The NEXTRANS Center is a Regional University Transportation Center funded by the U.S. Department of Transportation’s Research and Innovative Technology Administration (RITA) to implement a multidisciplinary program of transportation research, education, and technology transfer. The Center’s theme is to develop integrated and innovative solutions to transportation challenges by explicitly studying the interactions between vehicle, traveler, and infrastructure.

WINNERS SELECTED IN SECOND INDIANA HIGH SCHOOL ESSAY COMPETITION

The NEXTRANS Center is pleased to announce the winners of the 2010 NEXTRANS Indiana High School Essay Competition. Winning essays were chosen blindly by a panel of transportation scholars, Purdue University Discovery Park officials, and the NEXTRANS Center staff. More than 60 students from across the state participated in this year’s contest.

Matthew Prall, a senior at Columbus North High School in Columbus, Indiana, was awarded the $500 first place cash prize for his essay, “Creative Solutions to the Challenges Facing Indiana’s Automotive Industry.” Matthew is a participant in many extracurricular and community activities including: National Honor Society, Robotics Club, Science Olympiad, Columbus North High School tennis team, and Bartholomew County Youth Leadership. Following graduation, Matthew plans to attend college to study mechanical engineering.

Sarah Torline, a senior at Shawe Memorial High School in Madison, Indiana, received the second place prize of $250 for her essay about funding opportunities and sustainability of infrastructure in Indiana. Sarah is a member of National Honor Society and the varsity girls’ cross country and track teams. She is also student council president and an avid traveler; following a trip to Spain in 2010, Sarah will spend two weeks in France this summer. This fall, Sarah plans to attend Indiana University - Purdue University Indianapolis (IUPUI) to study psychology and linguistics.

Jacob Rogers, a sophomore at North High School in Evansville, Indiana, was awarded $100 for his third place entry, “Dedicated Truck Lanes on Interstate 70 Corridor.” Jacob’s hobbies include playing and watching sports, playing guitar, and spending time with friends. In school, his favorite subjects are principles of engineering, geography, world history, chemistry, and Spanish.

Diamond Hubbard, a freshman at the Hammond Academy of Science and Technology in Hammond, Indiana, and Zack Vanness, a senior at Benton Central Junior-Senior High School in Oxford, Indiana, received honorable mentions for their essays. Edited excerpts of the three winning essays can be read on pages 6-7. Congratulations to all students!

Initiated in 2009, the NEXTRANS Indiana High School Essay Competition serves to encourage high school students to consider how integral transportation is to the future of Indiana and our nation, and interest them in pursuing careers and/or higher education in the field.
The development of a well-prepared workforce, capable of developing sustainable solutions to complex challenges with limited resources, is a critical need and a timely topic in today’s economic climate. The NEXTRANS Center is committed to encouraging educational and professional growth to students interested in pursuing careers in transportation across all levels. This issue of the NEXTRANSporter highlights our educational activities at the K-12, undergraduate, and graduate levels.

This January, I was honored to join two NEXTRANS graduate researchers as they were recognized by the Council of University Transportation Centers (CUTC). Dr. Pengcheng Zhang, a May 2010 graduate of Purdue University, received the Pikarsky Award for Outstanding Ph.D. Dissertation in Science and Technology (page 3). Ms. Sofia Leon, a Ph.D. student at the University of Illinois at Urbana-Champaign, was recognized as the NEXTRANS Center’s 2010 Student of the Year for her achievements in the classroom, in research, and in the community (page 8).

Last fall, we evaluated and awarded prizes to three winners as part of our second annual Indiana High School Essay Competition (page 1). The contest garnered responses from students across the state on a wide variety of transportation-related topics.

As we move into the spring and summer months, we look forward to new and continuing events related to education and outreach. We will welcome a third round of Undergraduate Summer Interns; participate in a regional science fair at Purdue; expand and improve our online database of NEXTRANS student researchers and alumni; and launch a new program focused on encouraging girls to pursue education in STEM disciplines at the University of Wisconsin-Platteville, a NEXTRANS partner university.

Enjoy this issue of the NEXTRANSporter and please visit www.purdue.edu/dp/nextrans for up-to-date information on all NEXTRANS activities. As always, we welcome your feedback.
NEW FACULTY AWARD PRESENTED TO NEXTRANS INVESTIGATOR

Satish V. Ukkusuri, associate professor of civil engineering at Purdue University, was awarded the Council of University Transportation Centers (CUTC)-American Road & Transportation Builders Association (ARTBA) New Faculty Award.

Dr. Ukkusuri is the principal investigator on a NEXTRANS-funded project, “Estimating the Economic Impacts of Disruptions to Intermodal Freight Systems.”

Dr. Ukkusuri’s research interests include freight transportation and logistics; engineering for extreme events; complex network science; climate change and transportation land use; modeling uncertainty in transportation networks; simulation of large scale robust transportation networks; online network equilibrium problems; information and sensor technologies for transportation applications; and infrastructure uncertainty.

Before joining Purdue, Dr. Ukkusuri was an assistant professor at Rensselaer Polytechnic Institute (RPI). He received a bachelor’s degree from the Indian Institute of Technology, Madras, a master’s degree from the University of Illinois, and a Ph.D. from the University of Texas.

NEXTRANS RESEARCHER HONOURED WITH PIKARSKY AWARD

Pengcheng Zhang, a former NEXTRANS researcher at Purdue University, was awarded the Pikarsky Award for Outstanding Ph.D. Dissertation in Science and Technology by the Council of University Transportation Centers (CUTC).

Dr. Zhang’s dissertation, “A Generalized Modeling Framework to Analyze Interdependencies Among Infrastructure Systems,” was advised by NEXTRANS Center Director Srinivas Peeta. The dissertation proposes a generalized modeling framework that combines a multilayer network concept with a market-based economic approach to capture the interdependencies among the various civil infrastructure systems with disparate physical and operational characteristics.

Dr. Zhang received his award at the Annual CUTC Awards Banquet on January 22, 2011.

Dr. Zhang received his Ph.D. in Transportation and Infrastructure Systems from the School of Civil Engineering, Purdue University, in May 2010. He also holds master’s (1999) and bachelor’s (1994) degrees in Transportation Management Engineering from Northern (Beijing) Jiaotong University, Beijing, China. Since 2006, he has worked as a senior operations research analyst at American Airlines, Fort Worth, Texas.
STUDENTS AND FACULTY ATTEND INFORMS ANNUAL MEETING

NEXTRANS graduate students and faculty affiliates from NEXTRANS partner universities attended and presented at the 2010 INFORMS Annual Meeting held November 7-10 in Austin, Texas.

Each year, the INFORMS Annual Meeting hosts more than 1,000 sessions and just under 4,000 papers, covering a broad range of topics in operations research and management sciences. The theme of the 2010 meeting was, “Energizing the Future.”

Participants presented research on topics including (but not limited to) traffic surveillance, supply-chain management, enhancing energy consumption efficiency, Less-Than-Truckload (LTL) carrier-carrier collaboration, and quantifying the benefits of real-time traffic information.

NEXTRANS PARTNERS WITH NAVTEQ

The NEXTRANS Center welcomed David Ko, Global Lead of the NAVTEQ University Program, on January 18, 2011. Ko visited the Center at Purdue University to discuss a new partnership; NAVTEQ and NEXTRANS will collaborate on research of mutual interest related to real-time traffic information.

NEXTRANS is conducting a study on quantifying the benefits of real-time traffic information systems which will use NAVTEQ’s map and traffic data source. The study seeks to understand route choice behavior of commuters under real-time information provision. This research will bridge the key gap in terms of adequately understanding the role of human behavior in real-world contexts by conducting field tests.

NAVTEQ will provide the map database, live traffic data feed and historical traffic pattern data for Indiana as well as related technical help for the experiments.

For more information about the Center’s collaboration with NAVTEQ, please visit: http://www.nn4d.com/site/global/learn/university/partners/purdue/p_purdue.jsp.

NEXTRANS CO-HOSTS RECEPTION IN WASHINGTON, D.C.

In partnership with the School of Civil Engineering at Purdue University and the Joint Transportation Research Program (JTRP), the NEXTRANS Center hosted a reception in Washington, D.C. on January 23, 2011 during the 90th Annual Meeting of the Transportation Research Board (TRB).

Faculty, students, staff, alumni, and friends of the three organizations attended the reception held at the Omni Shoreham Hotel.

Right: Pictured at the NEXTRANS reception are Alexander Paz, assistant professor of civil and environmental engineering at the University of Nevada, Las Vegas; RITA Administrator Peter Appel; NEXTRANS Director Srinivas Peeta; and Mouyid Islam, graduate student at the University of Texas at El Paso.
Sustainable pavement infrastructure will lead to decreased maintenance costs and safer, more reliable roadways for travelers. In this continuing study, researchers will work to develop an integrated framework that allows for the linking of pavement simulation software with actual pavement cracking, distress, and roughness. A corresponding framework linking pavement roughness and distress information with vehicle maintenance and driver comfort will also be developed. The results of the project will be applicable to a wide range of stakeholders from all sectors and could be extended for various other pavement distress models and modes, including airfield pavements and railroad track foundations.

In a multistep process, this project will take a holistic approach to pavement design and maintenance, with the goal of creating a tool to decrease lifecycle costs of pavement systems, while enhancing safety. When completed, the model will take into consideration pavement condition in addition to vehicle operating costs and accident rates.

Various pavement sections with available distress data, location and traffic information, structural analyses, and material details will be selected by researchers. Cracking predictions using the pavement cracking prediction model will then be performed. The available field performance data (pavement distress, cracking, roughness) will be correlated with the output (engineering quantities) obtained from the simulation model. This important step is critical to the calibration and validation of the model.

A second aspect of this project entails developing a framework for relating pavement distress and roughness information with vehicular distress and driver comfort and behavior. This framework will allow for future research to develop a multifaceted integrated system to link infrastructure renewal, infrastructure-driver interaction, infrastructure-vehicle interaction, and asset management. See Figure 1 for a project outline.

To maximize the usefulness of the information derived from this project, NEXTRANS investigators will work with researchers from the Illinois Center for Transportation (ICT). The NEXTRANS project will supplement a recently initiated project to examine the feasibility of fine-graded Hot Mix Asphalt (HMA) sponsored by ICT.

Fine-graded asphalt mixtures have shown promise as easily constructed, smooth, and durable base and wearing courses in a number of states around the country. The Illinois Department of Transportation (IDOT) does not, however, permit the use of fine-graded mixtures in its current HMA specification. With the wide availability of crushed, fine aggregate, this research will demonstrate the feasibility of allowing fine-graded mixtures to be used on high-volume roads and interstates. While the ICT study will focus on mixture design, laboratory, and full-scale testing of fine-graded and course mixtures, the NEXTRANS project will provide a more comprehensive picture of overall performance and lifecycle costs of fine-graded mixtures. The collaboration will allow for a more thorough examination of the full economic benefits of crack-resistant, durable surfaces, resulting in the creation of more sensible, long-lasting infrastructure construction and renewal.

There is a critical need for infrastructure renewal across the country. Keeping limited resources in mind, the optimization of pavement structures in terms of lifespan and performance is imperative. This ongoing research aims to develop software capable of predicting pavement cracking as it relates to actual conditions, focused in a cold climate.

Researchers will integrate cracking prediction software with actual infrastructure conditions to generate more realistic and timely data.
“CREATIVE SOLUTIONS TO THE CHALLENGES FACING INDIANA’S AUTOMOTIVE INDUSTRY” - 1ST PLACE

“An efficient transportation system is essential to our modern, specialized economy. Our society is increasingly dependent on effective transportation. Products are transported across the city, across the nation, and across the world... The transportation of people is perhaps as crucial as the movement of goods...

...Another possible solution is increased reliance on alternative fuels. Currently, hydrogen and biofuels appear to be the most practical near-term alternatives to gasoline. Biofuels incorporate a wide range of fuels, all in some way derived from biomass. Recently, biofuels have received increased public and scientific attention due to factors such as oil price spikes, the desire for increased energy security, and concern over greenhouse gas emissions from fossil fuels. Biofuels presently account for a very small percentage of the world’s fuel usage. However, that percentage is expected to rise as significant time and money is invested in biofuel research.

...The degree to which the American and Hoosier automotive industry can positively respond to the challenges and opportunities presented by the increased demand for hybrid vehicles and for alternative fuels will impact Indiana’s future economic prospects.”

Matthew Prall
Columbus, Indiana

“FUNDING LONG-TERM OPERATING COSTS IN INDIANA” - 2ND PLACE

“...Indiana must not just maintain its present road system, but must find resourceful ways to use its funds in a manner that lowers long-term operating costs.”

...A second option is to look at alternate modes to avoid the constant expansion of our road network required to handle an ever-increasing demand. Americans love the feeling of independence that a car or truck provides. Yet when you consider the total cost of owning a vehicle: insurance, license fees, gasoline and maintenance, not to mention the purchase price, large cities like Indianapolis should be able to offer effective hub and spoke light rail to reduce the load on the road system. Further, reducing the need for parking lots and garages frees up valuable real estate...

...Consumers want the best value for their money, but do not always understand the real costs of transportation. The automobile will continue to play a vital role in the culture, attitude, and economy of Indiana and our country. Yet as industry and the population grow, there is increased strain on land, resources, and finances, changing our ability to continue to support our roads. Providing education and vision will be critical in helping the consumer understand the opportunities that new building materials and light rail offer.”

Sarah Torline
Madison, Indiana

(Continued to Page 7)
“DEDICATED TRUCK LANE ONS THE INTERSTATE 70 CORRIDOR” - 3RD PLACE

“Interstate 70 is one of America’s most traveled highways, allowing trucks to transport freight from east to west throughout the country. The Interstate 70 Corridor (I-70) plays an important part in the economies of Missouri, Illinois, Indiana, and Ohio. One third of the jobs in these four states are related to trade and manufacturing. Because of the number of businesses that depend on efficient transportation of goods, I-70 is crucial to the productivity of the Midwest (I-70: An Economic Engine, 2010).

Traffic congestion caused by trucks on I-70 is a problem in Indiana. Congestion on I-70 has an immense impact on the state of Indiana. Reduced congestion would improve the ability to transport goods efficiently, advance economies, and increase safety (I-70 Dedicated Truck Lanes, 2010).

One solution to this problem is to create two dedicated truck lanes on Interstate 70 (one eastbound and one westbound) in order to separate them from the rest of traffic. Dedicated truck lanes will be on the inside lanes. They will be separated from local traffic on the outside lanes by a median or a barrier for safety. Those lanes will reduce congestion and allow traffic to flow faster and more efficiently…”

Jacob Rogers
Evansville, Indiana

NEXTRANS SPONSORS PRIZE FOR “BEST TRANSPORTATION-RELATED PROJECT” AT SPRING REGIONAL SCIENCE AND ENGINEERING FAIR

The NEXTRANS Center sponsored a prize for, “Best Transportation-Related Project,” at the 2011 Lafayette Regional Science and Engineering Fair, held March 4-5 at Purdue University. The Science and Engineering Fair draws students in grades 5-12 from across a twelve-county region in Indiana. Judging was based on 14 categories including: engineering, environmental science, energy and transportation, and math and computer science.

Two NEXTRANS Center members attended the Science and Engineering Fair to judge entries based on creativity, accuracy, and real-world application. Michael Plite, a sixth grade student from West Lafayette, Indiana, received the NEXTRANS prize for his project, “Plane Wing Angle Stability and Distance.” Using paper airplanes, Michael tested which airplane design would fly the farthest, while controlling for outside variables via a device intended to enforce consistency during “test flights.”
SOFIE LEON NAMED 2010 STUDENT OF THE YEAR

NEXTRANS is pleased to announce the selection of Sofie Leon as 2010 Student of the Year. Sofie is pursuing her Ph.D. in Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign (UIUC).

At UIUC, Sofie has been working on a project to create new analysis and design tools to better predict thermal cracking in asphalt pavements. She created a general-purpose software being used to transfer technology from the university to industry and practitioners. In addition, she is involved in collaborative research with colleagues at the Pontifical Catholic University of Rio de Janeiro (PUC-Rio).

Now in her Ph.D. research, Sofie is investigating dynamic fracture including crack nucleation, initiation, propagation, branching and fragmentation in a multi-scale computational environment.

Sofie has also been involved in outreach and community service activities. As both an undergraduate and graduate student, she encouraged underrepresented students to pursue education in science, technology, engineering, and math through events such as, “Building an Engineer” and “High School Shadow.”

In recognition of her award, Sofie was honored at the Council of University Transportation Centers (CUTC) Annual Banquet and Awards Ceremony in Washington, D.C. on January 22, 2011.

Originally from Ventura, California, Sofie received her bachelor’s degree in civil engineering, with a minor in computer science, from California Polytechnic State University at San Luis Obispo in June 2008. She joined the University of Illinois at Urbana-Champaign in August 2008.

ANDREW LANDGRAF

Andrew Landgraf is a second year Ph.D. student in the Department of Statistics at The Ohio State University (OSU). A native of Columbus, Ohio, he earned a bachelor’s degree in Actuarial Science from OSU in 2004.

Andrew’s research interests include data mining and statistical learning. He is currently working with Rabi Mishalani, associate professor of civil and environmental engineering, and Prem Goel, professor of statistics, on a NEXTRANS project, “Impact of Public Transit Market Share on Energy Consumption and the Environment.” For this project, Andrew is creating an empirical model to assess the impact of public transportation on per capita greenhouse gas (GHG) emissions in U.S. urbanized areas, while controlling for other important explanatory variables. This modeling effort will refine and validate existing models in order to learn about the extent to which the increased share of transit use will help reduce GHG emissions due to urban transportation.

Andrew is also working on NEXTRANS project, “Smart Campus Transit Laboratory for Research and Education” with Professor Goel, Professor Mishalani, and Professor Mark McCord. Clever Devices, Inc. equipped OSU’s Campus Area Bus Service with automatic vehicle location and automatic passenger count sensors. Andrew manages the large amount of data collected by the buses so that it can be used for a variety of studies, including understanding passenger behaviors and measuring traffic congestion.
SEMINAR SERIES

QUANTITATIVE METHODS FOR RISK ASSESSMENT & MANAGEMENT
SANKARAN MAHADEVAN: VANDERBILT UNIVERSITY

The NEXTRANS Center and Purdue student chapter of the Institute of Transportation Engineers (ITE) hosted Sankaran Mahadevan on October 26, 2010. Dr. Mahadevan is a professor at Vanderbilt University with a joint appointment in civil and environmental engineering and mechanical engineering.

This seminar explored risk assessment and management from a researcher’s perspective. Using techniques from across engineering and management disciplines, Dr. Mahadevan discussed the value of a multidisciplinary approach to solving issues of risk and damage as they relate to transportation.

GLOBAL FOOD SECURITY AND THE ROLE OF TRANSPORTATION
GEBISA EJETA: PURDUE UNIVERSITY

The NEXTRANS Center and Purdue student chapter of the Institute of Transportation Engineers (ITE) sponsored a seminar by 2009 World Food Prize Laureate, Gebisa Ejeta, Distinguished Professor of Plant Breeding & Genetics and International Agriculture at Purdue University, Tuesday, March 1, 2011, at Purdue University.

The seminar presented various dimensions of global food security including the importance of storage, distribution, and transportation, with a particular emphasis on developing countries.

Professor Ejeta’s research is focused on elucidating the genetic and physiological mechanisms of important traits in sorghum. Grain sorghum is the fifth most important cereal crop in the world; it is grown worldwide, serving as a staff of life for over 500 million people in developing countries, and as the second most important feed crop in the United States.

NEXTRANS FACULTY PARTICIPATE IN OHIO CONFERENCE

NEXTRANS investigators from The Ohio State University (OSU) attended, presented, and organized sessions at the Ohio Transportation Engineering Conference, held October 19-20, 2010 in Columbus.

Professors Rabi Mishalani and Benjamin Coifman each presented their research during the two-day conference, including NEXTRANS-sponsored project, “Smart Campus Transit Laboratory for Research and Education.”

Professor Mark McCord organized two sessions, Transportation Research at Universities, Part I and Part II. Professor McCord also moderated a session.

NEXTRANS RESEARCH PRESENTED AT 97TH PURDUE ROAD SCHOOL

NEXTRANS researchers from Purdue University presented their research during the 97th Annual Purdue Road School, held March 8-10, 2011.

Projects included on-demand air service (ODAS), the economic impacts of bypasses on communities, public-private partnerships, and mass evacuation in disasters.
Wallace Tyner is the James and Lois Ackerman Professor of Agricultural Economics and Co-Director of the Center for Research on Energy Systems and Policy at Purdue University. His past work in energy economics has encompassed oil, natural gas, coal, oil shale, biomass, ethanol from agricultural sources, and solar energy. His current research focuses on renewable energy policy issues.

Professor Tyner’s NEXTRANS-sponsored completed research project aimed to identify the best places for cellulosic biofuel production plants in Indiana. Professor Tyner and co-investigator, Professor Frank Dooley (Purdue), developed supply curves for feedstocks in each region; the research concluded that cellulosic biofuel plants will have a substantially greater road infrastructure impact than corn-based ethanol.

Professor Tyner has more than 33 years of professional work experience, including extensive long-term and short-term experience in developing countries. He spent three years (1985-88) in Morocco working as Senior Agricultural Economist and Deputy Team Leader for a project on planning, economics, and statistics for agriculture. Short-term experiences include those in Senegal, Mali, Niger, the Gambia, Ghana, Burkina Faso, India, Bangladesh, China, Brazil, Morocco, Tunisia, Algeria, Egypt, Lebanon, Jordan, Kazakhstan, Estonia, Latvia, Lithuania, and Malaysia.

Professor Tyner has over 200 professional papers, including three books and more than 70 journal papers, published abstracts, and book chapters. He is the recipient of many awards and honors including: American Association of Agricultural Economics Distinguished Policy Contribution Award (2005); Energy Patriot, given by Senator Richard Lugar (2007); and Purdue College of Agriculture Outstanding Graduate Educator (2009). Professor Tyner is also a member of the National Academy of Science Committee on the Economic and Environmental Impacts of Biofuels.

In addition to his research, Professor Tyner teaches a graduate course in benefit-cost analysis, which incorporates risk into the economic and financial analysis of investment projects. In four of the past six years, his students have received the department’s Outstanding Thesis Award. Also, in the past four years, Professor Tyner has published papers with 14 graduate students.

Professor Tyner received his B.S. degree in chemistry from Texas Christian University (1966). He holds M.A. (1972) and Ph.D. (1977) degrees in economics from the University of Maryland.
MIKE FINN

Mike Finn currently serves as Vice President - North America Traffic for NAVTEQ where he and his staff of 400 traffic professionals provide real-time speed and incident data to millions of individual subscribers. NAVTEQ traffic data is delivered to users of automotive navigation systems, personal navigation devices, and smart phones. NAVTEQ traffic data also powers leading web portals and television and radio broadcasts.

Working at NAVTEQ since 1997, Finn has held leadership positions within Business Strategy, Mapping Operations, World Market Development, Product Management, and Location Based Content. Finn has successfully led several significant product efforts including the development of full navigable map coverage in the United States and Canada, and new product development efforts in Africa, the Middle East, Latin America, and China.

Prior to joining NAVTEQ, Finn was the Controller for the Consumer Business Units at Old Kent Financial Corporation (now Fifth Third) and a commercial lending officer at Chemical Banking Corporation (now JP Morgan Chase).

Finn serves as an elected member of the Board of Education for the Lake Zurich, Illinois, School District and the Advisory Board for the Beta Theta Chapter of Alpha Tau Omega Fraternity. Finn previously served as an Adjunct Faculty Instructor at Northwood University.

Finn holds a B.A. in economics from Cornell University in Ithaca, New York, and an M.B.A. from the University of Michigan in Ann Arbor.