

Mack Nuggets

MACK-BLACKWELL RESEARCHER VOTED “INNOVATOR OF THE YEAR”

Featured Stories

- Mack-Blackwell Researcher Voted “Innovator of the Year”
- Cox receives CAREER Award
- Wang receives Masters Award
- MBTC Student of the Year
- DHS Summit

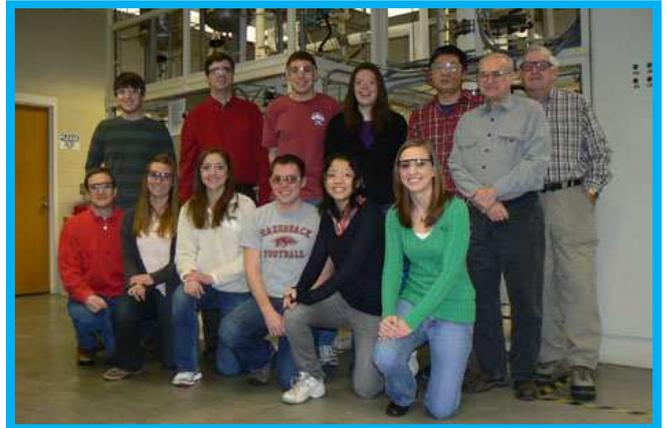
Director’s Message	2
Lecture Series	3
CTTP	4
Projects	5
About MBTC	6



UNIVERSITY OF
ARKANSAS
COLLEGE OF
ENGINEERING

MBTC researcher Jamie Hestekin was recently voted Planet Forward’s “Innovator of the Year.” Dr. Hestekin, his faculty co-advisors Bob Beitle and Roy Penney, and a team of Chemical Engineering students participated in an online competition designed to identify the most promising ideas in energy efficiency. Their research project, which involves designing and building a device that can convert algae directly into butanol, was featured on a Planet Forward Earth Day special which aired on PBS April 8.

Planet Forward, a project of the Center for Innovative Media at George Washington University, features ideas about energy, climate and sustainability on its website and through television specials, which air on public television stations across the country. Planet Forward describes its Earth Day special as “the culmination of our current cycle on energy efficiency.” In an online contest, participants submitted ideas to increase energy efficiency. Out of the 1024 ideas submitted, only 22 were selected to appear on the Planet Forward website. The University of Arkansas (UA) team was the online favorite, receiving 1558 votes, and becoming one of seven finalists featured on the television show. On the



show, energy innovators, including the students from UA, discussed their ideas with experts.

The UA team has developed a method for converting common algae into butanol, a renewable fuel that can be used in existing combustible engines. Algae, which grow quickly in streams and ponds, can be used to remove pollutants such as nitrogen and phosphorus from the water and can then be harvested to make clean-burning biofuel. In addition, the leftover plant material can be used as fertilizer.

The team is designing a biofuel miniprocessing unit, a machine that can turn algae and other biomass directly into fuel. Their device, which will be small enough to fit in the back of a pick-up truck and will

produce a few milliliters of fuel-grade butanol at a time, could serve as a model for larger applications of this technology. For example, a larger machine based on this model could be used by farmers to turn plants directly into fuel for farm equipment. Through the process Dr. Hestekin and his research team hope to design and create a more sensible path toward green transportation fuels in the future.

At the end of the PBS show, the audience and online voters decided which two ideas were the most innovative. The studio audience selected Danny Kennedy, the CEO of Sungevity, a company that leases solar panels to homeowners. The UA team won the online voting, which concluded on May 5,

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Dr. Tish Pohl



Message from the Assistant Director

It has been a busy spring semester for MBTC. Our researchers have been hard at work on important transportation-related research, while Fayetteville and its transportation infrastructure have endured snow, ice, torrential rains and flooding. The University of Arkansas was closed for a record number of days due to ice and heavy snowfall in February. April showers seemingly came all at once, as we received 13+ inches of rain over several days – prompting another early closure due to flooded streets.

Severe weather and natural disasters around the world this year have emphasized the relevance of our research projects related to system resiliency,

emergency planning and response, and ground motion analysis in the New Madrid Seismic Zone. Transportation systems are particularly vulnerable during these events, and at the same time, play a critical role in emergency response and mitigation of the tragic consequences.

Recently discovered terrorist plots against the U.S. rail system also confirm the vulnerability of our transportation systems to manmade disasters and the importance of security-related research. We are pleased to be able to contribute to transportation security through our continued role as a National Transportation Security Center of Excellence. MBTC was well-represented by faculty and

students at the DHS Annual Summit in March, which focused on the role of transportation systems following catastrophes.

On a happier note, I am pleased to congratulate three MBTC researchers who have received national-level awards this year. Brady Cox received the prestigious NSF CAREER award, Kelvin Wang received the Frank M. Masters Transportation Engineering Award from ASCE, and Jamie Hestekin, was voted Planet Forward's "Innovator of the Year." We appreciate the opportunity to fund such impactful research. Congratulations to our outstanding faculty members!

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"Mack Blackwell gave us a chance to do cutting edge biofuel research when others said it was too early."



by a wide margin. Planet Forward will follow their idea for a year, reporting on how they confront challenges and overcome obstacles. The UA team will be featured in a monthly blog supported by Planet Forward, as well as being part of several future PBS specials. If you missed the television show, you can watch it at www.planetforward.org, and follow the team's progress.

Dr. Hestekin, an Assistant Professor in Chemical

Engineering, recently completed project MBTC DOT 3018, *The Production of Butanol Fuel from Renewable Systems Using a Membrane Assisted Fermentation System*. The research sought to transform native algae strains, grown to clean contaminated water, into butanol, and resulted in the development and validation of a multi-step processing procedure. Tom Potts, a Ph.D. student on this project and a member of the winning UA team, won the Jack Buffington Student

Poster Contest at last year's Annual Advisory Board meeting. "Mack Blackwell gave us a chance to do cutting edge biofuel research when others said it was too early," stated Dr. Hestekin. "The faith they showed in us allowed us to be incredibly successful and leverage the work into other projects. We look forward to partnering again in the future."

ATTENTION Advisory Board Members!! MBTC 2011 Annual Advisory Board Meeting and Dinner will be on October 13th and October 14th. The dinner will be held at the Cosmopolitan Hotel on the 13th, with the meeting being held the next day, Friday, October 14th, at the Engineering Research Center at the University of Arkansas. Further details will be sent out this summer. For more information, contact Dana Williams at 479.575.6026.

Distinguished Lecture Series

MBTC held two exceptional lectures this spring. Our first lecture was delayed twice due to snow, but we were finally able to bring in Richard Grenville, Director of Logistics and Business Development at the Tulsa Port of Catoosa. Mr. Grenville gave a presentation on the Panama Canal Expansion and the Impact on Global Trade. This program was held on March 3, 2011 on the University of Arkansas (UA) campus.

Mr. Grenville spoke on the Panama Canal's history and influence on US and world trade. He illustrated the dramatic growth in size in cargo vessels and oil tankers over the last few decades and indicated that the most modern vessels could not traverse the canal because of width and depth restrictions. A major expansion, funded by the Panama Canal Authority and due to be complete in 2014, includes a new lock configuration and a network of water reutilization basins. Mr. Grenville presented statistics on current and emerging markets, and suggested that the trends indicate a shift in trade routes and trade partners. The expansion of the Panama Canal could further alter trade routes –

increasing the flow of commodities into the Gulf of Mexico and potentially increasing barge traffic on inland waterways. Mr. Grenville presented current freight rates for shipping corn and soybeans to Asia, via either the West coast or through the Gulf of Mexico. These trade routes may change substantially due to the Panama Canal expansion.

Our second lecture was held on March 31, 2011 in the Combs Auditorium on the UA campus. Dr. Karen Dixon, Associate Professor, Oregon State University, came well prepared to discuss the newly-published first edition of the AASHTO (American Association of Highway and Transportation Officials) *Highway Safety Manual*.

A significant portion of the three-volume manual provides a peer-reviewed compilation that predicts the safety performance of dozens of roadway design and operational elements. The manual offers guidance through the full range of project stages, starting with planning and programming, through the design of a roadway project, and continuing into ongoing operations and maintenance. Professionals

who take advantage of the manual's contents should be positioned to offer the traveling public an improved level of safety.

Through examples, Dr. Dixon showed the audience that identifying the safer design choice is not always intuitive. Her presentation emphasized the need to better integrate safety considerations into current decision-making processes. She gave the students some insight into real-world barriers to improved safety, such as lack of resources or the cultures in some organizations that are resistant to new methods or innovations. She also provided a brief overview of the computational procedures that the manual contains.

Dr. Dixon practiced as a design engineer a number of years before receiving her Ph.D. from North Carolina State University. She was an Assistant Professor at Georgia Tech before moving to her current Associate Professor position at Oregon State University.

To learn more about the new *Highway Safety Manual*, go to www.highwaysafetymanual.org



Dr. Heather Nachtmann, Mr. Dick Grenville, and Dr. Kevin Hall



Drs. Karen Dixon and Kevin Hall



CONGRATULATIONS! Dr. Brady Cox, Assistant Professor of Civil Engineering, has received a Faculty Early Career Development Award, also known as a CAREER award, from the National Science Foundation (NSF) for his work on non-intrusive subsurface imaging using seismic surface wave methods (SWM). Cox's research focuses on making these methods more reliable. The CAREER award is one of the NSF's highest honors for young faculty members. Cox will use the award of \$421,600 over five years to provide new opportunities for graduate and undergraduate students at the University of Arkansas. "This project opens up a unique chance for our institutions, professors and students to participate in international exchange of education, ideas and culture through undergraduate researchers," said Cox, who will have the opportunity to study surface wave testing at the Politecnico di Turino in Italy.

Center for Training Transportation Professionals



Frances Griffith, Stacy Williams, Rita Parrish, Mary Fleck, Charles Steelman and Roselie Conley



Training classes at CTTTP

The CTTTP calendar has been very full during the first portion of 2011. First quarter course enrollment levels have exceeded those of recent years, hopefully indicating a level of economic recovery in the state's transportation infrastructure. Recent enrollments have included individuals seeking to re-certify in various courses, as well as those new to the highway construction industry. Almost all courses have operating at or near capacity, and have focused on the primary topic areas of Basic Aggregates, Portland Cement Concrete, Hot Mix Asphalt, and Soils. Despite postponed and cancelled classes caused by inclement winter weather, nine courses were held during the first quarter in the primary topic areas, comprising more than one-third of those required by contractual agreement. Two additional courses offered certification in National Pollutant Discharge Elimination System (NPDES).

In January, CTTTP Online released its Basic

Aggregates refresher training on a trial basis. This course is currently under a second level of evaluation by AHTD, and will be available for full access during the summer of 2011. The course modules will be used to provide refresher certification to CTTTP technicians who have previously completed the Basic Aggregates course, but may also serve as a valuable resource for those seeking initial training. It is anticipated that this course will benefit highway construction personnel in Arkansas, as well as those in other states. Further adaptations of the modules are planned to serve local agencies and municipalities.

In addition to the online course module development, upgrades and modifications are continually being made to the CTTTP website. Although many of these changes have occurred "behind the scenes," they have already begun to significantly increase the efficiency and consistency of CTTTP programs. Many

of these changes have benefited the laboratory certification program by streamlining a number of the processes involved in laboratory inspections and reporting.

Members of the CTTTP team have also devoted significant attention to national training and specification organizations, including the American Concrete Institute, the Transportation Coordination Curriculum Council, and the American Society for Testing and Materials. Successful collaborations with the Arkansas Ready Mixed Concrete Association (ARMCA) and the American Concrete Institute (ACI) have resulted in numerous opportunities for students at the University of Arkansas and John Brown University to become certified technicians in concrete field testing methods. CTTTP has also assisted with the University of Arkansas' newly formed student chapter of ACI, which was recently recognized as an outstanding student chapter at the national ACI convention in Tampa, FL.

Kelvin Wang Receives Masters Award



Kelvin C.P. Wang, Ph.D., P.E.

Principal Investigator Kelvin C.P. Wang, Professor of Civil Engineering at the University of Arkansas was recently named by the Transportation and Development Institute (T&DI) of the American Society of Civil Engineers (ASCE) as the 2011 recipient of the Frank M. Masters Transportation Engineering Award.

The award citation reads: "For his innovative research

on automated pavement survey and data analysis technologies." The Frank M. Masters Transportation Engineering Award recognizes members of ASCE for the best example of innovative or noteworthy planning, design or construction of transportation facilities.

"This is a very distinct honor," said Kevin Hall, Executive Director of Mack-Blackwell Rural

Transportation Center (MBTC), "We are thrilled that Kelvin is receiving the recognition that he so richly deserves."

The award was presented during the T&DI Congress in Chicago, Illinois.



MBTC's Recently Completed Projects

Listed below are projects completed since our Fall 2010 newsletter. Full reports for these and all other completed MBTC projects are listed on our website at www.mackblackwell.org.

FEBRUARY 2011

MBTC DOT 3017
Practical
Recommendations for
Evaluation and Mitigation of
Soil Liquefaction in
Arkansas

Principal Investigator:

Brady Cox, Ph.D.
University of Arkansas

Distress Survey for Design
and Management

Principal Investigators:

Kelvin C.P. Wang, Ph.D.,
P.E. and Kevin D. Hall,
Ph.D., P.E.
University of Arkansas

Jamie A. Hestekin, Ph.D.,
Robert E. Babcock, Ph.D.,
and R.B. Beitle, Ph.D.
University of Arkansas

APRIL 2011

MBTC DHS 1105
Information Enhancement
Among Aviation Security
Partners

Principal Investigator:

Justin R. Chimka, Ph.D.
University of Arkansas

MARCH 2011

MBTC DOT 3016
AHTD Cracking Protocol
Application with Automated

MBTC DOT 3018
The Production of Butanol
Fuel from Renewable
Systems Using a
Membrane Assisted
Fermentation System

Principal Investigators:

MBTC Student of the Year

Shawn Griffiths was selected as the 2010 Mack-Blackwell Rural Transportation Center (MBTC) *Outstanding Student of the Year* for his research efforts that have led to the development of three new liquefaction triggering spreadsheets that are already being used by the Arkansas State Highway and Transportation Department (AHTD).

He was nominated by Dr. Brady Cox, who said, "I have come to learn that Shawn is self-motivated, and that I can trust him to be meticulous in his research. These attributes are invaluable to a

professor." Shawn has been working on MBTC project "Practical Recommendations for Evaluation and Mitigation of Liquefaction in Arkansas." The AASHTO LRFD Bridge Design Specifications indicate that "liquefaction of foundation soils [has] contributed to much of the damage" to bridges in historic earthquakes. The potential for a large earthquake in the New Madrid Seismic Zone (NMSZ) poses a real threat to transportation infrastructure in Arkansas, Missouri, Tennessee and Kentucky. Furthermore, only a few states in the nation have areas with higher earthquake-design

acceleration coefficients than NE Arkansas. This fact, coupled with the unusually deep, soft soil deposits found in the NMSZ, poses a real problem for designing economic and safe bridge foundations. Shawn's research is aimed at helping the Arkansas State Highway and Transportation Department (AHTD) update their liquefaction evaluation procedures so that bridge foundations can be designed with confidence.

MBTC congratulates Shawn on being our Student of the Year!



Shawn Griffiths receiving his award at the TRB awards banquet



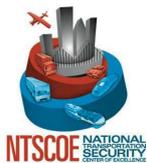
Jingjing Tong, graduate assistant and doctoral student in Industrial Engineering at the University of Arkansas, and Heather Nachtmann, Director of MBTC and Associate Professor in Industrial Engineering, received the 2010 Industrial Engineering Research Conference (IERC) Best Paper Award in the Homeland Security track. The Honors & Awards Banquet will take place at the conference in Reno, NV on May 23, 2011. Ms. Tong received her M.S. from Cardiff University, UK and her B.S. from Dalian Maritime University, China. She is currently conducting research with Drs. Heather Nachtmann, Justin Chimka, Ed Pohl and Tish Pohl. Their project, "Supporting Secure and Resilient Inland Waterways," is funded by the U.S. Department of Homeland Security. The award-winning paper is co-written by Jingjing Tong and Dr. Heather Nachtmann and is titled "A Review of Risk Assessment Models for Inland Waterway Transportation." The paper identifies the appropriate risk models that can be applied to inland waterways.

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The Research and Innovative Technology Administration (RITA) coordinates the U.S. Department of Transportation's (DOT) research programs and is charged with advancing the deployment of cross-cutting technologies to improve our Nation's transportation system and Mack-Blackwell is proud to be a participating university.



The Department of Homeland Security's National Transportation Security Center of Excellence (NTSCOE) is developing new technologies, tools and advanced methods to defend, protect and increase the resilience of the nation's multi-modal transportation infrastructure and education and training base lines for transportation security geared towards transit employees and professionals.

Kevin Hall, Ph.D., P.E.
Executive Director

Heather Nachtmann, Ph.D.
Director

Letitia M. Pohl, Ph.D.
Assistant Director
NTSCOE Program

Dana Williams, M.S.
Communications Director

Sandra Hancock CPS, M.S.
Fiscal Support Analyst

We're on the Web!

See us at:

www.mackblackwell.org

About Mack-Blackwell..

Stacy Williams came to the University of Arkansas (UA) to study engineering, although she almost majored in music. A friend said that music should be fun and that if it becomes your job, you risk losing sight of the fun. So she saved music for her fun thing and eventually settled on civil engineering. On a side note, she did actually march on the Razorback drumline and says, "It was FUN!"

After receiving her bachelor's degree in civil engineering, Stacy worked for Exxon Company USA. She says, "It was a great job that was jam-packed with experience and responsibility. I learned so much in a very short time." She was offered an early promotion, but instead decided to return to UA to pursue a master's degree in Civil Engineering.

There were opportunities in transportation at that time, and she felt fortunate to work

on a project that involved the implementation of the Superpave Asphalt Mixture Design System in Arkansas. As a master's student, she was selected as an Eisenhower Fellowship recipient and attended the TRB meeting in Washington D.C. After the presentation, she was encouraged to pursue a Ph.D. and she received her doctorate in Civil Engineering in December of 2001.

While working on her graduate degrees, the CTTT program was "born." She was one of the first performance test proctors, and assisted with the development of the original courses. During her Ph.D. program, Stacy served as an instructor for several of the primary courses, and had a role in developing the laboratory certification program. "Since I've been with the program from the very beginning, I feel passionate about its success

and am honored to now serve as the Director" said Stacy.

In 2008, she won the prestigious Fred Burggraf Award, which recognized excellence in transportation research by researchers 35 years of age or under.

Stacy is married to Jason Williams (whom she met in the asphalt lab during her graduate work!), a civil engineer with AHTD. They have been married for 13 years and have 2 wonderful children. McKayla, 8, is a 2nd grader and Brock, 5, is in kindergarten.



Brock, McKayla, Jason and Stacy Williams

DHS Annual Summit

The Department of Homeland Security hosted the Fifth Annual DHS University Network Summit in Washington, DC, from March 30 to April 1, 2011. The theme for the Summit was "Catastrophes and Complex Systems," with a focus on the role of transportation systems in preventing, mitigating, responding to, and recovering from natural or manmade disasters.

Assistant Director Tish Pohl represented MBTC at the Center of Excellence Directors' meeting on March 29 and throughout the Summit, as representatives from academia and government discussed three main topics: terrorist attacks on transportation systems,

natural disasters, and the transportation system's role in response and recovery. MBTC Director Heather Nachtmann was selected and served as a panelist. Her presentation was entitled "The Inland Waterway Transportation Systems' Role in Response and Recovery."

Three University of Arkansas students, Hugh Medal, Jessica Spicer and Dia St. John, attended the Summit and participated in Student Day on March 29. Hugh and Jessica were selected from a nationwide pool of applicants to present their research and serve as panelists during Student Day. Hugh spoke on "Infrastructure Protection and Positioning of Supplies for



Heather Nachtmann and Tish Pohl at DHS Summit

Disaster Relief," which is based on research conducted with Industrial Engineering faculty members Ed Pohl and Chase Rainwater. Jessica's topic, "Mitigating Risk in Multi-Modal Perishable Commodity Supply Chain Networks," is a research project directed by Ed Pohl, Chase Rainwater and Industrial Engineering Assistant Professor Ashlea Bennett.