

Applied Research and  
Technology Program of  
Distinction

# ARTP

Western Kentucky University

# Leading Edge

Issue 7, 1st Quarter

July, 2005 thru September, 2005

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## Two ARTP Groups Team up at Major International Karst Conference in Greece

A large contingent of faculty and students from Western Kentucky University's Department of Geography and Geology recently attended the 14th International Congress of Speleology (ICS) in Athens, Greece. The trip included students, faculty and staff from ARTP's Center for Cave and Karst Studies (CCKS) and Hoffman Environmental Research Institute, most of whom gave scientific presentations at the conference. This conference, the every four year meeting of the International Union of Speleology, is the world's largest. It deals with caves and karst landscapes and is held in a different country each time. The only ICS ever held in North America was hosted here at WKU in 1981. Dr. Nick Crawford, Director of CCKS, was a primary organizer of that conference.

Various combinations of the group made field excursions before, during and after the Congress, visiting great karst and other areas of Greece and other parts of Europe. One especially interesting stop during a Congress field trip was to the huge Argon Field Sinkhole, birthplace of the Greek god Poseidon. While born there on land, Poseidon was

later washed into the Nestani Cave sinkhole and emerged in the ocean 30 miles away, where he ultimately became god of the sea.

"The strong WKU presence at this important international conference is a measure of the department's teaching and research productivity and its reputation in international cave and karst research circles," said Dr. David Keeling, head of the Department of Geography and Geology. "Moreover, participation by ten students and five faculty and staff from the department in this conference is a great example of student engagement. Collaboration between students and faculty over the past year in the department has resulted in some significant research outcomes that are being presented in Athens."

As well as chairing academic sessions and contributing to the overall development of cave and karst research, WKU faculty and students are made the following research paper presentations during the Aug. 22-27 meeting:

Geoscience graduate student Gina Cesin of Miami, Fla., with co-authors Dr. Nick Crawford (Director of the Center for



Nicholas Crawford, Whit Crawford, Rick Toomey, Leigh Ann Croft and Gina Cesin enjoy a field trip to the Parthenon.

Cave and Karst Studies) and Jeremy Richardson, Urban Storm-Water Management for Cities Built Upon Karst, Bowling Green, Kentucky.

Staff scientist Annie Croft, with co-authors Dr. Nick Crawford and Mark Depoy (Mammoth Cave National Park), Karst Field Studies Offered by WKU's Center for Cave and Karst Studies and the Mammoth Cave National Park International Center for Science and Learning.

Undergraduate geology student Jeremy Tallent of Albany, with co-authors Dr. Nick Crawford and Pat Kambeis, Improving the Accuracy of Subsurface Cartography using Geophysics and GIS.

Dr. Nick Crawford, with co-author Scott Roach, Use of a Non-Linear Curve-Fitting Program to Separate the Emission Spectra of Multiple Fluorescent Dyes from Spectrofluorophotometer

Continued on Page 3



Hoffman Institute graduate student Andrea Croskrey works on the resource inventory with Munin Cave. (photo by Pat Kambesis)

**“In my mind, these types of activities optimize the very concept of WKU’s Applied Research and Technology Program,” Groves said.**

## Hoffman Institute and The Nature Conservancy Team Up On Kentucky Resource Protection Efforts

Geoscience students and faculty from Western Kentucky University’s Hoffman Environmental Research Institute are working to study and map significant caves in three Kentucky counties in order to help The Nature Conservancy (TNC) and affiliated agencies understand and protect these resources.

Working in Metcalfe, Green, and Adair counties, the WKU/TNC group has so far mapped six caves, along with providing photo documentation and preliminary biological surveys. In one case, maps and a report of these activities helped lead to a state grant to set aside an 80-acre tract in Metcalfe County containing a picturesque gorge and several key caves.

“The previously understudied caves have been overshadowed by the world-class caves that are part of the nearby Mammoth Cave system,” said Chris Groves, director of the Hoffman Institute. “In many other less cave-rich areas of the country, several of the caves being mapped

by the group would be considered as major systems,” he said. The group has utilized other hydrological techniques such as fluorescent dye tracing to establish the routes of underground streams within the cave systems in support of the project.

“In my mind, these types of activities optimize the very concept of WKU’s Applied Research and Technology Program,” Groves said. “Students simultaneously work on gaining experience and developing technical skills while providing a real service to the Commonwealth.”

Dr. Richie Kessler, who manages efforts within the Green River watershed for The Nature Conservancy, has coordinated activities with the WKU group. “The Nature Conservancy and other affiliated agencies benefit from the expertise and energy that the WKU students bring to these efforts,” Kessler said. “We look forward to developing new, enhanced programs in both resource protection and education.”

While at WKU

recently to get an update on the work, Groves and Kessler initiated discussion for a region-wide workshop on karst resource evaluation that the Hoffman Institute plans to present to TNC scientists. This effort will likely attract TNC scientists and conservation managers from Kentucky, Tennessee, and Indiana.

“This partnership is critical to TNC’s mission,” Kessler said. “Having access to the expertise found in programs such as the ARTP’s Hoffman Institute allows us to make better informed conservation management decisions based on the best available science.”

A presentation on the work’s progress will be given by Hoffman graduate student Melissa Hendrickson at this fall’s National Cave and Karst Management Symposium in Rochester, N.Y. The presentation is co-authored by Kessler, Groves and the Hoffman Institute’s Pat Kambesis.

~Submitted by  
Tommy Newton and  
Chris Groves



**(Photo Left)** Graduate student Melissa Hendrickson makes notes during the survey and resource inventory of Munin Cave. (photo by Pat Kambesis)

**(Photo Right)** Spanish scientist Dr. Angél Fernández Cortes (currently at the Hoffman Institute on a research fellowship) takes compass readings necessary for making cave maps on the project. (photo by Pete Mueller)





## Two ARTP Groups Team up in Greece (Continued from Page 1)

*Analysis used in groundwater Dye Tracing.*

Geoscience graduate student Brian Sakofsky of Fairport, N.Y., with co-authors K. Ballew and Dr. Nick Crawford, *Karst Hydrogeology of Lookout Mountain: A Synclinal Mountain in the Folded Appalachian Mountains of South-Central Tennessee.*

Dr. Nick Crawford, *Application of Dye Tracer Techniques in the Preparation of Conceptual Hydrogeologic Models for Contaminated Karst Aquifers.*

Staff scientist Annie Croft, with multiple undergraduate and graduate co-authors, *Development of Innovative Karst Hydrogeologic Research Techniques for Solving Karst Environmental Problems.*

Hoffman Institute Director Dr. Chris Groves, and co-authors Patricia Kambesis and personnel from the Karst Dynamics Laboratory in Guilin, China, *Chinese-American Cooperation in Cave Exploration and*

*Survey in Water Resource Development, Da Long Dong, Hunan, China.*

Patricia Kambesis, geoscience graduate student and assistant director of the Hoffman Institute, with co-authors Andrea Croskrey, geoscience graduate student from Blakesburg, Iowa, and Dr. Chris Groves, *Groundwater Sensitivity Mapping of the Beaver Dam and Campbellsville 30' x 60' Quadrangles.*

Geoscience graduate student Ben Tobin of Hartford, Conn., with co-author Dr. Steve Kenworthy, *A Quantitative Analysis of Relationships between Land-Use and Base-Level Conduit Sedimentation in South-Central, Kentucky.*

Library Sciences faculty Deana Groves, with co-authors Dr. Chris Groves and undergraduate geology major Weldon Hawkins of Munfordville, *A Century of Linkages and Synergy: WKU and the Mammoth*

*Cave System.*

Dr. John All, Dr. Chris Groves and Patricia Kambesis, *Ghost Cave, Eastern Himalayas, Bhutan.*

Undergraduate geology major Weldon Hawkins of Munfordville, with co-authors Patricia Kambesis and Dr. Chris Groves, *Potential Impacts of Acid Mine Drainage on the Hydrogeologic System of Russell Cave National Monument, Alabama.*

Patricia Kambesis, *Caves of Isla de Mona, Puerto Rico.*

Dr. Nick Crawford also presented a poster titled *Groundwater Basin Delineation by Dye Tracing, Water Table Mapping, and Cave Mapping: Geophysical Techniques in Bowling Green, Ky.*

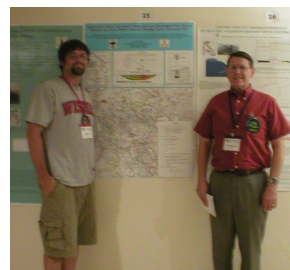
~Submitted by  
Tommy Newton  
and Chris Groves

(More Photographs from the ICS on Page 7)



**Photo Above:** Rick Toomey (Left) and Leigh Ann Croft (Right) stand near their poster presentation during the ICS.

**Photo Below:** (Left) Undergrad student Josh Brewer and (Right) Nicholas Crawford stand near their poster presentation during the ICS.



## New Biotechnology Center Coordinator

The Biotechnology Center is pleased to announce the hiring of Xinnan Niu, the new core facility coordinator. The center is proud to have attracted Xinnan to the position because he has ample experience in biotechnology. Prior to arriving at WKU in March of this year, Xinnan served five years as the Associate Director of the Adenoviral Core Facility at the Medical College of Wisconsin in Milwaukee; and, before that, as a research assistant at Vanderbilt University. Even before he arrived, Xinnan's outstanding abilities were known to many of the Biotechnology Center members because he was a student in Biology at WKU, graduating with a Master's Degree in 1999. His Master's Thesis, entitled "Inactivation of

glnA and cysZ Genes by Antisense and Truncated Gene Strategies", was truly excellent, earning him the award of Outstanding Graduate Student in Biology for that year. In addition, Xinnan received a Master's Degree in Bioinformatics from Marquette University in Milwaukee, WI, in 2004. His computing skills and bioinformatics expertise have already been a great benefit to the center. One of Xinnan's current projects is to develop a new web page that will provide current information on the Biotechnology Center and advanced information management for chemical inventory, scheduling of instrumentation, research support, bioinformatics, and budget management. Xinnan is supported in his center duties by three undergraduate

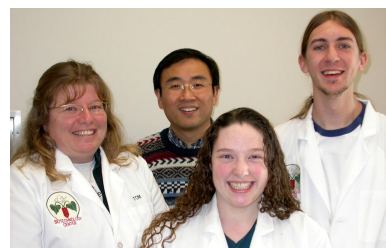
employees: Deborah Wolfe, Jon Faughn, and Lydia Kullman. Xinnan can be found in the Biotechnology Center Core Facility located in the new Engineering and Biological Science Building room 3130. He can also be contacted by phone (5-6931) or e-mail (xinnan.niu@wku.edu) to provide assistance with Biotechnology Center resources.

~Submitted by  
Sigrid Jacobshagen  
Director,  
Biotechnology Center



**The center is proud to have attracted Xinnan to the position, because he has ample experience in biotechnology.**

**(Bottom Photo)** The Biotechnology Center Staff. Second from left: Xinnan Niu, the new core facility coordinator. Others from left: The undergraduate employees: Deborah Wolfe, Lydia Kullman, and Jon Faughn.



## MCC Collaborated with the Oak Ridge National Lab

**“The time I spent at Oak Ridge opened my eyes to the vast career opportunities available in the real world. I strongly encourage other students to partake in such experiences if at all possible.”**

To create a research environment for students, Dr. Zeng collaborated with the Oak Ridge National Lab during the summer of 2005. Supported by the Materials Characterization Center (MCC), student Cassie Norris was hosted by Dr. Sheng Dai's Nanocatalyst Group of the Chemical Science Division at the Oak Ridge National Lab (ORNL). Supervised by Dr. Zeng, Cassie extensively interacted with their nanomaterial characterization instruments, performing Atomic-Layer-Deposition (ALD) to modify her Grätzel Solid Solar Cells. The ALD allows the building up of ultrathin films at the angstrom (Å) level, typically increasing the thin film thickness about 3Å per layer. This modification may bring about significant improvement in power conversion efficiency for the studied solar cells in Dr. Zeng's group at WKU.

Cassie prepared many solar cell samples and brought them back to WKU. She is now waiting for device evaluation. Her samples will be extensively studied this semester by thermal analysis at MCC to investigate the thermal

stabilities. Soon after the device tests this semester, Dr. Zeng, along with Cassie Norris as co-author, will prepare an article for peer journal publication.

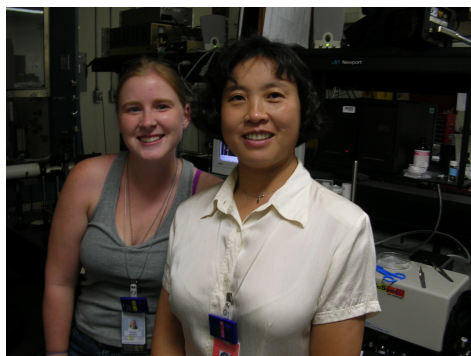
Cassie said, “The experience at Oak Ridge allowed me to interact with many scientists and post-doctoral fellows while participating in a government-regulated excellent research facility. The time I spent at Oak Ridge opened my eyes to the vast career opportunities available in the real world. I strongly encourage other students to partake in such experiences if at all possible. Mine was definitely one of a kind and unforgettable! Dr. Zeng, ORNL, MCC, Ogden College, and the Chemistry Department have my many thanks for making it happen!”

There was exciting news in research related to Dr. Zeng's QDs that she synthesized when she was hosted by the Laser Spectroscopy Group, Chemical Science Division. Her QDs presented “donuts” fluorescence emission under the excitation of a 514nm laser, and blinked like Christmas lights in the dark sky!

This experiment was first observed for QDs at the Laser Spectroscopy Group using their Total Internal Reflection Microscope. It was the first time for this Oak Ridge National Group to observe this phenomenon in their specialized field for “donut” emission that usually would happen with single molecules. Everybody was excited when this result came out in the first week of August. Everybody in the two host groups watched the experiment demo, and some of the scientists were involved in analyzing this phenomenon. At present, we still do not have a clear understanding of its mechanism. Thus, continuous cooperation was strongly requested when Dr. Zeng's group left Oak Ridge. We believe that we will make promising progress in understanding its mechanism in the next couple of years through our close cooperation.

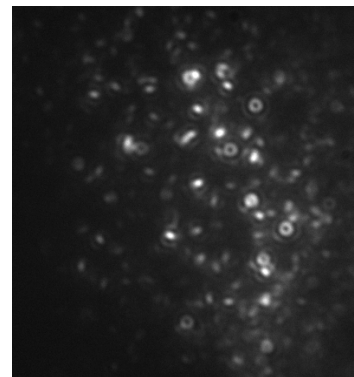
~Submitted by  
Eric Conte  
Director,

Materials Characterization Center



**(Photo Left):**  
Cassie Norris and Dr. Tingying Zeng at Oak Ridge National Lab

**(Photo Right)** “Donut” Quantum Dot Emission Under the illumination of a 514nm laser, this image looks like blinking Christmas lights.





## Institute for Astrophysics and Space Science (IASS)

### Outreach Activities:

The IASS faculty has teamed up with Warren Central High School in Bowling Green, KY, for a mentoring partnership. This partnership allows Warren Central High School students to be mentored by IASS faculty in current IASS research projects. This is the IASS' third year participating in the program.

The faculty and staff of the IASS are also providing public observing opportunities with WKU's 12.5 inch telescope, located on the roof of WKU's Thompson Complex (Central Wing). Planetarium shows will also be open to the public on a regular basis throughout the academic

year. The next Planetarium show, *Star of Bethlehem*, will begin in mid November. Visit the Department of Physics and Astronomy on the web at [physics.wku.edu](http://physics.wku.edu) for more information.

### Faculty Accomplishments/News:

The IASS would like to recognize three faculty members for their latest contributions to the department:

Over the summer, Dr. Charles McGruder, III visited several African nations, establishing connections and support for a global network of telescopes to search for extra-solar planets and study the

afterglows of gamma ray bursts.

Dr. Sergey Marchenko, a visiting research professor at Western, presented two papers at the *Stellar Evolution at Low Metallicity: Mass Loss, Explosions, Cosmology* international workshop in August. The workshop was held in Tartu, Estonia.

Associate Professor Dr. Richard Gelderman has begun a semester-long sabbatical. He will be focusing on his research, mentoring two undergraduate students, and bringing the Robotically Controlled Telescope project to a final completion.

**"It's challenging to get organized to where I can do research and teach, but the students have been very eager to learn about Astronomy."**

## Dr. Louis-Gregory Strolger joins the Institute for Astrophysics and Space Science team.

Over the summer, the Institute for Astrophysics and Space Science (IASS) and the Physics and Astronomy Department added a new member to its team.

Dr. Louis-Gregory Strolger, a former post doctoral researcher for the Space Telescope Science Institute in Baltimore, Maryland, was hired as an Assistant Professor and is teaching introductory stellar astronomy courses this fall. Dr. Strolger also brings a new research strength to the IASS team: supernova cosmology research.

"Western's nice," Dr. Strolger said. "It's challenging to get organized to where I can do research and teach, but the students have been very eager to learn about astronomy."

Dr. Strolger says his interest in space started at an early age and has only progressed over the years. He was born in San Antonio, Texas, and grew up in Reston, Virginia. But Dr. Strolger has come a long way from his early experiments with metal objects and electrical sockets.

He received his undergraduate degree in Physics from Earlham College in Richmond, Indiana, while playing nose guard for the football team. He continued his education at the University of Michigan by earning his masters and doctorate in astronomy.

For his dissertation, Dr. Strolger spent three years as a visiting astronomer at Cerro Tololo Inter-American Observatory in Chile. The

observatory is a sister institution to the Kitt Peak National Observatory in Arizona. There he worked on a project called the *Nearby Galaxy Supernova Survey*.

"The objective was to find and analyze nearby supernovae," Dr. Strolger said, "I looked for a bunch of lower redshift supernovae to collect a comparison sample. And at that time, the discovery of dark energy was just happening."

Dr. Strolger remembers being on the periphery of two major projects at that time; the Supernova Cosmology Project in Berkeley, California; and the High Z Supernova Search Project.



**Dr. Louis-Gregory Strolger a former post doctoral researcher for the Space Telescope Science Institute in Baltimore, Maryland joins the IASS team.**

**“We use supernova to understand cosmology, but we understand embarrassingly little about these tools,” he said.**

## Dr. Louis-Gregory Strolger (Continued from Page 5)

Recently, the High Z project was broken into two project teams with slightly different science goals;

ESSENCE and PANS. ESSENCE's focus is on collecting a large sample of moderate redshift supernova, while PANS' is to find the rate of change of dark energy using the Hubble Space Telescope.

After returning to the United States and devoting a year to defending his dissertation, Dr. Strolger became a part of the PANS group. He was hired by the head of the PANS project, Dr. Adam Riess, as a post doctoral researcher at the Space Telescope Science Institute. His assignment was to

work on the PANS project beginning to end.

“We use supernova to understand cosmology, but we understand embarrassingly little about these tools,” he said.

Dr. Strolger plans to use the Robotically Controlled Telescope (RCT) at Western to continue his research and engage undergraduate students with supernova studies. Though the RCT is still being refurbished, it is estimated to be completed within the next year. He will use the RCT to analyze differences between specific supernova environments to find how certain events effect their environ-

ments.

Though Dr. Strolger's is in the fourth year of his project, his first semester at Western is coming to a close. Dr. Strolger plans on emphasizing to his students the important role his research plays in general studies of supernova.

“The semester ends with cosmology,” Dr. Strolger said, “and I plan to introduce what I do then because you have to first understand a little about astronomy and physics in general – which I hope to give then along the way.”

~Submitted  
by Mike Carini,  
Written by  
Dara Hardin

## Center for Cave and Karst Studies Director receives GSA Hall of Fame Award



**GSA Hall of  
Fame  
2005  
Annual Meeting  
Salt Lake City,  
Utah**



Feature Article: Photo Page: *From Page 1 and 3*

#1

#2



#4



#3



#5



#6



"The strong WKU presence at this important international conference is a measure of the department's teaching and research productivity and its reputation in international cave and karst research circles," said Dr. David Keeling, head of the Department of Geography and Geology. "

(From Page 1)

#1: Panoramic View of Athens, Greece from the Parthenon.

#2: WKU Faculty, Staff and students viewing the Parthenon during an ICS field trip.

#3: Graduate student Gina Cesin, standing near the Aegean Sea.

#4 Undergraduate student Jeremy Tallent and Nicholas Crawford standing near the pier in Apostoli during the ICS.

#5: Faculty, Staff and students from WKU at the ICS in Athens.

#6 WKU Faculty, staff and students at the ICS Farewell Banquet.





**ARTP Office**  
Ogden College of Science  
and Engineering  
TCCW 100  
1906 College Heights Blvd.  
Bowling Green, KY 42101  
270-745-8892  
270-745-8893 Fax

**Blaine Ferrell**  
Director, Dean OCSE  
TCCW 105  
270-745-4448  
blaine.ferrell@wku.edu

**Marilyn Anderson**  
Assistant to the Dean  
TCCW 100A  
270-745-8891  
marilyn.anderson@wku.edu

**Cindy Graham**  
Administrative Research Assistant  
TCCW 100D  
270-745-8890  
cindy.graham@wku.edu

**Steva Kaufkins**  
Operations Specialist  
TCCW 100C  
270-745-8894  
steva.kaufkins@wku.edu

**Lisa Haynes**  
Office Coordinator  
EST 438  
270-745-3252  
lisa.haynes@wku.edu

**Lisa Wood**  
Office Associate  
TCCW 100B  
270-745-8892  
lisa.wood@wku.edu

**Visit us on the web:**  
<http://artp.wku.edu>



## ARTP CENTERS

### CENTER PHONE INDEX:

**AREC**  
270-745-5959

**API**  
270-745-4052

**AMSI**  
270-745-6302

**BIOD**  
270-745-5048

**BIOTECH**  
270-745-5994

**CCKS**  
270-745-3252

**CWRS**  
270-745-4448

**ES**  
270-745-8859

**HERI**  
270-745-5974

**IASS**  
270-745-6198

**ICSET**  
270-780-2532

**KCC**  
270-745-5983

**MCC**  
270-745-6019

**AREC-- Agriculture Research and Education Complex**  
Nevil Speer, Director, EST 234, 270-745-5959  
nevil.speer@wku.edu

**API--Applied Physics Institute**  
Phillip Womble, Director, TCCW 232, 270-745-4052  
phillip.womble@wku.edu

**AMSI--Architectural and Manufacturing Science Institute**  
Neal Downing, Director, EST 222, 270-745-6302  
neal.downing@wku.edu

**BIOTECH--Biotechnology Center**  
Sigrid Jacobshagen, Director, TCNW 111, 270-745-5994  
sigrid.jacobshagen@wku.edu

**BIOD--Center for Biodiversity Studies**  
Scott Grubbs, Director, TCNW 107, 270-745-5048  
scott.grubbs@wku.edu

**CCKS--Center for Cave and Karst Studies**  
Nicholas Crawford, Director, EST 401, 270-745-3252  
nicholas.crawford@wku.edu

**CWRS--Center for Water Resource Studies**  
Andrew Ernest, Director, TCCW 105, 270-745-4448  
andrew.ernest@wku.edu

**HERI--(Part of CWRS) The Hoffman Environmental Research Institute**  
Chris Groves, Director, EST 321  
270-745-5974, chris.groves@wku.edu

**ES--Engineering Services**  
Kevin Schmaltz, Director, EBS 2210, 270-745-8859  
kevin.schmaltz@wku.edu

**IASS--Institute for Astrophysics and Space Science**  
Mike Carini, Director, TCCW 229, 270-745-6198  
mike.carini@wku.edu

**ICSET--Institute for Combustion Science and Environmental Technology**  
Wei-Ping Pan, Director, 2413 Nashville Rd. 270-745-2272  
wei-ping.pan@wku.edu

**KCC--Kentucky Climate Center**  
Stuart Foster, Director, EST 304, 270-745-5983  
stuart.foster@wku.edu

**MCC--Materials Characterization Center**  
Eric Conte, Director, TCNW 313A, 270-745-6019  
eric.conte@wku.edu