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Mack Nuggets, Fall 2008

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Mack Nuggets

Mack-Blackwell Site Visit and Annual Advisory Board Meeting

Featured Stories

- Site visit & AAB
- High Speed Rail Network Project
- Student Poster Award



Stakeholders discuss the future of MBTC in a strategic planning meeting.

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This November MBTC hosted our Annual Advisory Board Meeting in conjunction with a site visit from USDOT. Members of the USDOT/RITA site visit team were Director Curtis Tompkins of the UTC program, University Programs Specialist Lydia Mercado, and Program Analyst Denise Dunn. The site visit team visited with members of university research support, MBTC researchers, students, and research partners as well as toured the MBTC facilities. Director Dan Flowers of Arkansas State Highway and Transportation Department (AHTD) and Research Engineer (AHTD) Mark Bradley traveled from Little Rock to meet with the site visit team to discuss the partnership between MBTC and AHTD.

The evening began with a dinner reception to kick off the start of the Annual Advisory Board meeting and gave the site visit team a chance to visit with MBTC Advisory Board members in a relaxed setting before getting down to business the next day. Executive Director Kevin Hall presented Director Heather Nachtmann with a plaque that recognized her many contributions to the center.

In addition to several of our board members, other meeting participants included Operations Research Analyst Gia Harrigan with the Office of the Undersecretary at the US Department of Homeland Security (DHS) Science and Technology (S&T) and Field Representative Lou Keller with the Office of Senator Mark Pryor. The morning

was spent providing an update of MBTC's activities and highlighting the research projects that were completed during the past year. Prior to breaking for lunch, a student poster session was held to spotlight student participation in MBTC (see page 6 for details).

The afternoon was a very informative session when Kevin Hall and Heather Nachtmann led a strategic planning session. Many new and innovative ideas were brought up during this session including how advisory board members and outside partners could help in the future of MBTC. The two day session was wrapped up, and everyone is looking forward to the many new endeavors this year will bring.

Message from the Director



Dr. Heather Nachtmann

As you read in our feature article, MBTC had the pleasure of hosting Curt Tompkins, Lydia Mercado, and Denise Dunn from RITA this November. Their site visit, coupled with our 2008 Annual Advisory Board meeting, provided us with a great opportunity to showcase the current efforts of our faculty and students. The USDOT delegation met with twenty-eight members of the MBTC team including university research support, panels of faculty and students, and the Director of the Arkansas State Highway

and Transportation Department. Their visit culminated with dinner with our advisory board members and other MBTC stakeholders. The highlight of our advisory board meeting was a three hour strategic planning session we held with our board members. This session provided us with great insight towards the future plans of MBTC.

In addition to our customary research and educational efforts, our fall semester was busy with our distinguished lecture series and participation in

Arkansas' first Construction Career Day. We are also working hard to kick off our efforts as a member of the Department of Homeland Security's Transportation Security Center of Excellence.

Thank you for taking the time to read about our fall activities. All of us at MBTC wish you a happy and healthy holiday season. Travel safe!



A Nationwide High-Speed Rail Network for Freight Distribution

"This research utilized the results of technology-feasibility tests and addressed the problem of designing such a network, as well as analyzing its maximum impact on the current highway system."

Dr. Russell D. Meller of the University of Arkansas and Dr. Kevin Gue of Auburn University think they know a way to address the problem of rapidly growing congestion on America's highways. Highway congestion today results in an estimated cost of \$7.8B in lost productivity annually and is expected to grow.

The specific objective of MBTC Project 2087/3001 was to explore the maximum impact of instituting a high-speed rail network for freight distribution. This research utilized the results of technology feasibility tests and addressed the problem of designing such a network, as well as analyzing its maximum impact on the current highway system. The

model created by the researchers showed that with sufficient capacity and associated investment, a high-speed network for freight distribution will have a significant impact on freight transit times and on highway congestion, with the potential to address many of the challenges facing transportation today. For example, a 20,000-mile network (approximately half the length of the present U.S. interstate highway system) that utilizes current Maglev technology and proposed 6-minute headways would make it advantageous for a majority of the freight traffic to utilize the high-speed network. And although such a network would require a significant investment of \$760B to \$2.8T (using current cost

estimates of \$38M - \$140M per mile), this investment would lead to an estimated 38% reduction in overall freight transit times. Perhaps more importantly to the public, it would also precipitate a net 78% decrease in annual total truck highway miles driven.

Dr. Meller said that to completely fund the high-speed rail network would be a huge investment (trillions of dollars) but "it would reduce the time for freight by 40% and the number of trucks on our highways by 80%." He will be presenting their research at the Maglev 08 conference in San Diego.

For the complete report, visit the research page at www.mackblackwell.org.



Model of a 20,000-mile nationwide high-speed rail network.

Distinguished Lecture Series

The fall semester brought two great lectures. The first was our annual civil engineering career orientation program, "Evening with the Pros" presented in conjunction with the AHTD. The program was held on September 11, 2008 in the Combs Auditorium in the Bell Engineering Center.

This year's emcee was Mike Marlar, P.E., President of Marlar Engineering of North Little Rock. The speakers for the evening were Sherman Smith, P.E., Director of Pulaski County Public Works, Robert Seay, P.E., City Engineer for the City of Hot Springs, Charles Clements, P.E., Division Head, Roadway Design, AHTD, Natalie Becknell, P.E., Project Engineer at Garver Engineers who received her MSCE in 2005 from the University of

Arkansas, and Bill Staggs, P.E., Chief Engineer at North Little Rock Wastewater Utility.

The topics varied from an overview of engineering that went into the space race and landing on the moon to things you need to know other than math.

The second lecture this fall was given by Wallace F. Forbes, CFA, President of the Forbes Investors Advisory Institute. This lecture was presented on October 23, 2008. Mr. Forbes discussed the many opportunities available to engineers in many areas. He gave himself as an example of having a bachelor degree from Princeton in civil engineering and later attending Harvard Business School and earning his MBA. He is both a successful civil

engineer as well as a financial analyst.

Many of the students had questions as to what he thought about our nation's financial future. Mr. Forbes was able to encourage everyone that he felt this downward turn would not last for long and for everyone to keep a positive outlook and continue with their education.



Bob Walters and presenters Robert Seay, Natalie Becknell, Bill Staggs, and Mike Marlar take questions from students.



Wallace F. Forbes, CFA



Forbes with MBA students from the Walton College of Business.

Washington Makes a Stop at MBTC

Congressmen John Boozman and Mike Ross recently made a stop by MBTC for a briefing on the proposed SEERlab (Structural Engineering Education and Research Laboratory), which will complement existing laboratories in computational modeling and structural modeling/simulation.

Kevin Hall, MBTC Executive Director and Department Head of Civil Engineering, gave an overview on the needs and

benefits of such a lab in the central part of the US. Currently, there are few facilities in the US to apply controlled wind-load, seismic, and other forces to full-scale buildings/infrastructure. The SEERlab would also lead the development of the next generation of engineers with the knowledge and tools to better manage, maintain, secure and preserve the nation's vital civil infrastructure systems as well as provide workforce training for professionals

charged with inspecting, monitoring, maintaining and constructing this infrastructure.

Dr. Hall estimates it could take approximately \$15M and 6 years to fully deploy SEERlab. Congressmen Boozman and Ross both toured the facilities at CTPP and were impressed with the progress being made through MBTC's research, training, and technology transfer efforts.



L to R – Congressman Mike Ross, Dean of Engineering Ashok Saxena, Congressman John Boozman, MBTC Executive Director Kevin Hall tour facilities at CTPP along with researchers.

Center for Training Transportation Professionals

The Center for Training Transportation Professionals (CTTP) continues their efforts toward training transportation professionals. The center has recently offered several pilot courses and is reaching out to students in high schools and vocational schools to peak their interest in the construction field.

In September, CTTP participated in the Construction Career Day (a national event) that was held locally at Northwest Technical Institute in

Springdale, Arkansas. Hundreds of high school students attended this event and were able to literally sink their hands in concrete.

Some of the specialized courses CTTP offers are Concrete Patching (pilot completed and available upon request), Concrete Strength Testing (FYI - AHTD technicians performing strength tests on concrete must be certified by January 2010), and Erosion Control Pilot Course. The Erosion Control Pilot Course will be repeated in January

due to the high level of interest with the first "regular" class in February.

CTTP also hosted the Stream Stability and Bridge Scour course in October. The class was a success and CTTP plans to offer the second part of the pilot course in March 2009 by request.

The staff of CTTP continues to work on updating their website and hopes to have it consistent with the rest of the University's websites in the near future.

Construction Career Day

September brought many students from the area to Northwest Technical Institute (NTI) in Springdale, Arkansas for the first annual Construction Career Day. This was the first of its kind in NW Arkansas and the intent of the expo was to interest 10th, 11th and 12th graders in the opportunities available in the construction industry. Approximately 400 students attended the event. With the average construction worker's age nationwide approximately 48, retirement for them could occur between 2010 and 2015 and the need to

fill those jobs will be high.

Participants set up a variety of heavy equipment on the grounds of NTI with CTTP's and MBTC's among the favorites. Dr. Brady Cox, P.E. brought the "shaker truck" which simulates an earthquake and can be used in various other studies such as evaluation of the behavior of a full-scale pavement test on sections of highway. CTTP brought self-leveling concrete for the students to mix and create their own personal coasters. This demonstration allowed the

students to see how the process works as well as made it fun for them as they decorated and personalized their coasters with several beads available. The students commented that this was the best booth as it allowed them be creative as well as take something home with them to show their parents. Quite a few of the students had already worked summer jobs in the construction field and planned to continue in this field after graduation.

Heather Nachtmann, MBTC Director, was recently selected as a 2008 Trendsetters by *Public Works* magazine. Dr. Nachtmann, along with her colleague, Dr. Edward Pohl, concluded that risk-based urban transportation assessments cannot simply be applied to rural transportation assets. Her team provided rural networks with a tool to perform risk assessments of their infrastructure assets. Congratulations on the great work!



Students working in the concrete lab.



"The average construction worker's age nationwide approximately 48, retirement for them could occur between 2010 and 2015 and the need to fill those jobs will be in high demand."



Students visit the CTTP booth and the "shaker truck."

MBTC's Recently Completed Projects

Listed below are projects completed since our Spring 2008 newsletter. Full reports for these and all other completed MBTC projects are listed on our website at www.mackblackwell.org/web/research/all-projects.htm.

JUNE 2008

MBTC – 2047
WebShipCost – A
Geographical Information
System for Waterway
Utilization
Principal Investigators:
Manuel D. Rossetti, Ph.D.,
P.E. and Heather
Nachtmann, Ph.D.,
University of Arkansas

MBTC – 2073
Effects of Frontage Road
Conversion
Principal Investigator:
J.L. Gattis, Ph.D., P.E.
University of Arkansas

MBTC – 2061
Risk Modeling, Assessment
and Management
Principal Investigator:
Edward A. Pohl, Ph.D.
University of Arkansas

MBTC – 2063
Highway Collision Warning
Technology: Determination
of Criteria for Detecting and
Logging Hazardous Events
in Tractor-Trailer Safety
and Training Programs
Principal Investigators:
Roy McCann, Ph.D.
University of Arkansas

MBTC – 2066
Surface Friction
Measurements of Fine-
Graded Asphalt Mixes
Principal Investigator:
Stacy Williams, Ph.D., P.E.
University of Arkansas

MBTC – 2075
Non-Nuclear Methods for
HMA Density
Measurements
Principal Investigators:
Stacy Williams, Ph.D., P.E.
University of Arkansas

MBTC – 2084
Development of an
Intermodal Container Load
Status and Security
Monitoring System
Principal Investigator:
Roy McCann, Ph.D.
University of Arkansas

JULY 2008

MBTC – 2098/3005
A Model-Based Risk Map
for Roadway Traffic
Crashes
Principal Investigator:
Chang S. Nam, Ph.D.,
CHFP and Joon J. Song,
Ph.D.
University of Arkansas

MBTC – 2086
Routing Models for Rural
Networks with Time-
Varying Constraints
Principal Investigator:
Scott J. Mason, Ph.D.,
Russell D. Meller, Ph.D.,
Edward A. Pohl, Ph.D.
University of Arkansas

MBTC – 2071
Prestress Losses in
Prestressed Bridge Girders
Cast with Self-
Consolidating Concrete
Principal Investigator:
W. Micah Hale, Ph.D., P.E.
University of Arkansas

AUGUST 2008

MBTC – 2088
Applications of GIS and
Operations Research
Logistics Planning Methods
for Arkansas Rural
Transportation Emergency
Principal Investigator:
Manuel D. Rossetti, Ph.D.,
Ph.D., Edward A. Pohl,
Ph.D., Fred Limp, Ph.D.
University of Arkansas

MBTC – 2087/3001
A Model to Design a
National High-Speed
Network for Freight
Distribution
Principal Investigator:
Russell D. Meller, Ph.D.,
University of Arkansas
Kevin R. Gue, Ph.D.
Auburn University

MBTC – 2089
Development of a Soft
Ground Arrestor System
Principal Investigator:
W. Micah Hale, Ph.D., P.E.,
Ernest P. Heymsfield,
Ph.D., P.E.
University of Arkansas

MBTC – 2083
Human Factors Study of
Driver Assistance Systems
to Reduce Lane Departures
and Side Collision
Accidents
Principal Investigator:
Steven L. Johnson, Ph.D.,
P.E., C.P.E.
University of Arkansas

SEPTEMBER 2008

MBTC – 2056
Applicability of
Microelectronic and
Mechanical Systems
(MEMS) for Transportation
Infrastructure Management
Principal Investigator:
Kelvin C.P. Wang, Ph.D.,
P.E.
University of Arkansas



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DOT invests in the future of transportation through its University Transportation Centers Program, which awards grants to universities across the United States to advance the state-of-the-art in transportation research and develop the next generation of transportation professionals.



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.

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

Heather Nachtmann, Ph.D.
Director

Jack Buffington, P.E.,
RADM (Ret.)
Associate Director

Dana Ledbetter
Communications Director

Sandra Hancock CPS
Accountant

We're on the Web!

See us at:

www.mackblackwell.org

About Mack-Blackwell...

In our last issue, Dr. Walter LeFevre gave us an overview of how MBTC started.

In keeping with this theme, I thought I would introduce you to our Associate Director, Jack Buffington. Many of you who read this are acquainted with Jack.

Jack came to the University of Arkansas in 1996 after retiring as a Rear Admiral having

served 34 years in the Naval Civil Engineers. Jack rose to the position of Chief of Engineers for the Navy as well as representing the 24,000 active and reserve Seabees in the Navy. He has worked in over 20 foreign countries with experience from design through construction. He has experience responding to natural disasters and has worked with foreign governments

at all levels. His experience also extends to serving four years in Washington while in the Navy. Jack is a member of the National Academy of Engineers (NAE) and National Academy of Construction (NAC).

Jack is the Commander in Chief of MBTC, and we are extremely grateful for his leadership, intelligence and experience in guiding the center.

Jack Buffington Student Poster Award

The competition for the 2nd Annual Jack Buffington Student Poster Award was extremely tight. There were eight entries that ranged from posters on biodiesel fuels to waterways to bicycle trails.

Andy Tackett, a graduate student in civil engineering, won the recognition and \$50 prize for his poster on MBTC 3012 *Examining the Effects of Mixer Type and Temperature on the Properties of Ultra-High Performance Concrete*. His advisor, Dr. Micah Hale, said this project is the focus of his dissertation.

Other participants were: Brandon Curry and Christina Young for MBTC 3013 *Accelerated Characterization of Full-Scale Reinforced Flexible Pavement Models Using a Vibrosesis*.

Jun Jia for MBTC 3011 *Improving Forced Transfer and Special Needs Busing in Rural Public Schools*.

Hugh Medal for MBTC 2086 *Routing Models for Rural Transportation Networks with Time-Varying Constraints*.

Shanique Murray for MBTC 2095/3004 *Potential Applications of Nanotechnology for Improved Performance of Asphalt Pavements*.

Josh Robinson and Alex Lopez for MBTC 3009 *Economies of a Two-Step Biodiesel Process Involving Supercritical Methanol Esterification*.

Austin Sharp for MBTC 3008 *Emergency Response via Inland Waterways*.

Shannon Wallace for MBTC 3010 *A Cost-Driven Policy Approach for Development of On-Street and Off-Street Bicycle, Multi-Use and Single-Use Paths and Related Facilities*.

The award, given at the Annual Advisory Board Meeting, is named in honor of Jack Buffington for his years of service to students and MBTC.



L to R: MBTC Executive Director Kevin Hall, Director Heather Nachtmann, Andy Tackett, and Associate Director Jack Buffington.