University of Missouri-Rolla

UTC NEWS

Spring 2006 *Volume 1, Issue 3*

University Transportation Center

INSIDE...

Pankow Award	2
Geotech Conference	2
Women's Lock-In	3
UMR Earthquake Research	3
Pre-College Initiative Program	4
UTC Student Support	4
Smart Bridges	5
More MEP news	6

A NOTE FROM THE DIRECTOR

It seems impossible to believe, but three months have passed since I wrote my last editorial, and there are already unmistakable signs of spring in the air. Spring means green, and green means Saint Pat's. It was interesting to see what follies UMR students came up with this year.

On more serious matters, the first item of relevance I wish to touch upon is the recognition and success obtained by the Greene County bridge construction featured in an article written in Volume 1, Issue 1. Not only did we have a remarkable opening day ceremony led by Representative Roy Blunt, but we were also informed that the project makes UMR one of the two finalists for the Charles Pankow Award for Innovation (see story on page 2). Opening day was special for many reasons, and one of them was the opportunity to spend time with UMR friends and alumni such as Vernon Jones (see picture).

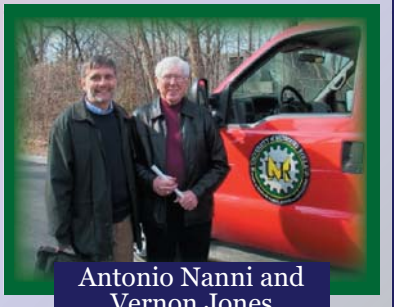
Other items of relevance related to the center are the continuous efforts towards the definition of the research agenda for the years to come. We have made excellent progress via meetings and communications within and outside the university towards the creation of a "Hydrogen Center," an activity that would see a major investment of our UTC resources. Among other R&D and technology transfer activities, the new Center of Excellence would contribute to the design, testing, and evaluation of a model large-scale demonstration of alternative -fuel vehicles as they exist in the rural, suburban, and urban communities of Missouri. The program would be called "Show Me the Road to Hydrogen."

We have also met with MoDOT officials to discuss activities in the area of structures. As we identify needs and opportunities at the state level, we must remain cognizant of a broader, national agenda. To this effect, FHWA has developed a "Bridge Program Strategic Plan" that provides the focus and road map for the future (for more information, contact Ian M. Friedland, Technical Director for Bridge and Structures R&D at 202–493–3023 or ian.friedland@FHWA.dot.gov).

Finally, during this quarter UMR has received official notification from the Research and Innovation Technology Administration (RITA) of the US DOT of the National UTC award. This notification means that funding becomes one step closer! Send us proposals—the opportunities you have for matching non-federal dollars with UTC dollars will not last forever.

To colleagues in the university setting and students, best wishes for a successful conclusion of the spring semester; to all others, keep on working hard.

--Tony



Antonio Nanni and Vernon Jones

UPCOMING EVENTS

ASCE Structures Congress on Structural Engineering and Public Safety

May 18–20, 2006

St. Louis, MO

content.asce.org/conferences/structures2006

Artificial Neural Networks in Engineering (ANNIE) Conference

November 5–8, 2006

St. Louis, MO

web.umr.edu/~annie

Sixth International Conference on Case Histories in Geotechnical Engineering* *and symposium in honor of professor James K. Mitchell*

August 4–9, 2008

Washington D.C.

www.6icchge2008.org

*See story on page 2

Phone: 573.341.4497
Fax: 573.341.6215

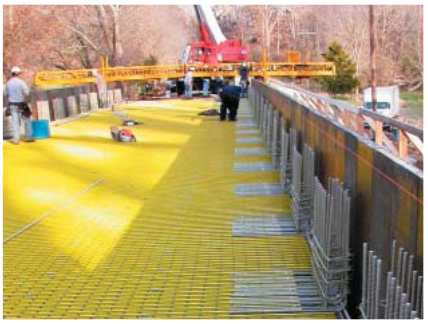
University Transportation Center
Center for Infrastructure Engineering Studies
University of Missouri-Rolla
223 Engineering Research Laboratory
Rolla, MO 65409–0710

E-mail: cies@umr.edu
http://www.utc.umr.edu

UMR

The Charles Pankow Award

UMR's Greene County bridge project (see story in Volume 1, Issue 1) has been chosen as one of two finalists for the 2006 CERF Charles Pankow Award for Innovation. This award recognizes organizations working collaboratively to bring innovative civil engineering ideas into practice. Candidate projects for the Pankow Award must meet three main requirements: showcase the transition of innovative technologies from Research and Development (R&D) to field implementation, involve collaborative research and implementation, and show a significant impact on construction industry performance. UMR's submission, called GRIDFORM, successfully met the qualifications for this award.



Construction of Greene County Bridge

GRIDFORM is a prefabricated Glass Fiber Reinforced Polymer (GFRP) reinforcement and integrated stay-in-place (SIP) formwork system for the accelerated construction of corrosion-free concrete bridge decks. Following an articulated R&D program, the solution was successfully implemented in the renewal of an actual bridge in Greene County, MO, (see picture) that was in serious need of structural rehabilitation.

While the Pankow Award requires recipients to show collaboration between two out of three categories (academia, industry, and government), UMR showcased extensive and effective collaboration among all three. The project was a joint effort between UMR, the University of Wisconsin-Madison; the Greene County Highway Department; Great River Engineering of Springfield; Hartman Construction; Strongwell Corp.; Hughes Brothers, Inc.; and MoDOT.

The GRIDFORM solution was proven to have a significant impact because it showed over a 70 percent reduction in time for deck reinforcement installation (reduced from 2–3 weeks to 3 days), over a 75 percent reduction in deck construction labor cost, a 50 percent increase in concrete placement productivity, enhanced durability, and significantly improved safety and working conditions.

Everyone involved with this project is very excited about the recognition of this innovative design; UMR is extremely privileged to be considered for this prestigious award. The OPAL Awards Gala is to be held at the Ronald Reagan Building and International Trade Center Atrium in Washington, D.C., on April 26, 2006. For more information on this exciting event, please contact cies@umr.edu.

Ribbon Cutting Ceremony for the New Bridge

International Geotech Conference

Dr. Shamsher Prakash is currently planning for the 6th International Conference on Case Histories in Geotechnical Engineering, which will take place in 2008. He has been coordinating this innovative conference since 1984 and is supported by UTC.

This conference is special for many reasons. It started as a way to showcase the newest and hottest topics in the field and continues to do so. The 2008 conference will feature speakers (for the "state of the art and practice" portion) on topics like Hurricane Katrina and levees, piles in liquefiable soil, and soils in outer space.

Accordingly, this conference is a way to bring academics and practitioners from around the world together to share knowledge. In addition to having both North American and international speakers, 38 to 45 percent of the attendees will come from overseas.

Every conference honors one special person with a symposium. The 2008 conference will honor Dr. James K. Mitchell, retired chairman of the civil engineering department at University of California-Berkley and retired Virginia Tech emeritus distinguished professor. This accomplished professor has supervised 73 doctoral dissertations in his lifetime. The symposium provides two opportunities. First, six of Dr. Mitchell's prior students (from the U.S., U.K., and Turkey) will discuss what they learned while working with him, and how he influenced their research and ideas. Dr. Mitchell will then discuss his "most memorable" research project and how it may help the young engineers and students.

Lastly, the conference will feature a special lecture by the senior most respected geotechnical engineer in the world, Professor Ralph Peck, who is 93 years old.

For more information about this conference, check out the Web site at http://www.6icchge2008.org.

Women in Science and Engineering

Girls Get "Locked-In" to UMR

The Women's "Lock-In" at UMR was held on October 14–15, 2005 and March 10–11, 2006. This program is held twice each year, with the UMR's Women In Science & Engineering program (WISE) and the Society of Women Engineers student chapter hosting the two-day campus program for 30 high school junior and senior women at each Lock-In. The program is designed to give the clearer picture of science, technology, engineering, and math (STEM) careers as part of a caring and enabling profession. The young women got to "camp-out" in one of the university residence halls with other female UMR students and participate in staff and faculty discussions on how women succeed in the STEM fields. The program also included departmental lab visits, sessions to acquaint students with college study issues, financial aid and scholarship opportunities information, and details about the college admission process. The girls participated in fun, hands-on learning activities and learned what kind of jobs, salaries, and benefits come with STEM degrees.

"We are trying to continue to increase the number of female students in the fields of science, engineering, math, and technology at UMR," says Cindi Vogt, coordinator of UMR's WISE program. The program prepares junior and senior high school girls for college and also gives them a better understanding of what it will take to pursue engineering or science as a profession, Vogt explains. Trenisha Ford, a senior from Kansas City, MO, participated in the program and when asked how valuable the Lock-In conference was said, "I loved the conference. I learned a lot about UMR and about the different engineering majors." Elizabeth Perry, a senior from High Ridge, MO, who was also asked the same question said, "I learned a lot. It was a real eye opening experience."

The Lock-In was sponsored by UMR's University Transportation Center, Women In Science & Engineering program, MSM-UMR Alumni Association, Student Council, and USG.

Technology Transfer

UMR's Earthquake Research Team

A UTC-supported team from UMR will soon participate in a $1.42 million, 4-year, 5-university research project funded by the second phase of the National Science Foundation's (NSF) George Brown Jr. Network for Earthquake Engineering Simulation (NEES). Dr. Abdeljelil Belarbi heads up UMR's team and the collaboration efforts with the four other universities. This project has a scope from very local (as UMR is close to the New Madrid fault line) to very international (eventual collaboration with earthquake engineers worldwide).

Specifically, the project will study the complex loading that can occur in bridge structures during earthquakes. The end results should help engineers and designers build safer bridges that are better able to survive earthquakes. The UMR team will head up the effort to research an optimal design for the bridge columns that will enable them to withstand a large earthquake.

The other universities participating are University of Nevada-Reno (lead), University of Illinois-Urbana Champaign, University of California-Los Angeles, and Washington University-St. Louis. Researchers from the five universities will be able to collaborate through the NEES state-of-the-art technology (an Internet2 "cybersystem"). This network will allow remote testing and technology transfer. In addition, researchers from around the world can have access to real-time experimental results from the labs at UMR.

For more information about this research effort, contact Dr. Belarbi at belarbi@umr.edu or 573–341–4478.

National Society of Black Engineers host a Pre-College Initiative Program

Sixty-three high school students from Kansas, St. Louis, Waynesville, and Dallas, TX areas attended the camp, which is a nationwide outreach program to generate more interest in science, technology, engineering, and mathematics among traditionally underrepresented student populations.

"The Pre College Initiative (PCI) is a great opportunity to showcase our well-known science, technology, and engineering programs to high school students," says J.P. Fransaw, coordinator of the Minority Engineering and Science Program at UMR. "It was very busy weekend for the students, but they seem to really enjoy the experience."

The PCI included lectures from UMR faculty, hands-on science projects, engineering workshops, academic discussion groups, interaction with alumni and staff members, and tours of campus facilities.

"This program is organized for students by students. I am especially proud of Daniel Edwards (freshman, PCI Chair), he worked hard to organize this event," says Fransaw.

Those selected to participate in the camp have expressed an interest in pursuing a higher education degree in a science, technology, engineering, or mathematics field. High school transcripts are reviewed before students are selected for the camp.

The camp is sponsored by the National Society of Black Engineers, John Deere, the Minority Engineering & Science Program (MEP), UTC, African American Recruitment and Retention Committee, Phelps County Bank, and the UMR Bookstore.

UTC Student Support

Do you love doing research? Are you interested in your efforts making a meaningful, nationwide contribution? If so, read on!

The University Transportation Center at UMR is uniquely positioned to offer significant opportunities to individuals interested in solving critical national transportation issues. Following are several doctoral degree options that could include a UTC research assistantship:

- Chemical and Biological Engineering
- Civil, Architectural, and Environmental Engineering
- Computer Science
- Electrical and Computer Engineering
- Engineering Management and Systems Engineering
- Information Science and Technology
- Manufacturing Engineering
- Materials Science and Engineering
- Mechanical and Aerospace Engineering

More specifically, UMR-UTC will support activities related to the goals and needs of US and State Departments of Transportation.

Applicants will need to apply for graduate admission, apply for financial support, send official transcripts from all undergraduate and graduate schools attended, send official GRE scores, send official TOEFL score, present copies of journal and refereed conference papers, send three letters of recommendation, pay a $50 application fee, and provide a statement of purpose.

For more information, visit http://www.utc.umr.edu or contact Dr. K. Krishnamurthy at 573–341–4151 or soe@umr.edu.

Remote Health Monitoring of the First Smart Bridge in Florida

Principal Investigator Ashraf Ayoub, Ph.D. and Graduate Student Ebrahim Mehrani

Monitoring of civil engineering structures is an emerging area that has gained significant attention recently and has become a topic of extreme national interest. This area is being driven by the societal and economic need to develop efficient condition assessment procedures for structural performance. The main goal of monitoring is to accurately and efficiently detect structural damage from long-term deterioration processes or from extreme events (*e.g.*, earthquakes, blasts).

With the emergence of new technologies, structures can now be monitored remotely from a central monitoring station located several miles away from the field. Sensors are placed at several critical locations along the structure, and they send structural information to the central station. The structure is thus thought of as an intelligent or smart system that is capable of sending information and providing warnings before any major failure. This remote capability allows immediate damage detection, so the necessary actions to ensure public safety are taken. A schematic diagram of the remote health monitoring system is shown in Figure 1.

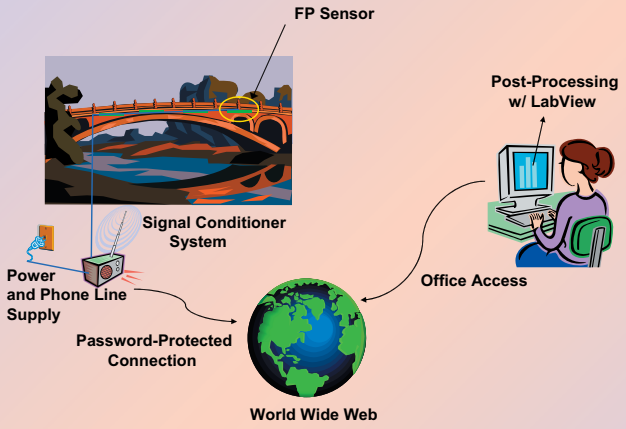


Figure 1. Remote Health Monitoring System

This research involves the development, construction, and testing of the first smart bridge structure in Florida, the East Bay bridge over Bullfrog Creek in Gibsonton, Hillsborough County. Fiber Optic Fabry-Perot (FP) smart sensors were both surface-mounted to the concrete and bonded to the deck reinforcing bars during the construction phase of the bridge. A plan view of the FP sensors embedded and protected on the deck is shown in Figure 2.

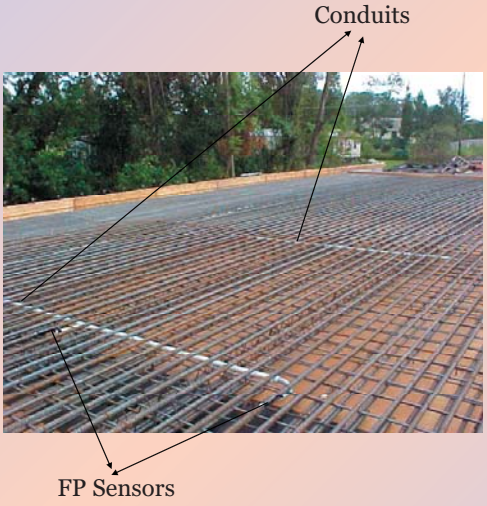


Figure 2. Plan View of FP Sensors

The smart sensors are currently being connected to a data acquisition system permanently installed on site. The acquisition system can be accessed through remote communication with DSL lines, which permits the evaluation of the bridge behavior under live traffic loads. Currently, live structural data under traffic loading is being transmitted continuously to the county maintenance office. Figure 3 shows the data acquisition system.

The overall cost of the acquisition system used in this project was around $14,000, which accounts for less than 1 percent of the overall cost of the bridge ($1.5 Million). The acquisition system weighed only 10 lbs, which makes it ideal for field monitoring.

The technology developed will enable practical, cost-effective, and reliable maintenance of bridge structures, and the study will provide a unique opportunity for future growth of this technology within the state of Florida and beyond.

Figure 3. "Smart Box" Data Acquisition System

Bus Trip to Pennsylvania

MEP and UTC sponsored a bus trip for 22 high schoolers and 24 college students to the National Society of Black Engineers (NSBE) 32nd Annual National Convention. The convention took place March 29–April 2, 2006 (conveniently during UMR's spring break), in Pittsburgh, Pennsylvania. This year's convention adopted the theme of "Building the F.I.R.E.—Foundation to Impact, Revitalize, and Empower" and included special speakers, workshops, entertainment, and even a career fair. In addition, four individual conferences were held for the benefit of the various groups of attendees: The International Mini Conference, The Graduate School Conference, The Pre-College Conference, and the Technical-Professional Conference.

The UMR group benefitted from the convention, but also benefitted from the learning, camaraderie, and mentoring that took place within the group on the long trip to Pittsburgh. Jacques Fransaw, coordinator of MEP, was excited for the opportunity for the high school students to be exposed to successful college students in engineering-related fields. High school students need to be encouraged by professionals and teachers, but value exists in being encouraged by the students' peers as well. Fransaw was also extremely excited for the college students to learn about graduate schools and career opportunities and even have the opportunity to network with current industry professionals.

Overall, the convention was a complete success, and was a fun spring break experience for all involved.

Special Announcement

The Minority Engineering and Science Program (MEP) is pleased to announce that Dr. Antonio Nanni will be named this year's honorary member of the 3.0 Club. The 3.0 Club recognizes UMR minority students who have achieved a grade point average at or above a 3.0. Dr. Nanni will receive the honorary member award at the 3.0 Club Banquet, which serves to recognize students' academic achievements and to thank those faculty, staff, and companies who contribute to their successes. Each student is rewarded for his or her academic success by receiving a 3.0 T-shirt, certificate, jacket, bag, or lapel pin.

The 3.0 Club Banquet is scheduled to take place on April 28, 2006, at 5:30 PM. For more information on the banquet, the 3.0 Club, or MEP, please visit http://campus.umr.edu/mep, call 573–341–4212, or e-mail mep@umr.edu.

Current UTC Staff

Nanni, Antonio
Director
nanni@umr.edu

Nystrom, Hal
Assoc. Director
nystrom@umr.edu

Spitzmiller, Gayle
Admin. Assistant
spitz@umr.edu

Massmann, Rebekah
Editorial Assistant
massmann@umr.edu

Myers, John
Assoc. Director
jmyers@umr.edu

Galati, Nestore
Research Scholar
galati@umr.edu

Sherman, Abigayle
Senior Secretary
abigayle@umr.edu

Cox, Jason
Sr. Research Specialist
coxjn@umr.edu

Watkins, Steve
Assoc. Director
watkins@umr.edu

Bastianini, Filippo
Adjunct Professor
fbroptic@umr.edu

Geisler, Cheryl Ann
Secretary
geislerc@umr.edu

Hernandez, Travis Martin
Lab/Research Technician
travi@umr.edu