China Symposium on CO2 Emission Control Science & Technology, Dec 10-12, 2010, Hang Zhou, P. R. China.
 - ♦ "Progress on the Development of Chemical Looping Combustion in ICSET".

Hoffman Environmental Research Institute

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- Institute personnel were awarded research grants for climate change and environmental research and education in the Caribbean region from the Government of Barbados, the Association of American Geographers (AAG), and the WKU Alive Center, and for work in Florida from the SW Florida Water Management District.
- Institute scientists Leslie North, Jason Polk, Pat Kambesis and Chris Groves travelled with two graduate students to the annual meeting of the Geological Society of America meeting in Denver Colorado, making five presentations. North and Polk also presented results of Chinese water resource protection efforts at the SE Division of the AAG in Birmingham Alabama.
- Institute Director Chris Groves traveled in December to Guilin China as a member of the Academic Committee of the Karst Dynamics Laboratory of the Institute of Karst Geology.
- The Hoffman Institute, in collaboration with Mammoth Cave National Park, hosted three delegations of Chinese scientists and land managers here at WKU to continue cooperative efforts in resource management and protection.
- Leslie North continued research into cave guide training to maximize learning outcomes at Mammoth Cave National Park, Lost River Cave, Florida Caverns State Park, and Cumberland Caverns.

Kentucky Climate Center

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- The Kentucky Mesonet added new stations in Oldham and Shelby counties, bringing the year-end total to 53 stations
- Students affiliated with the Kentucky Climate Center gave six research presentations at the annual meeting of the Kentucky Academy of Science
- The Kentucky Climate Center and Kentucky Mesonet were featured in a one and a half hour session at the Kentucky Weather Workshop organized by the Kentucky Division of Emergency Management.
- Students associated with the KCC presented four papers at the Annual Meeting of the Southeastern Division, Association of American Geographers.
- Students associated with the KCC presented at the Annual Weather Conference of Kentucky.
- Four peer-reviewed papers were accepted for publication.

Institute for Astrophysics and Space Science

Director:

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- IASS Staff and students, along with the Hilltoppers Astronomy Club, held star parties in October and November, to watch the Geminid meteor shower and conduct astrophotography of Jupiter during it's closest approach to Earth.
- IASS students presented posters at the Southeastern Section of the American Physical Society meeting held in Baton Rouge, LA, Oct 20-23. IASS students Schuyler Wolff and Jonathan Newton had their poster selected for the final round of judging and we congratulate Jonathan, and his advisor Dr Steven Gibson, whose poster won the Marsh White Award for outstanding student presentation.
- The perennial favorite, Star of Bethlehem show returned to Planetarium for 6 weeks of packed audiences. The presentation, given by Dr Roger Scott, discusses the possible sources of the Christmas Star.
- In November the HAC and IASS faculty were invited to participate in Plano Elementary's "Moon Activity Night" teaching students and their parents how to use small telescopes to view the moon and also giving a fun demonstration of how lunar craters are formed. The activity night is likely to become an annual event to which the HAC and IASS faculty have been invited to return.
- IASS faculty were highly successful in the latest funding cycle of the Kentucky Space Grant Consortium, securing awards for student centered research projects, undergraduate student scholarships and public outreach.

Advanced Materials Institute

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- First, AMI would like to announce that we are inviting all the PODs to consider performing their material characterization or material synthesis with AMI. Please Contact Dr. Celestian to find out more.
- The new Inductively Coupled Plasma Mass Spectrometer has been installed in TCCW and is working beautifully.
- The new, and amazingly bright, single crystal X-ray diffractometer has been installed and has already been used to solve the structures of some really tiny crystals.
- Director Dr. Celestian will be giving an invited colloquium at the University of Kentucky where he will discuss zeolite synthesis and ion separation.
- A new office associate has been hired in AMI to replace the retirement of Janet Allen.