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are welcome at anytime

# the leading edge

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## The 5<sup>th</sup> Annual Conference of the International Society for Environmental Information Sciences

The 5<sup>th</sup> Annual Conference of the International Society for Environmental Information Sciences (ISEIS) was organized by the Center for Water Resource Studies, assisted by DELO and held in Bowling Green, KY on August 1<sup>st</sup> through 3<sup>rd</sup>, 2006. The Conference, held at the Sloan Convention Center, promoted the international exchange of knowledge in the field of environmental information systems research. The conference addressed issues related to foundations, techniques and tools of environmental information sciences, by bringing together scientists, engineers and managers from a broad range of disciplines with common interests.

Organizations, industry leaders, faculty and students from around the world were encouraged to submit papers for presentation and posters on any of 24 different topics.

Western Kentucky University (WKU) was well represented by 23 students and 17 faculty members. WKU students, Benjamin Hughes and Michael Miller collaborated on a poster, winning first place in the poster contest. WKU student, Jonathan L. Bowers won third place. While many attendees were from the United States, Canada, China, Egypt, Japan, Taiwan, Nigeria, Netherlands, and Pakistan also sent presenters.

The new topic of this year's conference was Sustain-

ability in Higher Education, which ranges from "green" roofs on academic buildings to ways to sustain new concepts in undergraduate curriculums. The United Nations has declared 2005-2014 as the Decade of Education for Sustainability Development and the presentations at this conference represented new ideas and models for integrating sustainable concepts in undergraduate curriculums, campuses, and the environment.

The conference began with a reception and boat tours at the Lost River Cave, here in

Bowling Green, to introduce attendees to Kentucky's cave and karst environment. Optional tours were offered after the 2 ½ day conference to introduce other environmental attractions including Mammoth Cave and the Upper Green River Biological Preserve.

The 6<sup>th</sup> Annual Conference is expected to be in Egypt.

~Submitted by  
Marsha Wallace  
Office Associate  
Center for Water  
Resource Studies



**Figure 1:** Dr. Blaine Ferrell, Dean of Ogden College of Science & Engineering with poster winners: Benjamin Hughes and Michael Miller.

**Photos from the ISEIS Conference:****Figure 1:** ISEIS Presentation.**Figure 2:** Posters on display for the ISEIS.**Figure 3:** Presenter at the ISEIS Conference.**Figure 4:** Conference Attendees.**Figure 5:** Question and answer session of Alanna Storey's presentation.**Figure 1****Figure 2****Figure 3****Figure 4****Figure 5**



## CWRS Begins a Cooperative Venture with the Kentucky Rural Water Association (KRWA) and Spatial Data Integrations (SDI)

The Center for Water Resource Studies at Western Kentucky University (CWRS – WKU) has been taking incredible strides to improve the quality of waterways spanning the state of Kentucky. A cooperative venture was started between CWRS, Kentucky Rural Water Association (KRWA) and Spatial Data Integrations (SDI) called The Kentucky Collaborative for Combined Sewer Overflow Management. The Collaborative was established to guide utilities through all processes necessary to achieve the standards of compliance as required by the State of Kentucky. One of the major issues currently being faced, according to the Secretary of Kentucky's Environmental and Public Protection Cabinet, LaJuana Wilcher, is the overflow coming from Combined Sewer Systems (CSS). A CSS is a collection system for sanitary sewage that also collects the storm water runoff from roofs and streets. It is designed with relief structures in the sewer system so that when the sewer is overloaded with too much flow the water would exit the sewer system and

dump into a nearby body of water instead of backing up, into the street or peoples homes. There are currently seventeen municipalities reporting active Combined Sewer Overflow (CSO) points in the state of Kentucky, and they are all being required by the state to submit a Long-Term Control Plan (LTCP) detailing projects that will eventually eliminate these overflows.

The Collaborative has thus far and will continue to offer services to aid municipalities in the characterization, monitoring, and modeling of their systems. Examples of services include assistance with mapping the systems using Geographic Information Systems (GIS), smoke testing and camera work to find sewer main defects and leaks, and in some cases subsidizing the GIS software through grants at WKU so that it can be provided at a discounted rate to the smaller communities that could otherwise not afford it. The Collaborative has also worked concertedly with the Division of Water (DOW) to create an online template to ease the process of generating a LTCP. The systems

were invited to attend a workshop on July 31, 2006 that was held in conjunction with the annual conference for the International Society for Environmental Information Sciences, which was also hosted by CWRS, at which Secretary Wilcher gave the opening remarks. After attending this workshop, the systems involved had a firm grasp of exactly what information they have left to collect, such as rainfall data collection over a certain period of time, and determining a common trend regarding how much rain it takes to cause an overflow. Through this work and numerous other projects, extreme pride is taken in knowing that a difference is being made in our state's environment through the staff and students at CWRS-WKU.

*~Submitted by  
Alanna Storey  
Outreach Coordinator  
Center for Water  
Resource Studies*

*"Through this work and numerous other projects, extreme pride is taken in knowing that a difference is being made in our state's environment through the staff and students at CWRS-WKU."*

**Figure 1:** Secretary of Kentucky's Environmental and Public Protection Cabinet, LaJuana Wilcher gives opening remarks.  
**Figure 2:** Participants of at the workshop for ISEIS.



**Figure 1**



**Figure 2**

*“The Institute for Combustion Science and Environmental Technology has been awarded a \$957,491 grant from Illinois Clean Coal Institute, City Water, Light and Power in Springfield, and Southern Illinois Power Cooperative”*

## Long Term Evaluation of Mercury Monitoring Systems at Illinois Fired Boilers

The Institute for Combustion Science and Environmental Technology has been awarded a \$957,491 grant from Illinois Clean Coal Institute, City Water, Light and Power in Springfield, and Southern Illinois Power Cooperative for their project “Long Term Evaluation of Mercury Monitoring Systems at Illinois Fired Boilers.”

Long-term evaluation of Mercury Monitoring Systems will be studied at four Illinois Coal Fired Boilers with a two-month testing period at each unit. This project will address significant technical issues for the use of mercury Continuous Emission Monitoring Systems (CEMS) such as (1) the precision, accuracy and time lag associated with the Ontario Hydro wet chemical reference method (2) the development of an instrumental mercury reference method (3) a comparison between direct extraction and dilution methods for

the sampling system (4) the availability and feasibility of calibration techniques for both elemental and oxidized mercury conditioning (5) confirmation of EPA part 75 compliance (6) the reliability and operational ability of mercury CEMS (7) the performance of sorbent trap hardware (appendix K) and analytical techniques using Illinois coal conditions.

This project will also assist City Water Light, Power's Unit 33 (T-fired boiler) and Unit 32 (cyclone-high sulfur and high chlorine) boilers and Southern Illinois Power Cooperative's Unit 123 (CFBC) and Unit 4 (cyclone-high sulfur and low chlorine) in planning how to reduce mercury emissions by ninety percent by the middle of 2009 as proposed by Illinois Governor Blagojevich. The findings from this project will definitely enhance knowledge of the stability and accuracy of Mercury Continuous Emission Monitoring Systems using

Illinois coals to overcome several technical issues related to mercury CEMS. These findings will also address several questions regarding the abatement of mercury emissions from the burning of Illinois coal. The difficulty of handling and maintaining the mercury CEMS will also be determined and documented. The results may also help to open a new market for Illinois coals by better understanding mercury control through the co-benefit from the air pollution control devices (SCR/SNCR, WFGD, and ESP) with high chlorine Illinois coal and the availability of CEMS' operating experiences. This project will have collaboration between City Water, Light and Power in Springfield, Southern Illinois Power Cooperative, and Western Kentucky University.

*~Submitted by  
Dr. Wei-Ping Pan  
Director, Institute for  
Combustion Science and  
Environmental  
Technology*



Figure 1

**Figure 1, 2 and 3:** Faculty, Staff and students at the Thermal Analysis Laboratory part of the Institute for Combustion Science and Environmental Technology.



Figure 2



Figure 3



## Thermal Analysis Laboratory officially opens on August 9, 2006, at Western Kentucky University

The Thermal laboratory, which was previously located at South Campus, has moved to Western Kentucky University's *Center for Research and Development*. The new Thermal Laboratory is more spacious and offers one of the best, if not the best, equipped thermal laboratories in the United States. As a result of this, the Thermal Laboratory has developed into an internationally recognized facility. This facility is used for numerous purposes, including: an instructional lab for physical and materials chemistry courses; a research center for 10-15 students per year; and a provider of analytical services to over 230 companies, universities, and agencies in 30 different states. The lab has tested and provided analytical results for over 2,500 samples, from meat to explosives, but the majority of the work has been dedicated to polymers.

The festivities began with an introductory speech from Dr. Wei-Ping Pan who elaborated on the purpose of the Thermal Analysis Laboratory and future plans for ICSET. He then introduced the staff of ICSET and spoke of how they are the driving force of this institute and without them this would not be possible. Dr. Pan spoke in front of more than 150 guests including the president of TA Instruments, the Provost of WKU, faculty of WKU, visiting scholars, and many visiting thermal analysis representatives from different companies and agencies. Dr. Pan's presentation was then followed by two speeches from special guests from TA Instruments and WKU.

The president of TA

Instruments, Terry Kelly, and the Provost of WKU, Dr. Barbara Burch, spoke on the strong points of Dr. Pan and the Thermal Analysis Laboratory. They both said Dr. Pan was a great ambassador for the thermal analysis society because of his expertise in the field and his efforts to further the use of these helpful techniques throughout the world of chemistry. Dr. Pan's ability to educate was also recognized by Mr. Kelly, and he expounded upon this further, saying that it is impossible to over-estimate the passion Dr. Pan has for teaching. Mr. Kelly also joked about Dr. Pan's entrepreneurial skills, saying that five minutes after any meeting with Dr. Pan you are never quite sure who was the scientist and who was the salesman. On a more important note, Mr. Kelly announced that TA Instruments would be donating \$40,000 to ICSET to improve the productivity of the Thermal Analysis Laboratory and to upgrade it to the most state-of-the-art thermal analysis equipment. Overall, Mr. Kelly and Dr. Burch are enthused by ICSET and its efforts to burn coal more efficiently, its efforts to use wastes more effectively, and the first class laboratory that has been established at this Institute.

Following these speeches the guests were invited to a reception within *The Research and Development Center* and also were encouraged to take a tour of the newly opened Thermal Analysis Laboratory. The tour, which was given by staff members of ICSET, outlined the different technology that exists

within the Thermal Analysis Laboratory. The tour displayed the well-equipped Thermal Analysis Laboratory and Combustion Laboratory at ICSET, and it also introduced new equipment, like technology that improves the accuracy of experiments and improvements in safety that allows the staff of ICSET to run procedures hazard free.

Concluding the ceremonies at ICSET, the guests were invited to attend a dinner at the Kentucky Museum located on WKU's campus. The guests enjoyed the antiques within the museum and were treated to an elegant dinner that ended the official opening of the Thermal Analysis Laboratory.

~Submitted by  
Dr. Wei-Ping Pan  
Director,  
Institute for Combustion  
Science and Environmental  
Technology



**Figure 1:** Dr. Andrew Ernest (CWRS Director), Dr. Wei-Ping Pan (ICSET Director), Terry Kelly (President of TA Instruments) and Dr. Barbara Burch (WKU Provost) at the Dedication for the Thermal Analysis Laboratory.



**Figure 2**



**Figure 3**



**Figure 4**



**Figure 5**

**Figures 2, 3, 4 and 5:** Faculty, Staff, Students and Participants at the opening of the Thermal Analysis Laboratory

## New Addition to the WKU Physics and Astronomy Department

*Novikov said, "I am looking forward to teaching and working with students while also helping them apply their classroom knowledge to future API projects."*

Dr. Ivan Novikov is the newest assistant professor in the Department of Physics and Astronomy and is actively involved with the Applied Physics Institute. Dr. Novikov is a former Post-Doctoral Research Associate from Purdue University and received his B.S., M.S., and Ph.D. from St. Petersburg State University located in St. Petersburg, Russia.

Dr. Novikov gained his inspiration to pursue the science of physics from his father who is a practicing physicist in St. Petersburg, Russia. Dr. Novikov served as a WKU Research Associate from 2001-2002, during which he conducted neutron-based elemental analysis. Novikov performed research at Purdue University for over 4 years and returns to WKU with greater experience and knowledge.

Dr. Ivan Novikov plans to join the group from the University of California, Santa Cruz and contribute work to a long-term project that is developing a new facility for high energy physics. This project is one of many for Dr. Novikov who

also plans to engage WKU students in other projects studying medical nuclear physics and electronic development. Novikov's passion remains in educating future physicists and engineers, while contributing to API projects that involve WKU physics students.

Novikov said, "I am looking forward to teaching and working with students while also helping them apply their classroom knowledge to future API projects."

*~Submitted by  
Kelly Johnson  
PR Coordinator  
Applied Physics Institute*



**Figure 1 & Figure 2:** Dr. Ivan Novikov teaches Physics 250 to WKU undergraduate students. He is actively involved in API and working directly with student researchers.



**Figure 2**



## API Students Help US Navy Clean-Up Project

The Applied Physics Institute is giving students real-world experience across the country. API student researchers participated in the remediation of a storage facility located at the Indian Head Naval Facility in Indian Head, MD this past August. Research assistants, Jeremy Board, Christopher Davenport, Christopher McGrath, Kyle Moss, and Matthew Nichols conducted research throughout the week-long project.

API students worked directly with a PELAN III system, which performs analysis on different types of elements and their contents. WKU Associate Professor Dr. Phillip Womble and API Senior Applications Engineer Jon Paschal led students throughout the recovery of 243 items. The PELAN III examined all of the items and their contents.

Students gained valuable knowledge and research skills throughout the week. Chris McGrath said, he appreciated the project since he could apply his classroom knowledge to a real situation and feels that the experience will benefit his future in many ways.

*~Submitted by  
Kelly Johnson  
PR Coordinator  
Applied Physics Institute*

*“The Applied Physics Institute (API) conducts research and development activities that incorporate and go beyond basic research to provide solutions applicable to materials characterization. API also uses its research activities as a practical training tool for undergraduate students in a variety of scientific disciplines by making undergraduates an integral part of its research.”*

Figure 1



Figure 2



### Figure 1 and Figure 2:

API Students working on project:

- Christopher McGrath- Logan Co., KY
- Kyle Moss- Greensburg, KY
- Chris Davenport- Corbin, KY
- Jeremy Board- Paynesville, KY
- Matthew Nichols- Ohio



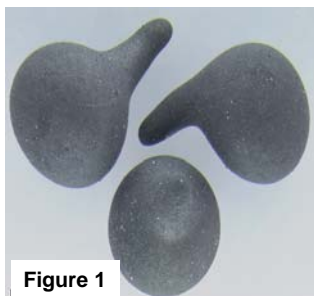


Figure 1

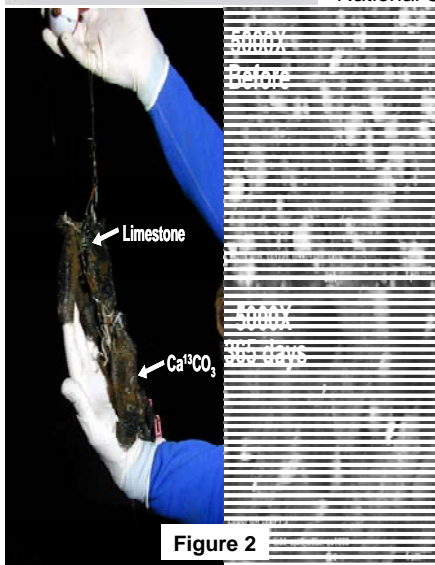


Figure 2

**Figure 1 and Figure 2:** BioSep® beads containing limestone (top) were custom made to deploy in cave pools and streams for one year (bottom left), at which time they were covered by a bacterial biofilm (visible in photomicrographs, bottom right) which was analyzed by DNA analysis and other biomolecular techniques.



Figure 3

**Figure 3:** WKU Alumni at NSS Convention included (left to right) Heather and Ben Tobin with son Liam (Three Rivers, CA), as well as Ben and Carrie Hutchins (Washington, DC).

## WATERS Laboratory Presents Cave DNA Monitoring Plan at NSS Convention

A four-year study of microorganisms at Oregon Caves National Monument (ORCA) was wrapped up this summer and results were presented at the August 2006 National Speleological Society

Convention in Bellingham, WA on the campus of Western Washington University. Also presented were results from ongoing bacterial DNA research at Mammoth Cave National Park (MACA). Rick Fowler, Laboratory Analyst in WATERS Laboratory of the Center for Water Resource Studies (CWRS), traveled to the Pacific Northwest to give two presentations and to design strategies for biological monitoring of caves at ORCA and other federal properties in the Klamath Network (including Oregon and Northern California) of the National Park Service (NPS).

The ORCA study followed on the heels of work being carried out at MACA to

try different methods of DNA analysis to provide useful data for monitoring and identifying bacteria, fungi, protozoans, and algae. The data will be used to monitor and catalog microbes in cave environments and to evaluate the impacts of tourism and visitation.

By applying the monitoring strategies in two very different cave environments, techniques were developed for eliminating variability in substrate composition and sample types. Sediments, water, and custom-made ceramic beads composed of about one-third limestone were subjected to DNA analysis to determine the quantities and identities of selected groups of cave microorganisms (Figure 1 & 2).

Over the duration of the ORCA study, two WKU biotechnology students (Christal Wade, Eli Roberson) developed new techniques for quantifying algal and fungal DNA while determining the DNA sequences of genes used for the identification of 13 fungi, 6 protozoans, and 79 bacteria. WATERS

Laboratory has applied techniques developed during the study to monitor drinking water treatment processes for the Louisville Water Company and to monitor for *Acanthamoeba* in eye-wash stations, the later eventually winning national recognition for a Louisville area high school student (Kristen Fields).

The MACA study is ongoing for long term studies and will continue to offer opportunities for applied research, monitoring, and education. Other parks in the NPS are adopting the techniques in their monitoring and management plans. WATERS hopes to broaden the ORCA study throughout the Klamath Network to provide baseline data for cave microbial monitoring.

*Submitted by  
Rick Fowler  
Center for Water  
Resource Studies*

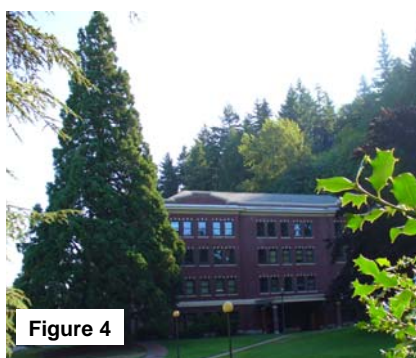


Figure 4

**Figure 4:** Western Washington University campus in Bellingham, WA  
**Figure 5:** Rick Fowler at Oregon Caves National Monument in the Siskiyou Mountains of Southern Oregon, approximately 2 hours inland from Crescent City, CA.

**Figure 6:** The Chateau at Oregon Caves survives as a fine example of 1930's rustic architecture in the National Parks.



Figure 5



Figure 6



## WATERS Laboratory EPA Approved for the Analysis of *Cryptosporidium* under LT2

On October 18, 2006, the WATERS Laboratory was notified by the EPA *Cryptosporidium* Lab QA Evaluation Program Manager, that the lab has been granted approved status for the analysis of *Cryptosporidium* under the Long Term 2 Enhanced Surface Water Treatment Rule (LT2). The WATERS Laboratory is very excited about this accomplishment as it offers the potential for substantial growth. The WATERS Laboratory is the 49<sup>th</sup> laboratory to gain approval in the United States. Of these, only 29 will be accepting *Cryptosporidium* samples commercially. Under the LT2 rule, all public water systems (PWS) that use surface water or ground water under the direct influence of surface water must monitor their source water for *Cryptosporidium* and/or *E. coli*, and turbidity for a specified time. Based on the population served by the PWS, the mandatory start dates for monitoring are staggered over a period of 4½ years, beginning October 2006. The laboratory has two analysts who have completed all the requirements as Principal Analyst under the rule, Christal Wade and Rick Fowler.

To achieve approval the laboratory has to have at least one analyst that has gained one year experience with Immunofluorescence Assay microscopy, six months experience with EPA Method 1623, and completed the analysis of at least 100 samples. The laboratory must also participate in quarterly Proficiency Testing provided by the EPA. The WATERS Lab has been participating in Proficiency Testing since June, 2005. In addition, the laboratory is subjected to an on-site evaluation which includes both a data/QA evaluation as well as a technical evaluation. The WATERS Lab completed its

on-site evaluation in February, 2006.

In July, 2006, Christal Wade and Rick Fowler traveled to the EPA's A.W. Breidenbach Environmental Research Center in Cincinnati, Ohio for a four-day workshop on EPA Method 1623. The workshop consisted of three-hour sessions on each of the major steps required by Method 1623. After this workshop, some revisions were made to the WATERS Lab *Cryptosporidium* program and analyses were performed to generate new Ongoing Precision and Recovery Data. This data along with all supporting documentation was submitted to the EPA on September 28, 2006.

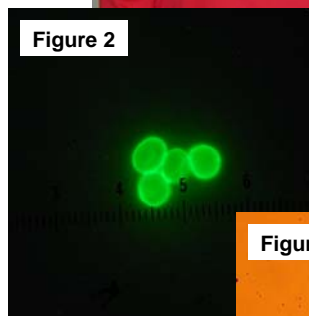
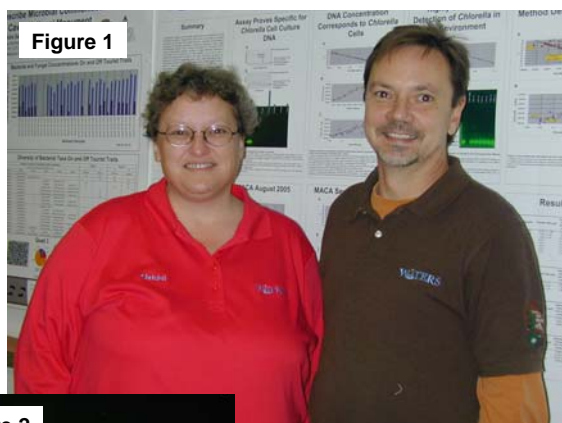
The EPA Method 1623 is a performance based method, which means the laboratory has some options available which can be used to maximize performance. Although there are two possible filtration methods provided for in EPA Method 1623, the WATERS Lab uses the Envirochek™ HV filter manufactured by Pall Corporation. This filter offers a self-contained, single-use, disposable design, with no possibility of cross-contamination. WATERS Lab evaluated the IDEXX Filta-Max method in-house for sixty days, but achieved better recoveries with the Envirochek™ HV.

Christal Wade has assumed responsibility for the *Cryptosporidium* program at the WATERS Lab, with Rick Fowler serving as a back-up analyst. In her capacity as Principal Analyst, Christal Wade has prepared a slide presentation on LT2 to educate PWS operators about the requirements of the rule. She has delivered the presentation at two Kentucky Rural Water Association Water & Wastewater Training sessions: one in Somerset and the other at

General Butler State Park. She plans to be in Owensboro with KRWA in January, 2007, and also in Louisville with KWWOA in March, 2007. In addition, the presentation will be delivered for the clients of Appalachian States Analytical, LLC, in Shelbyville in late November or early December, 2006.

*Submitted by  
Christal Wade and  
Rick Fowler  
Center for Water  
Resource Studies*

*"In July, 2006,  
Christal Wade  
and Rick Fowler  
traveled to the  
EPA's A.W.  
Breidenbach  
Environmental  
Research Center  
in Cincinnati,  
Ohio for a  
four-day  
workshop on EPA  
Method 1623."*



**Figure 1:** Christal Wade and Rick Fowler, WATERS Laboratory, achieved EPA approved status for *Cryptosporidium* analysis in October, 2006.

**Figure 2:** *Cryptosporidium* stained with FITC and observed under Immunofluorescence Assay microscopy. (Each segment on scale = 1µm)

**Figure 3:** The same *Cryptosporidium* under Differential Interference Contrast microscopy. (Each segment on scale = 1µm)

## Entomologist Keith Philips joins Biotechnology Center



**Figure 1**



**Figure 2**



**Figure 3**

**Figure 1:** Keith Philips (in front, second from right) and graduate student Chris DeWildt (in front, second from left) in Ghana together with village elders, students, and the Curator of Insects from the University of Ghana.

**Figure 2:** Dr. Karen Bell (right), postdoc in the Philips Lab, and undergraduate researcher Jennifer Forbes working in the Biotechnology Center obtaining DNA sequence data.

**Figure 3:** Jesus Orozco, graduate student of Dr. Philips, in a Ghana cave collecting beetles (July 2006).

The Biotechnology Center would like to welcome Dr. Keith Philips as its newest member. He joined the Department of Biology at WKU in 2000 after his postdoctoral research at the University of Pretoria, South Africa. His primary research interest involves studies on insect evolution, with an emphasis on beetles and their amazing biodiversity. His current research effort is a National Science Foundation funded study on insect biodiversity in Ghana, West Africa. This country contains a large part of the remaining Upper Guinean forest of Africa, an ecosystem that is one of only 25 biodiversity hotspots in the world. This region is a vital refuge with high species endemism that is poorly known and extremely threatened from high human birth rates, continued logging and mining, bushmeat hunting, and other forms of exploitation both inside and outside protected areas. Hence, there is little time remaining to increase information on the diversity and ecology of its insect species.

Dr. Karen Bell, a postdoc in the lab from Australia (University of Queensland) and several undergraduate and graduate students (Brent Collins, Chris DeWildt, Doug Foster, and Jesus Orozco), have all traveled to Ghana over the past three years to conduct research with scientists and students from the University of Ghana and the University of Pretoria. One project currently underway in the lab is a molecular phylogeny hypothesizing the evolution of the bostrichoid beetles, a group that includes many timber and stored product pest species. There are also investigations on the evolutionary history of the water penny beetles using DNA sequence data and similar studies on the cetoniine fruit chaffer beetles will begin shortly.

One very active re-

search focus for the lab is the biodiversity of the scarabaeine dung beetles. They are the most important group of dung feeding insects and have an astonishing variety of lifestyles with, for example, species that relocate dung by making balls and those that give a great deal of parental care to their offspring. Undergrads Aaron Carver, Brent Collins, Bonnie Newby, and Brian Payne are helping document the diversity and abundance of this group from various habitats, including those that have been degraded by human activity, in the hope that they can be used to monitor ecosystem health. Spider beetles are also a group that several lab members are studying. This poorly known group of beetles is also very diverse, both ecologically (see below) and morphologically. Many taxa still remain undescribed and the evolutionary diversification of the group is unclear. Genera and species previously unknown to science have been described and given names. Clement Akotsen-Mensah, an Masters student that recently graduated, described a new genus and eight new species.

*Editor's Note:*

*Keith Philips is also a member of the Center for Biodiversity Studies and the Bioinformatics and Information Science Center*

### Two Members Leave Biotechnology Center

Dr. Joe Bilotta, Professor of Psychology at WKU, unexpectedly passed away in January of 2006. Dr. Wayne Tarrant, Department of Mathematics, left WKU in May of 2006 to accept a position in Europe.

*Submitted by  
Sigrid Jacobshagen  
Director  
Biotechnology Center*



## IASS Faculty Member Participates in International Planet Debate

Dr. Richard Gelderman attended the 26th General Assembly of the International Astronomical Union in August 2006, where the status of Pluto as a planet and a change in the number of planets were determined.

Dr. Gelderman went to the Prague, the capital of the Czech Republic, to give two presentations. At IAU Symposium No. 235, "Galaxy Evolution across the Hubble Time," Dr. Gelderman presented "Gravitational Perturbations As The Trigger For Nuclear Activity in Galaxies" that included contributions from WKU students Sarah McMurray and Shelly Smith. He also presented "Global Network of Autonomous Observatories Dedicated to Student Research" during IAU Special Session No. 2, "Innovation in Teaching/Learning Astronomy Methods."

The IAU is the world's largest professional group for astronomers. Its mission is to promote and safeguard the science of astronomy in all its aspects through international cooperation. The IAU General Assembly is held every three years and is one of the largest and most diverse meetings in the astronomical community's calendar. Since 1919 the IAU has been the arbiter of planetary and satellite nomenclature.

The current debate was triggered by the discovery in 2003 of Eris, a large icy body in orbit around the Sun well beyond the orbit of Pluto. The debate among astronomers has been whether this new object should be classified as a planet, and if not, whether Pluto, smaller than the new object, should still be included as a planet.

After two years of unresolved debate, the IAU convened a diverse, international seven-person Planet Definition Committee containing astronomers, writers and historians. At the end of the

meeting in Prague, the world's astronomers voted on the proposal to establish the difference between "planets" and the smaller "solar system bodies" such as comets and asteroids.

According to the Planet Definition Committee's proposal, three conditions must be satisfied for an object to be called a "planet." First, the object must be in orbit around a star, while not being itself a star. Second, the object must be massive enough for its own gravity to pull it into a nearly spherical shape. The shape of objects with mass above  $5 \times 10^{20}$  kg and diameter greater than 800 km would normally be determined by self-gravity, but all borderline cases would have to be established by observation. Pluto meets the first two criteria, but it fails the third: A planet must have cleared out the area around its orbit and established its place around the Sun.

Pluto, Eris and a few dozen other objects have been given a new category, and are now known as dwarf planets. Objects in this new category orbit the Sun and have enough gravity to make them spherical in shape, but for some reason have failed to clear out their orbits. A third class of objects that orbit the sun, such as asteroids, comets and other natural satellites, will be called "small solar system bodies."

"People were passionate on both sides of the issue," Dr. Gelderman said of the debate. "Nobody had anything against Pluto, it just doesn't fit the new criteria." When Pluto was discovered in 1930, nothing else like it had been discovered so it was easy to add it to the list of planets. But now we believe there may be more than a dozen objects with the size and composition of Pluto. "Overall," Gelderman notes of the IAU debate, "more people agreed that it was better to drop back to the eight classic planets and let Pluto, Eris, and

the other twenty or more smaller objects with odd orbits go into a new category."

The decision won't change the way faculty at WKU teaches their astronomy courses. "Pluto has always been the odd man out," Gelderman said. "I've always taught that there are four Earth-like rocky planets and four Jupiter-like gaseous planets, and then there's Pluto."

Submitted by  
Mike Carini

Director  
Institute for Astrophysics  
and Space Science

*"People were passionate on both sides of the issue," Dr. Gelderman said of the debate. "Nobody had anything against Pluto, it just doesn't fit the new criteria."*

**Figure 1:** Dr. Richard Gelderman, Professor of Physics and Astronomy at Western Kentucky University (Photo courtesy of Krista Schinagl, College Heights Herald)

**Figure 2:** An artist's conception of the view from Eris with its satellite, Dysnomia <http://www.gps.caltech.edu/%7Embrown/planetlila/moon>, in the background, looking back towards the distant sun. (Credit: Robert Hurt IPAC).



*"Andrea's career path embodies the core concept of WKU's Applied Research and Technology Program," said Dr. Chris Groves*

## Hoffman Institute: WKU Graduate On Discovery Channel

Bowling Green, KY.—Andrea Croskrey, who received her master's degree in geosciences from Western Kentucky University in May, was featured in a Discovery Channel documentary on October 28, 2006.

*"What Lies Below"*

Iowa, worked as a Graduate Research Assistant in the Hoffman Environmental Research Institute within WKU's Applied Research and Technology, completing master's research that developed new applications of Geographic Information Systems (GIS) technology for protection of groundwater resources within Kentucky. She was chosen and participated in the Discovery Channel expedition to Iceland while a graduate student at WKU, having earlier participated in other cave expeditions including geological work in southwest China and a continuous week underground exploring and surveying deep in New Mexico's Lechugilla Cave.

Croskrey, who received her bachelor's degree in 2003 from Northwest Missouri State, in October began a position with the National Park Service Geologic Resources Division in Denver, Colorado. This work involves working with GIS databases for geologic information, and followed successful internships with the Park Service at Mammoth Cave and in Alaska during and after her WKU graduate program.

"Andrea's career path embodies the core concept of WKU's Applied Research and Technology Program," said Dr. Chris Groves, Director of the Hoffman Institute and Andrea's graduate advisor, "While at WKU Andrea developed skills in GIS and geological analysis while actually using them in local and federal government projects to protect natural resources. Now she works full-time at a national level to continue this work for the National Park Service."

That is, of course, when Andrea is not off being a TV star!

More information on Croskrey's appearance on "What Lies Below" is available at:

<http://www.nwmissouri.edu/UniversityRelations/news/newsreleases/061017croskrey.htm>

*Submitted by  
Chris Groves  
Director*

*Hoffman Environmental  
Research Institute*

Figure 1



Figure 2



**Figure 1, 2 and 3:** Former WKU Graduate Student, Andrea Croskrey along with two other cavers explore caves in Iceland as part of a Discovery Channel expedition entitled "What Lies Below".

follows Croskrey and two other cavers as they explore caves in Iceland, including ancient lava caves, and beautiful yet strange caverns where hot volcano-heated rivers have sculpted through thick glaciers of ice.

Croskrey, a native of Blakesburg,

Figure 3





## Hoffman Institute Group Attends International Hydrology Conference in Switzerland

WKU and the Hoffman Environmental Research Institute were well represented at the recent 8<sup>th</sup> *International Conference on Limestone Hydrogeology* held at The University of Neuchâtel, Switzerland in September 2006. Neuchâtel is situated on a beautiful lake between the Jura Mountains and the Alps, and is home to the Center of Hydrogeology, or CHYN. This group is well known as one of the key centers of karst hydrogeology research in Europe, and has been home to several of Europe's most well known and accomplished karst scientists.

The fine three-day conference included two days of talks covering a wide topical and geographic range of cave and karst issues focusing of course on water. These were followed by a plenary field trip to karst regions of the Swiss Jura Mountains near the border with France. There were also several optional two-day excursions in the days that followed the conference.

One continued deeper into the Jura Mountains to the French side, visiting several large beautiful springs and of course, plenty of nice French food. The more strenuous excursion focused on the Alps and particularly the limestone-floored Tsanfleuron glacier. This group traveled several hours by bus from Neuchâtel high up into these unbelievably tall mountains and rode by cable car to the top of the glacier at an elevation of nearly 10,000 feet. From there they hiked down to the glacier's end and onto the broad limestone pavement below that has been exposed by increasingly rapid melting of the glacier, with great exposure of dissolution features, caves, and sinking streams, several of which had served as dye injection points for tracer tests to delineate the catchment area of the Glarey water supply spring far below. After spending the night at a Swiss Alpine Club mountain hut, the group continued down the mountain to the waiting bus below, and

then to the remarkable Glare Spring where local water officials described the development and protection of this water supply, ending with a toast of local wine produced from that community, for which the hosts were justifiably proud.

The conference was also preceded by a three-day educational course on the Management of Karst Water Resources where 12 participants from around the world joined an international team of karst hydrogeologists to discuss a wide range of applied aspects of karst water, including groundwater protection, vulnerability mapping, and tracer tests.

Overall, as might be expected from a team of Swiss organizers, the conference was extremely well planned and organized, though with the caveat that since Neuchâtel is in the somewhat more relaxed French-speaking part of Switzerland, some sessions started as much as three minutes late.

(Continued on Page 14)

*"WKU and the Hoffman Environmental Research Institute were well represented at the recent 8<sup>th</sup> International Conference on Limestone Hydrogeology held at The University of Neuchâtel, Switzerland in September 2006."*

**Figure 1**



**Figure 1:** WKU graduate student Melissa Hendrickson (Left) pauses at the top of the Tsanfleuron glacier, as a group of scientists embark on a two-day hike down the glacier to study karst hydrology and groundwater protection.

## Continued from Page 13 - Hoffman Institute Group Attends International Hydrology Conference in Switzerland

Three Hoffman Institute graduate students (Scotty Sharp, Melissa Hendrickson, and Joel Despain) gave presentations and/or published papers from their Master's

research at the conference, along with Chris Groves and Dr. Warren Campbell, from WKU's Engineering Department.

The papers were:

- Despain J., Groves C. & Meiman J. "Hydrology and Rock/water Interactions of an Alpine Karst System: Spring Creek, Mineral King, Sequoia National Park, California."
- Hendrickson M, Kambesis P., Groves C. & Kessler R. "A Template for Academic/NGO Partnership in the Evaluation of
- Cave and Karst Resources."
- Sharp S., Groves C. & Ragan C. "Assessment of the Herbicide Atrazine within a Karst-Influenced Drinking Water Source: Rough River Lake, Kentucky, USA."
- Bolster C., Groves C., Meiman J., Fernandez-Cortes A. & Crockett C. "Practical Limits of High-Resolution Evaluation of Carbonate Chemistry within Karst Flow Systems."
- Campbell C.W. "Stormwater Modeling in Karst Areas."

*Submitted by  
Chris Groves, Director  
Hoffman Environmental  
Research Institute*

**Figure 2**



**Figure 2:** The Tsanfleuron glacier field trip group stopped overnight at this mountain climber's hut.

**Figure 3:** The beautiful Noiraigue karst spring supplies a small town in the Jura Mountains near the French-Swiss border.

**Figure 3**



### NOTES OF INTEREST:

- Thanksgiving Break Nov. 22-24, 2006 — Fall Semester Ends Dec. 16, 2006
- ARTP Spring Expo--  
(Tentative Schedule) Thursday, March 1, 2007, 2:00pm - 6:00pm, Carroll Knicely Conference Center  
(Look for up-coming SPECIAL EDITION Newsletter Featuring EXPO INFORMATION on EVERY Center)



## Hoffman Institute "China Environmental Health Project" Receives USAID Funding

A Western Kentucky University environmental health project for China has received \$2 million from the U.S. Agency for International Development.

Funding for the "China Environmental Health Project" was obtained with support from U.S. Sen. Mitch McConnell. With matching and other funds, the two-year project will total just over \$2.5 million.

Dr. Chris Groves, director of the Hoffman Institute and the new project, has been conducting karst and water resource research in China for more than a decade and has been working on the environmental health project since 2002.

"The overall theme of this project is to seek solutions for environmental problems associated with the natural conditions in China," Dr. Groves said. "Our work will help improve the environmental health of Chinese people." Some 80 million people are estimated to live in the southwest China karst region where much of the work will be focused, about 8-10 million of whom live below the Chinese poverty level equivalent to about \$85 per year.

"One of WKU's greatest strengths is the commitment of its researchers and students to improve peoples' lives," Sen. McConnell said. "I'm always proud to support WKU as it works toward this goal, and I was pleased to have been able to assist WKU on this project."

The "China Environmental Health Project" has two main components: a karst water resource project managed by Dr. Groves and an air quality project managed by Dr. Wei-Ping Pan of WKU's Institute for Combustion Science and Environmental Technology.

WKU also is partnering with Dr. Jennifer Turner,

director of the China Environment Forum, which is part of the Woodrow Wilson International Center for Scholars in Washington, D.C., on the project. She will oversee the project's community outreach and training of Chinese nongovernmental organizations who will work with WKU and Chinese scientists.

The goal is to develop solutions for China's environmental problems and to train people in China with the technology to solve the problems. "We plan to use the expertise here at WKU and provide opportunities for our undergraduate and graduate students to significantly improve public health in China," Dr. Groves said.

As part of the project, WKU faculty and students will travel to China to conduct seminars, field work and training. Chinese scholars and students also will visit WKU for training, which will include work in hydrogeology and water resources, Geographic Information Systems, and coal combustion technology to better understand air quality issues.

"We will be working with our Chinese colleagues to solve environmental health problems," Dr. Groves said, "but an even more important goal is capacity development to increase the technical infrastructure for the work among our colleagues in China so that they are better prepared to carry this work on in the future."

Geography and Geology Department Head David Keeling noted that "the department has been active internationally for over a decade and this funded project in China will continue to build on the relationships Chris and others have built over the years in East Asia. Our hope is to engage more WKU students and faculty in our China research program and to develop parallel projects that could benefit both

Kentuckians and Chinese citizens. China is emerging as the U.S.'s most important trading partner and a powerful force in the global economy, so providing opportunities for WKU students to better understand China is in our best long-term interests."

*WKU press release submitted by Tommy Newton*

Figure 1



**Figure 1:** An estimated 80-100 million rural residents of southwest China rely on karst groundwater, such as this spring in China's Guangxi Autonomous Region.

**Figure 2:** A joint WKU-Chinese team during a 2004 cave mapping expedition in Hunan Province to assist Chinese engineers with the construction of an underground reservoir.

**Figure 3:** A major water supply problem results from the fact that during the winter dry season, water is underground in caves, and not accessible at the surface, such as in this poor, rural region of Guizhou Province.

Figure 2



Figure 3





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