



Mountain-Plains Consortium

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MPC SUCCESSFUL IN TRANSPORTATION CENTER COMPETITION

The Mountain-Plains Consortium will receive nearly \$2.6 million from the USDOT's Research and Innovative Technology Administration to conduct research to enhance transportation in the Upper Great Plains and intermountain west.

The MPC was one of 35 successful applications among more than 145 proposals submitted. MPC's work under the grant will emphasize work aligned with USDOT's strategic goal of keeping transportation systems in a state of good repair. In particular, the work will focus on roads and other transportation systems which have been placed under unprecedented stress by an energy boom in the region. The funds are for the 2013 and 2014 fiscal years.

Critical areas of research will include:

- Increasing the reliability of life-cycle performance predictions used in infrastructure design, construction and management
- Improving the ability of transportation agencies to deliver projects that meet expectations for timeliness, quality and cost
- Reducing user delay attributable to infrastructure system performance, maintenance, rehabilitation and construction
- Improving highway condition and performance through increased use of design, materials, construction, and maintenance innovations,
- Studying vulnerabilities of the transportation system to seismic activities and extreme events and methods to reduce those vulnerabilities.

Colorado State University
North Dakota State University
South Dakota State University
University of Colorado Denver
University of Denver
University of Utah
Utah State University
University of Wyoming

SDSU STUDENT NAMED REGION 8 STUDENT OF THE YEAR



Ahrenstorff

SDSU student Brittney Ahrenstorff has been named Region 8 Student of the Year by the MPC in recognition of her academic and research accomplishments.

Ahrenstorff, of Lake Park, IA, earned her B.S. degree in civil engineering from SDSU in May 2012 and is expected to earn her M.S. degree from SDSU in spring 2014. Ahrenstorff's research focuses on measuring

and evaluating ice loads on bridge piers in South Dakota. The main objective of the study is to calibrate the ice load equations given in AASHTO's LRFD Bridge Design Specifications to develop realistic estimates of the loads imposed by the ice formations found in South Dakota rivers. Based on her preliminary work, she was invited to present her research in Seoul, South Korea, at the International Association of Bridge and Structural Engineering conference in September 2012.

Ahrenstorff graduated with a GPA of 3.83/4.00 in her B.S. degree and to date has maintained a 4.00 in her M.S. program. She received numerous honors including memberships in Phi Kappa Phi national honor society, Chi Epsilon civil engineering honor society, Tau Beta Pi engineering honor society, and Phi Sigma Pi national honor society. She is also a member of the American Society of Civil Engineers and the National Society of Collegiate Scholars.

(Competition continued)

"MPC faculty effort and success is evident in the many innovations in transportation management, engineering, and operations developed in MPC projects that are being implemented across the region and nation," MPC director Denver Tolliver said. "We look forward to the continued expertise, collaboration and innovation that will result from this latest round of funding."

NDSU is the lead institution in the consortium. Colorado State University, South Dakota State University, University of Colorado-Denver, University of Denver, University of Utah, Utah State University, and University of Wyoming are partners.

PORTER AND WOOD EARN TRB BEST PAPER AWARD

The Transportation Research Board's Geometric Design Committee awarded its 2013 Best Paper Award to Richard J. Porter, assistant professor of civil and environmental engineering at the University of Utah, and Jonathan S. Wood (2013 MPC Student of the Year) at the 2014 TRB Annual Meeting. The title of the paper is "Safety Impacts of Design Exceptions on Non-Freeway Segments" and is based on work from project MPC-360, Safety Impacts of Design Exceptions in Utah, sponsored by the Mountain-Plains Consortium and Utah Department of Transportation. The paper is published as: Wood, J.S. and Porter, R.J. "Safety Impacts of Design Exceptions on Non-Freeway Segments," in *Transportation Research Record, Journal of the Transportation Research Board No. 2358*, 2013, pp. 29-37. This is the second straight best paper award from the Geometric Design Committee awarded to Porter.



Wood



Porter



Student Activities

Student Inducted into NDSU's Tapestry of Diverse Talents



Dharmadhikari

Nimish Dharmadhikari, PhD student in the NDSU Transportation and Logistics Program and graduate research assistant at NDSU's Upper Great Plains Transportation Institute, was inducted into the Tapestry of Diverse Talents at NDSU.

The Tapestry of Diverse Talents is a pictorial mosaic that recognizes NDSU students, staff,

faculty, and alumni for the contributions and diversity they bring to the university. The program is designed to expand diversity on campus.

At NDSU, Dharmadhikari has participated in NDSU's International CORE program by volunteering to help new international students participate in Orientation Week, mentored new students in NDSU's summer intensive English learning program, and joined the Global Ambassador program in the Office of International Programs. He took part in the NDSU Memorial Union's Masters of Success leadership program and was also elected the 2011-2012 vice president of the Graduate Student Association and president the following year. As president, Dharmadhikari and the Graduate Student Association worked to expand graduate students' diversity programs. He later went on to organize a Graduate Research and Arts Forum to display research accomplishments of fellow graduate students.

USU Wins Regional ASCE Student Competition and Heads to Nationals

The USU ASCE Student Chapter won the overall competitions at the American Society of Civil Engineers Rocky Mountain Regional Student Conference April 4-6 at USU. For three years in a row, USU has won the overall competition. For the third straight year, USU took first place in the concrete canoe competition. The win qualified USU for the national competition at the University of Illinois at Urbana-Champaign, Urbana, IL, where the team placed 5th. At the regional competition, they also placed second in the steel bridge competition. This year 213 teams from the United States, Canada and Mexico competed in the student steel bridge competitions. USU was one of 49 teams that advanced to the national competition at the University of Washington May 31-June 1.



UC-Denver Students Receive Honors

Rachael Bronson, an MS student at the UC-Denver, was selected as a 2013 Eno Leadership Development Conference Fellow and also won the Rocky Mountain Women in Defense scholarship, the CU-Denver ARCS Scholarship, the CU-Denver Shuman Scholarship, and the Association of Pedestrian and Bicycle Professionals (APBP) scholarship. At CU-Denver, Bronson served as secretary of the ITE student chapter and is a member of the ACT Research Group. She is engaged in research exploring how multi-modal transportation options make communities more resilient when faced with catastrophic events.

Kara Luckey, a PhD student at the UC-Denver, was selected as a 2013 Eno Leadership Development Conference Fellow as well as a Dwight D. Eisenhower Fellow. She also won the Dr. Thomas D. Larson Fellowship in acknowledgement of her commitment to the pursuit of excellence in her doctoral studies. Her work is focused on the relationship between urban infrastructure, economic and community development, and social equity. She is studying neighborhood change processes, transportation and housing equity, and the public transit's role as a community and economic development tool.

NDSU Transportation and Logistics Student to Present Paper at International Conference

Ankush Agrawal, NDSU Transportation and Logistics PhD student, presented a research paper, "Developing Evaluation Tools for Achieving a Sustainable Concrete Design and Construction," at the 2013 International Conference on Construction and Real Estate Management Oct. 10-11 in Karlsruhe, Germany. The paper, which points out sustainable tools and methods that can be applied to the construction industry around the world, also appears in the conference proceedings. NDSU was one of the universities and organizations organizing the conference.



Agrawal

Students Present Research at American Concrete Institute Convention

Graduate students from UC-Denver who are involved in MPC projects presented their research at the American Concrete Institute Convention in Minneapolis in April. Their talk was part of the special sessions titled "Advanced Materials and Sensors toward Smart Concrete Bridges: Concept, Performance, Evaluation, and Repair." Shahlaa AlWakeel, a PhD student, presented "Performance of Bridge Decks in a Cold Region and a High-Fidelity Sensing System for Damage Detection." Abdul Namrou, an MS student, presented "An Experimental Investigation into the Behavior of Concrete Elements Retrofitted with NSM Composite Strips at Elevated Temperatures." The presentations have been selected for a special publication of the ACI and the manuscripts submitted are currently under review.

Transportation and Logistics Student Published in Journal of Industrial Engineering and Management

A paper written by NDSU transportation and logistics Ph.D. student Yasaman Kazemi was recently published in the Journal of Industrial Engineering and Management. The paper, "Optimal Decisions and Comparison of VMI and CPFR Under Price-Sensitive Uncertain Demand," compares the performance of two advanced supply chain



Kazemi

coordination mechanisms, vendor managed inventory and collaborative planning forecasting and replenishment, under a price-sensitive uncertain demand environment, and makes the optimal decisions on retail price and order quantity for both mechanisms. To view the article, go to <http://www.jiem.org/index.php/jiem/article/view/559>.

UC-Denver Student wins ITE Leadership Award

Alejandro Henao, PhD student at UC-Denver won the Institute of Transportation Engineers Colorado/Wyoming Executive Committee Leadership Award. The \$750 award is designed to encourage students pursuing careers in transportation-related fields. Henao is conducting research focused on multi-modal transportation options, transportation economic resilience, and travel demand modeling. He is also interested in studying transportation and crowd movement for sport and major events such as the Olympic Games and FIFA Soccer World Cup, considering the long-term goals of the host cities. He currently serves as resident of the Institute of Transportation Engineers UC-Denver Student Chapter.



Henao

Utah Traffic Lab Students Present Research

U of U students Ivana Tasic, Anusha Musunuru, Jeffrey Taylor and Thanh Le presented their research at the Wasatch Choice for 2040 Consortium meeting Oct. 29, supported by faculty Richard J. Porter, Cathy Liu, Milan Zlatkovic and Xuesong Zhou (now with ASU). The conference was organized and sponsored by the Wasatch Front Regional Conference, to assemble state and national professionals in transportation planning, modeling and engineering. A majority of the presented research was co-sponsored by MPC.



The Utah Traffic Lab research team also presented research co-sponsored by MPC at the Utah Department of Transportation (UDOT) Annual Conference Nov. 6. The team was represented by

students Thanh Le, Ivana Tasic, Anusha Musunuru, and Kevin Croshaw, and faculty Richard J. Porter and Milan Zlatkovic. The presentations included topics in traffic operations, safety, modeling, pavement marking, and public transportation.

Transportation and Logistics Ph.D. Presents Research

Fesseha Gebremikael, an NDSU transportation and logistics doctoral student, presented his research at the National Decision Science Institute (DSI) Annual Conference in Baltimore, MD, Nov. 16. His paper, "Decision Support Model for Managing Disruptive Influences in Global Supply Chain Operations: A Sensitivity Analysis Insight" will also be published in the referred DSI 2013 Proceedings. In the paper, Gebremikael identifies a proposed decision support model to examine the most important disruptive influences in a firm's food supply chain. Co-authors are Chris I. Enyinda, Canadian University of Dubai, UAE and Khalid Backhar, California State University. Both are graduates of the NDSU Ph.D. program in transportation and logistics.



(l-r) K. Backhar, C. Enyinda and F. Gebremikael

U of U Student Chapter to Host Concrete Symposium

The U of U American Concrete Institute Student Chapter will host its sixth annual Concrete Symposium with guest speakers from across the U.S. The symposium will be Thursday, March 13, 2014, from 7:30 a.m. to 4 p.m. on campus. The theme will be "Is what you see, what you get? Looking at Concrete Surfaces." Speakers will talk about surface defects, non-destructive testing of concrete, and new concrete innovations such as smog-eating concrete surfaces.



Education and Workforce Development

New Courses Offered at U of U

Amanda Bordelon, assistant professor of civil and environmental engineering at the U of U, introduced a new course offered Fall 2013. "Advanced Materials Testing" provides a hands-on opportunity for students to experience multiple-scale laboratory and field testing and evaluation techniques used for design and monitoring of civil engineering structures, pavements, and materials. Civil engineering graduate students are often asked to do consulting or assist in quality assurance projects which relate to existing infrastructure. This course offers students experience in recognizing and understanding the tools and resources available to them in order to perform evaluations and inspections on existing infrastructure. This course is scheduled to be re-offered Fall 2014.

U of U assistant professor of civil and environmental engineering Richard Porter introduced a new course Fall 2013, "Statistical and Econometric Analysis." Students learn to apply various statistical and econometric analysis techniques to the analysis of data. Examples are drawn primarily from transportation, but the methods have broader applications to civil engineering, city and metropolitan planning, and beyond. A unique aspect of the course was the semester project, where students worked on any problem involving the statistical/econometric analysis of data using techniques covered in class and/or discussed with the instructor and shared their results through a research paper and in-class presentation. Topics

ranged from the "Correlation between Precipitation and Stormwater Runoff Nitrogen Concentrations" to "Modeling Spatial Relationships between the Multimodal Access to Transportation and Traffic Safety Outcomes: Data from Chicago."

U of U Senior Capstone Design Course Featured in Deseret News

The Deseret News published an article about the student project presentation for a senior-level capstone class in civil engineering.

In the professional practice and design course, students studied dams, bridges, roadways, drinking water and wastewater in Utah to develop current costs of infrastructure maintenance and improvements as well as 10-year and 20-year forecasts. Total needs anticipated in the next year totaled nearly \$1 billion and nearly \$18 billion over the next 20 years. Read the article at <http://www.deseretnews.com/article/865583868/Student-study-18-billion-needed-for-Utah-infrastructure-maintenance-over-20-years.html>

Building Information Modeling Facility Opened at CSU

Following months of coordination, renovation, and technology installation and furniture selection, the new Mortenson Center for Virtual Design and Construction officially opened to students in the CSU Department of Construction Management with a ribbon cutting ceremony Sept. 11. The new space, housed in Guggenheim Hall, provides interactive equipment that allows students to work more effectively with Building Information Modeling technology. This facility will be used to integrate Building Information Modeling into the curriculum as well as to support research projects involving Building Information Modeling such as those funded by MPC.

High School Summer Camps Introduce Students to Engineering

Amanda Bordelon, U of U assistant professor of civil and environmental engineering, along with students Crystal Orantes, Jem Locquiao and department staff Luisa Rogers hosted activities for two different summer camps in June 2013. The HI-GEAR (Girls Engineering Abilities Realized) aimed at recruiting high-school-age females interested in engineering learned the effects of mixing procedures on materials performance and component dispersion through the use of gelatin and food. At the Exploring Engineering Camp, high school students were able to mix and test their own zombie-resistant fiber-reinforced concrete columns. The theme of the camp was "Lights, Cameras, Engineering: Engineering a Zombie Movie." Both camps were a huge success.

CSU Internship Highlights Industry Partnership

A tour of a new pedestrian bridge and bus box at Denver's Union Station marked the completion of a CSU-industry internship and research partnership.

Faculty members Caroline Clevenger and Mehmet Ozbek, along with graduate student Blaine Fanning, met with industry professional and CSU CM alumnus Sean Vonfeldt ('89) of Triunity Engineering & Management, Inc. / Regional Transportation District (RTD) to tour the station and the adjoining bus box project. The tour, led by John Harwell of RTD, consisted of accessing the pedestrian bridge over the new platforms that will be used by commuter rail and Amtrak trains, and then walking through the new 1,000-foot bus box. This meeting and tour was the final step in the successful industry internship and partnership in which Fanning took part to further his research on the MPC project entitled, "A Pilot Case Study to Evaluate the Potential Impact and Benefit of Adopting and Implementing Building Information Modeling on Bridge and Infrastructure Projects." Through this collaboration of industry and academia, Fanning worked for Triunity as a program support consultant intern while collecting the data necessary for the MPC research.



RECENT GRADUATES

Colorado State University

Alex Hesse completed his M.S. in May 2013. Hesse worked on MPC-394 Quantifying Uncertainty in Non-destructive Bridge Inspection Methods for use in Performance Based Inspection.

Sherona Simpson graduated with her MS in the fall of 2013. Her thesis title is "A Framework for Assessing Transportation Sustainability Rating Systems for Implementation in U.S. State Departments of Transportation."

Matt Hardman earned his MS degree in civil and environmental engineering in 2013. His thesis focused on a study of the effects of earthquakes on bridges in combination with either traffic loads or scour of bridge piers. He is currently an entry-level structural engineer at the Denver office of engineering company Thornton Tomasetti.

Salem Abdalmedaged earned his MS degree in civil and environmental engineering in 2013. His thesis was "Dynamic Analysis and Fatigue Assessment of Bridge Decks Subjected to Traffic and Corrosion Effects."

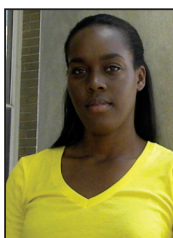
Thomas Wilson earned his MS in civil and environmental engineering in 2013. At CSU he worked on a Colorado DOT funded project to investigate the effect of semi-rigid connections on the seismic performance of steel frames.

University of Colorado Denver

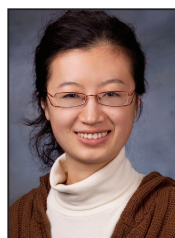
Dan Piatkowski graduated with his PhD in design and planning Fall 2013 from the University of Colorado Denver. His dissertation is "Identifying Impacts of Interventions Aimed at Promoting Walking and Cycling: Directions for Increasing Non-motorized Transportation in U.S. Cities."



Hesse



Simpson



Liu



Nguyen



Freckleton



Squire



Pant



Boggs

North Dakota State University

Qing Liu earned her PhD in the fall of 2013. She has accepted a non-faculty position as a transportation economist with a university. Her dissertation is "Game Theory Approach to the Vertical Relationships for U.S. Containerized Imports."

Nam Nguyen earned his master of managerial logistics degree at the end of 2013 and returned to Viet Nam where he will work in the transportation industry.

Chip Nsereko earned his master of managerial logistics degree at the end of 2013 and is seeking a position in the transportation industry.

Utah State University

Derek Freckleton graduated with his MS in fall of 2012. His thesis topic was in Automation. He is currently employed by Booz, Allen, & Hamilton in Washington DC.

Devin Squire graduated with his MS in fall of 2012. His thesis was on Asset Management. He is currently employed by Horrocks Engineers in Pleasant Grove, UT.

Sunil Pant graduated with his MS in fall of 2012. His thesis topic was in Transportation Resiliency. Sunil is currently employed at the Ministry of Physical Infrastructure and Transport, in Kathmandu, Nepal.

Wesley Boggs graduated with his MS in fall of 2012. His thesis topic was Sign Management Systems. Mr. Boggs is currently employed at Felsburg, Holt, and Ullevig, in Colorado Springs, Colorado.

James Fishelson graduated with his MS in fall of 2012. His research topic was Automated Electric Transportation. James Fishelson is currently pursuing his PhD at the University of Michigan in Ann Arbor, MI.



Faculty Activities

USU Faculty Member on Sabbatical in China and Thailand

USU professor of transportation engineering Anthony Chen is on a one year sabbatical in China and Thailand. As part of Chen's sabbatical in 2013-2014, he was invited to teach a nine-week course on "Modeling Transport and Travel Demand Analysis" to the Graduate Transportation Program at Tongji University, Shanghai, China, from September to November. During this period, Chen visited several universities in China and Thailand to initiate academic exchange and cooperation in teaching and research. Chen currently holds two professorship titles as a Guest Professor for the School of Traffic and Transportation Engineering at Central South University and a Shanghai Specially-Appointed Professor – Eastern Scholar for the School of Transportation Engineering at Tongji University. For the remaining sabbatical in 2014, Chen will collaborate with the Faculty of Logistics at Burapha University, Thailand, on a sponsored project by the Department of Highways to develop a decision support tool for disaster management in Thailand.



Bordelon

Bordelon Promoted in Concrete Institute Committee

Amanda Bordelon, U of U assistant professor of civil and environmental engineering has been promoted to voting member of the American Concrete Institute's Committee on Fracture Mechanics (ACI 446)

which is a joint committee with ASCE. The fracture mechanics committee has been developing a new report on fracture toughness testing and Dr. Bordelon has contributed towards the implementation of fracture mechanics for concrete pavement applications.



Marshall

Marshall Wins Teaching Award

Wesley Marshall, assistant professor of civil engineering at the University of Colorado Denver was awarded the 2013 Outstanding Faculty in Teaching Award from the College of Engineering and Science. The award recognizes valuable

contributions in teaching, particularly his efforts in redesigning several courses to better engage students.



Ibarra

Ibarra receives Milek Faculty Fellowship

Luis Ibarra, U of U assistant professor of civil and environmental engineering, recently received the 2013 Milek Faculty Fellowship from the American Institute of Steel Construction. This four-year award will provide funds to

investigate the effect of Buckling Restrained Brace boundary conditions on the seismic resilience of braced frames.



Atadero

CSU's Atadero Invited to International Workshop

Rebecca Atadero, assistant professor of civil and environmental engineering at CSU, was invited to the FHWA International Workshop on Aging of Composites in September 2013 to present findings from

MPC -340, Long Term Performance of FRP Repair Materials. This project was also supported by the Colorado DOT and included a field evaluation of the FRP on the Castlewood Canyon Arch Bridge.

CSU Faculty Recognized for Instructional Innovation

Caroline Clevenger and Mahmet Ozbek, both faculty in the CSU Department of Construction Management were recognized recently with the Preston Davis Award for Instructional Innovation and the Institute for Learning and Teaching's 2013 Exceptional Instructional Innovation in Service-Learning award.

The awards recognized technology-related innovation and the implementation of service learning concepts. . In 2011, under the umbrella of the CM Cares initiative,

Clevenger and Mehmet developed a service-learning course focused on sustainable design and construction while engaging at-risk youth and the community through a hands-on service project. The course, Leadership of Sustainable Community Projects, empowers CSU students to be leaders and

mentors while managing a real-world project from conception to completion. The course utilizes Universal Design for Learning principles that involves the development of a learning environment in which ideas and concepts are represented in multiple ways. Students express their comprehension and mastery of the subject matter and multiple opportunities for engagement are available to students.

CSU graduate students collaborate with high school students on the construction of small-scale, sustainable projects that benefit the local community. In spring 2011, the class built two sustainable doghouses for the Rocky Mountain Great Dane Rescue. The project for 2012 involved 12 xylophone music stands, two of which are handicap accessible, for the Bennett Elementary School in Fort Collins.



NEW FACULTY

Colorado State University



Bareither

Christopher Bareither is an assistant professor of Civil and Environmental Engineering. His expertise is in geotechnical and geoenvironmental engineering. He received a BS in geological engineering from the University of Idaho and an MS and PhD in the same field from University of Wisconsin-Madison. After earning his PhD, he was an instructor and research

associate at the University of Wisconsin-Madison. Bareither's graduate research at UW focused on the mechanical properties of geomaterials. His MS research focused on geological controls on the shear strength of naturally occurring sands and gravels. The Wisconsin Department of Transportation has adopted his recommendations as standard practice for evaluating shear strength of backfill materials. Bareither's PhD research coupled physical and biological mechanisms controlling municipal solid waste compression in bioreactor landfills. His research helped advance the experimental evaluation of municipal solid waste, and also helped develop predictive tools for sustainable solid waste management. At CSU, his research will focus on scale effects in laboratory testing, scale effects between laboratory and field processes, mechanisms of geomaterial behavior, and sustainable solutions to geoenvironmental problems.

South Dakota State University

Dr. Seyed M. S. Ardakani is a lecturer in the Department of Civil and Environmental Engineering. Ardakani received his PhD degree in structural and earthquake engineering from the University of Nevada - Reno, in July 2013. He teaches undergraduate and graduate level courses in structural engineering and manages research projects related to bridge engineering. His areas of research expertise include earthquake engineering and seismic design of bridges, near-fault earthquake effects, application of innovative materials in structures, computational modeling of structures, and performance-based design. Ardakani is a member of American Concrete Institute (ACI), American Society of Civil Engineers (ASCE), and Earthquake Engineering Research Institute (EERI).

Junwon Seo is an assistant professor in the Department of Civil and Environmental Engineering. He earned a BS, two MS degrees, and a PhD in civil engineering with a focus on earthquake and bridge engineering from Konyang University, Yonsei University, Georgia Institute of Technology, and the Pennsylvania State University, respectively. Prior to joining SDSU, he was an assistant research professor in the Department of Civil, Construction, and Environmental Engineering at Iowa State University. His areas of research expertise include structural health monitoring of in-service bridges, seismic vulnerability assessment of bridges with geometric irregularities, reliability analysis-based load rating estimation of various bridge types, field testing and computational analyses, structural examination of curved and/or skewed bridges during erection, and lateral distribution factor examination of bridges. During his academic career, he authored numerous peer-reviewed journal articles in earthquake and bridge engineering. He is a Licensed Professional Engineer in Iowa.

University of Colorado Denver

Carrie Makarewicz joins the planning and design faculty as an assistant professor after finishing PhD studies in city and regional planning at the University of California Berkeley. She focuses on community development, sustainable economic development strategies, transport equity, regional planning, and urban school reform. Prior to pursuing her doctorate, she worked as a planner and research manager for the Center for Neighborhood Technology and the Center for Transit-Oriented Development where she helped to develop the Housing and Transportation Affordability Index and the National Transit Oriented Development Database. She also worked for the City of Chicago's Department of Planning and Development and Office of Management and Budget, and other non-profits and private consulting firms. She has served on several local and national boards and advisory committees, including the founding board of the Andersonville Development Corporation, a neighborhood nonprofit focused on the creation and implementation of sustainable policies for small business districts in Chicago. Currently, she serves on the Technical Advisory Group for STAR Communities, a national system to provide sustainability and assessment tools for local governments throughout the US. She holds a bachelor of business administration from the University of Michigan, Ann Arbor, and a master's in urban

planning and policy from the University of Illinois-Chicago.

Austin Troy is an associate professor of planning and design. He joined UC-Denver after more than a decade at the University of Vermont. He is the former director of the University of Vermont Transportation Research Center and focuses on land use policy, environmental planning, GIS, spatial analysis, remote sensing, and land use change modeling and simulation. He is the author of a recent book entitled: *The Very Hungry City: Urban Energy Efficiency and the Economic Fate of Cities*. Troy holds a PhD in environmental policy and economics from the University of California Berkley, a master of forestry degree from the Yale School of Forestry and Environmental Studies and a BA in anthropology from Yale University.

University of Utah

Xiaoyue Cathy Liu joined the Department of Civil & Environmental Engineering in Fall 2013. She has a PhD in transportation engineering from the University of Washington, a master's degree in transportation planning and management from Texas Southern University, and a bachelor's degree in electronics and electrical engineering from Beijing Jiaotong University. She serves as a member of the Transportation Research Board (TRB) Managed Lane Committee. Liu's background includes extensive research in performance analysis, highway capacity analysis, traffic sensor data analysis, traffic operations, traveler information systems, advanced traffic control systems, freeway network modeling, and traffic simulations. Liu has also won several awards, most notably, Boeing Academic Achievement Awards, WTS Helene M. Overly Memorial Graduate Scholarship, ITE Washington State Outstanding Graduate Student, ITE Western District Outstanding Graduate Student, ITE Western District Best Student Paper, as well as the ITE Daniel Fambro Paper Award.

Milan Zlatkovic became a research assistant professor in the Department of Civil and Environmental Engineering in July 2013. He received his BS degree in Road and Urban Traffic and Transportation Engineering from the University of Belgrade, Serbia, and MS and PhD degrees in civil engineering with emphasis in transportation from the University of Utah. His research interests include traffic signal systems, public transportation, transit signal priority, traffic modeling and simulation, intelligent transportation systems, traffic flow theory, highway design, and

transportation safety. He has been involved in numerous national and state research projects. MPC provided additional support to Zlatkovic's research in public transportation and transportation modeling. His work has been published and presented in various journal and conference venues. Zlatkovic is currently a member of the Institute of Transportation Engineers, and a friend of the Transportation Research Board AHB25 (Traffic Signal Systems) and AP075 (Light Rail Transit) Committees.

Utah State University

Ziqi Song joined USU in the fall of 2013 as an assistant research professor. He received his PhD from the University of Florida where he then went to the Technical University of Munich as a post doctorate research fellow followed by his return to the University of Florida to continue on as a post doctorate research associate. His research areas include transportation economics, transportation network modeling, traffic operations and management, multimodal transportation systems, sustainable transportation development, and intelligent transportation systems. He is currently a member of the Transportation Research Board, the Institute for Operations Research and the Management Sciences, and the Institute of Transportation Engineers.



Outreach Activities

University of Denver Hosts Global Sustainability and Supply Chain Conference

A Global Sustainability, Transportation and Supply Chain Conference was held in October in Denver, CO, with support from the MPC.

The event was designed to enhance public awareness related to policy issues facing freight and passenger transportation in maintaining a sustainable, global supply chain. More than 40 participants including university faculty and students, supply chain and logistics professionals and representatives from transportation companies and shippers came from across the United States and from as far away as the United Kingdom and Australia. The one-day conference was sponsored by the Intermodal Transportation Institute and the National Center for Intermodal Transportation for Economic Competitiveness at the University of Denver and the transportation and logistics organizations in Denver that participate on the NCITEC Outreach Steering Committee. Financial support was provided by the MPC.

For a list of conference panelists and to download conference papers, go to http://www.du.edu/transportation/forum_programs.html

Liu Appointed To Transportation Advisory Board

U of U civil and environmental engineering assistant professor Xiaoyue Cathy Liu was recently appointed as a member of the Transportation Advisory Board in Salt Lake City. Cathy will serve as a representative of transportation academia. The board provides recommendations to the transportation division, mayor, and city council regarding transportation decisions and issues affecting Salt Lake City.

Liu Selected to Participate in Inaugural HCQS Mentoring Program at TRB

U of U civil and environmental engineering assistant professor Xiaoyue Cathy Liu has been selected as mentee to participate in the inaugural mentorship program of the Highway Capacity Quality of Service (HCQS) Committee (AHB 40). HCQS committee acts as the primary overseer for research and enhancement of the Highway Capacity Manual, and a lot of other new projects that will significantly affect the practice. Cathy will work with her mentor, Loren Bloomberg, over the next several years to receive great exposure to the committee and inner workings of various subcommittees.



Bordelon

U of U's Bordelon interviewed by Salt Lake Tribune

Amanda Bordelon, U of U assistant professor of civil and environmental engineering, was interviewed and highlighted in an article in the Salt Lake Tribune about women in science, technology, engineering,

and mathematics (STEM) careers. Published online on 06/07/2013 at <http://m.sltrib.com/sltrib/mobile3/56422296-219/utah-women-stem-education.html.csp>.

Porter Explains Yellow Light Dilemma Zone on KSL Radio

Richard Porter, assistant professor of civil and environmental engineering was interviewed on Salt Lake City radio station KSL on the dilemma's drivers face at yellow traffic signals. Porter was

interviewed by KSL's Bill Gephardt and explains the "dilemma zone" and what traffic engineers are doing to keep our roads safe. Watch and read the article, "Hit the brakes or the gas? Help for drivers at yellow lights," here: <http://fw.to/GR3NbsY>.



Porter



Project Highlights

Integral Abutment Project Completed at USU

As part of a study to develop design guidelines for integral abutment bridges, a study by USU researchers was undertaken in which the bridge movement of the 400 South Street Bridge in Salt Lake City was surveyed for one year to quantify changes in bridge movement due to temperature variations.

Researchers Paul Barr and Marv Halling compared these quantitative bridge movements to predicted behavior from a finite-element model. The model was subsequently used to determine likely causes of cracking stresses in the bridge's north abutment. The modeling scheme was further implemented to investigate the influence that various bridge parameters have on the integral abutment stresses.

In general, expansion and contraction of the 400 South Street Bridge was observed as temperature increased and decreased, respectively. The observed movements were unequal when comparing the east and west sides of the bridge. Through finite-element analyses, this unequal movement is believed to be a result of lateral movement at the skewed support of the North Abutment. As a result, the abutment cracking of the 400 South Street Bridge is likely a result of a combination of bridge parameters. These properties include a combination of skew, curvature, span length, and detailing. Integral abutment bridges with more than one of these conditions need to be detailed appropriately.



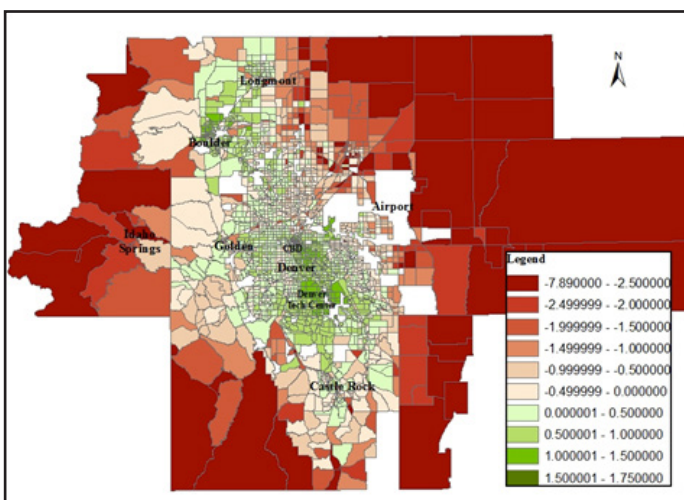
UC-Denver Research Identifies Keys in Transportation Resiliency

Researchers at UC-Denver identified three key pathways to transportation resiliency in communities impacted by economic shocks.

Transportation resiliency is the ability for a transportation system to maintain or return to a previous level of service after a disruptive event. The goal of the research was to understand how the availability of transit, bicycling, and walking contributes to transportation resiliency under economic shocks to the system caused by an abrupt doubling of gas prices.

To realistically assess the alternative mode options under the resiliency scenario, the researchers, directed by Wesley Marshall, performed a series of analysis – including multinomial logistic regression – to assess resiliency disparities across the Denver region. They found that high incomes; housing proximity to employment centers such as downtown; and high quality / low stress multi-modal transportation options were the three main pathways to transportation resiliency.

The researchers also determined that there is a cumulative effect in these results; for instance, we also found high vulnerability in many suburban communities, which is exacerbated by lower income households being priced out of more accessible locations. The figure below depicts the results of the researcher's Transportation Economic Resilience (TER) rating system for the Denver region at the TAZ level, where the green color suggests better resilience and the red color indicates increased vulnerability.



The analyses provided a better understanding of how geographically and demographically diverse areas are impacted by a disruptive event such as a drastic gas price increase. The researchers were also able to measure the financial benefit of various transit, biking, and pedestrian infrastructures – even if few people are using those facilities today – and how these investments may support transportation resiliency.

Seismic Performance of SCC Bridge Columns

Seismic design provisions require high amounts of transverse reinforcement in reinforced concrete bridge columns. Those requirements sometimes lead to steel congestion and prevent proper placement and consolidation of conventional concrete (CC). In such cases, self-consolidating concrete (SCC) can be a better alternative to conventional concrete.

Researchers at SDSU are evaluating and comparing the seismic performance of SCC bridge columns to that of CC bridge columns. Four scaled rectangular bridge column specimens (two SCC and two CC) were constructed and tested to failure at the Lohr Structures Laboratory at SDSU. The specimens were tested under constant axial load and cyclic lateral loading with increasing displacement amplitude. The test results are being analyzed; however, initial results indicate that the SCC column specimens exhibited high ductility and good energy dissipation.

The research team is comprised of Dr. Nadim Wehbe and graduate student Todd Pauly. The study is co-sponsored by MPC and South Dakota State University.



Test setup



Column specimen during the test

U of U Research Addresses Early Pavement Failures Caused by Thermal Cracking

Thermal cracking in pavements due to stresses caused by low temperatures is a major factor in roadway degradation nationwide and especially in the Mountain West. In fact, some studies have shown that more than \$50 million are spent every year on road maintenance resulting from thermal cracking in pavements. Researchers at the U of U are solving this problem by adopting a new mixture test using equipment already available to test asphalt binders.

Dr. Pedro Romero with graduate students Charan Kumar Chandika, Zac Gary Jones, and Crystal Clendennen-Peirce have used the bending beam rheometer to measure low temperature response of asphalt mixtures from both laboratory-prepared and field samples. The first part of their work consisted in demonstrating that small beam slivers measuring 12.7 mm x 6.35 mm x 127 mm could be tested in bending at low temperatures to represent the global properties of the pavement mixture. Once it was clear that this test configuration satisfied the requirements for a representative volume element, field samples were obtained from cores taken from multiple roads around the Salt Lake Valley in Utah. The cores were cut into small beam slivers and prepared for bending beam rheometer testing.

The beams were tested in bending at different temperatures to obtain their time-dependent, viscoelastic, properties. The response of field cores and subsequent viscoelastic analysis showed that, even though the same binder grade is used throughout the region (PG 64-28), the resulting mixtures have significant differences in creep moduli and m-values. This indicates that binder testing alone, as it is currently done, might not be enough to control the material's creep modulus and thus its resistance to thermal cracking.

The analysis of test results and comparison to field surveys indicate that two material properties can be used to characterize the low-temperature performance of asphalt pavements. The properties are the creep modulus determined at 60 seconds of loading and slope of the creep modulus versus time curve at the same time (called m-value). Pavements with high creep moduli and low m-values are more susceptible to low-temperature thermal distress (i.e., cracking).

Field observations were conducted over two winters to determine the performance of each section; then by plotting the test results of the field samples on a Black Space Diagram (modulus versus m-value) it was observed that, as expected, those sections with high modulus and low m-value were more susceptible to thermal cracking. Based on these results it was determined that a thermal stress failure envelope might exist and could be developed into a low temperature pavement performance specification.

The results also showed that using the bending beam rheometer to test field mixtures is practical; the process is simple and the variability in the results is within acceptable values. Coring, cutting, and testing at one temperature could all be completed for a single core within one work day; thus making this test ideal for quality control or even quality acceptance of asphalt mixtures. Other less tangible benefits include the fact that this test is performed using equipment already available to the asphalt industry, thus reducing the cost of equipment acquisition and training.

U of U Studies Transit Oriented Development Using Traffic Modeling

Transit oriented development helps communities grow in a way that promotes accessibility and mobility, but U of U researchers wanted to know how the practice impacts traffic. To find out, they studied a community using traffic modeling techniques to quantify the traffic impacts of transit oriented development.

Transit oriented development creates high density, mixed land use patterns with pedestrian friendly environment concentrated around transit stations. This enables people to walk to transit stops or to their daily destinations, and decreases the need for private vehicle use. Throughout the Wasatch Front Metropolitan Region, the majority of land use development forces people to drive in order to access their destinations. This is due to low density and mostly single use developments, built on the poorly connected street networks with a lot of cul-de-sacs and low number of routing options for transport system users.

The project, conducted by Xuesong Zho, assistant professor of civil and environmental engineering,

quantified the traffic impacts of TOD using a study network located in West Valley City, UT, bordered by 3500 S and 4700 S (north-south), and 4800 W and 5600 W (east-west). This part of West Valley City will go through many development and land use changes in the next 15 years. The Mountain View Corridor is being built along 5600 W, and many other road and transit projects are planned in the vicinity. This area will be focused on transit use, so there is a need to design the best possible transit oriented design features for the planned conditions.

The purpose of transit oriented design is to motivate people to change their travel mode choices. Built environment could be the answer to this challenge. Changing the environment to accommodate walking and transit vehicles could increase the number of transit users. Proposed improvements evaluated through this project are: enhanced street connectivity, traffic calming measures, innovative intersections, and transit friendly designs. Performance evaluation measures used are related to traffic analysis, street connectivity and transit accessibility. The project resulted in recommendations for future development of the observed network into a transit oriented design-supportive environment.

Comparison of travel times and speeds on different segments for 2009 and 2040 showed significant increase in travel time for only one of 12 segments we compared on the test network, meaning that new network designs for 2040 need to focus on intersection operations. Increased street connectivity without improving intersection operations will not accommodate traffic demand for 2040 PM peak period, under the assumption that mode shift does not occur. Comparing street connectivity scenarios for different network segments between main intersections, street widening and enhanced connectivity show similar results, implying that enhanced connectivity could be a good alternative approach for the corridors.

The project also includes conceptual frameworks for measuring street connectivity and transit accessibility, which could serve as indicators of transit quality of service and both spatial and temporal coverage once proposed transit service changes are implemented as a part of the future transit oriented development site.

Understanding Driver's Cell Phone Use and Why They Support Legislation to Restrict the Practice



David Sanbonmatsu (driver) and David Strayer in the Applied Cognition Laboratory driving simulator facility at the University of Utah.

Although a great deal is known about the detrimental effects of cellular communication on driving performance, relatively little research has examined the motivations and self-regulatory factors underlying this behavior. With the support of the MPC, UU researchers David Sanbonmatsu, David Strayer, Arwen Behrends, Nathan Medeiros-Ward, and Jason Watson are investigating why people talk on a cell phone while driving and why they also support legislation to restrict this practice. Ironically, many drivers support legislation that would restrict a behavior in which they regularly engage.

Previously, the researchers examined the relationship between personality and individual differences in multitasking ability. They found that multitasking activities such as using a cell phone while driving were negatively correlated with actual multitasking ability. Multitasking was positively correlated with participants' perceived ability to multitask, which was found to be significantly inflated. Participants with high levels of impulsivity and sensation seeking also reported greater multitasking behavior while driving.

In their current research, nearly 300 drivers were surveyed about their driving attitudes, beliefs, and behaviors. In addition, they completed a series of laboratory tasks that measured their multitasking ability. As in previous studies, most participants reported talking on a cell phone

at least occasionally while driving. The majority of participants also expressed support for laws restricting this behavior – a behavior that they often engage in.

Participants reported using cell phones for benefits such as connecting with family and friends and getting work done. They generally acknowledged the risks of using a cell phone while operating a motor vehicle. However, they downplayed the dangers relative to behaviors such as drinking and driving. Moreover, they saw others' usage of cell phones while driving as much riskier than their own behavior. The overconfidence in their ability to drive safely while distracted contributes to their lower perceived risk and increases their willingness to use cell phones behind the wheel.

Interestingly, there was little relation between participants' self-assessments of their ability to drive safely while distracted and their actual multitasking ability (a pattern we also observed in our prior study). Alarming, multitasking performance was negatively correlated with self-reported cell phone usage while driving. Thus, drivers who use cell phones the most often tend to be the worst at multitasking. The pattern is surprising because decision theory would suggest that people should choose to multitask when they are good at it. However, the decision to multitask while driving appears to have little to do with the driver's proficiencies.

Study participants were much less confident about others' ability to drive safely while using a cell phone. Support for legislation to limit cell phone use appears to be based heavily on the perceived threat to public safety presented by others' usage of cell phones while driving. The perceived benefits of personal usage and others' usage of cell phones also predicted support for laws to limit cellular communication while driving. In other words, people tend to support legislation to restrict cell phone use while driving because they don't want the other guy using his cell phone on the roadway.

Our latest research is examining individual differences in driving performance in our driving simulator and in an instrumented vehicle to determine what factors predict a driver's ability to self-regulate their behavior. This work differentiates between proactive self-regulatory decisions to not

multitask (e.g., talk or text on a cell phone) while driving and reactive self-regulatory behaviors to terminate multitasking activities when driving demands increase, for example, as traffic density increases. Early evidence suggests that the reactive form of self-regulation is more difficult because cell phone use impairs driver's ability to monitor their actions.

Congress and Federal Railway Administration Look to NDSU for Info on Small Railroads

To assure that the nation's small railroads continue to provide access to rural and agricultural communities as well as the nation's ports, NDSU's Upper Great Plains Transportation Institute is studying those railroads' financial options and investment needs.

The study is the result of a request from the U.S. House of Representatives Committee on Appropriations to the U.S. Secretary of Transportation and is designed to provide background for public policy decisions that could impact investment and capital availability.

"These are the railroads that provide service to most rural and agricultural communities and communities that have a single industry," notes UGPTI research fellow Doug Benson. "These are the class II and class III railroads that more broadly extend the reach of the railroad industry." According to the American Short Line and Regional Railroad Association, 558 short line railroads operate over 50,000 miles of track in the United States.



Benson

The research, expected to be complete in early 2014, is designed to provide an assessment of the overall investment needs of small railroads and their ability to find the capital to meet those needs. Most small railroads are relatively small companies or are owned by holding companies. They face huge capital needs as infrastructure, particularly roads and bridges, deteriorates from age and from increasing loads and traffic. The average cost to

upgrade a mile of track is about \$1 million and railroads must also upgrade operating systems to meet safety standards and take advantage of technologies like positive train control and radio frequency identification (RFID) that are already in use by large railroads.

Those long-term improvements are critical to the industry, but typically do not generate the kinds of returns that would make them attractive to investors. "This is part of the railroad industry that reaches out to every part of the country, but it is also the part of the industry that is least able to generate financial options," Benson explains.

Two earlier studies, one by the Federal Railroad Administration in 1993 and the other by the UGPTI in 2012, contributed to Congressional development and support for the Railroad Rehabilitation and Improvement Financing loan and loan guarantee program.

The current study will assess the situation in light of current capital and investment markets. "If small railroads cannot find funding for their capital investment needs, the national transportation system will be diminished," Benson says. "Public policy must be informed by a current assessment of small railroad investment requirements and the financial options available for responding to those needs."



Campbell



Ndembe

Anne Campbell and Elvis Ndembe, research assistants and transportation and logistics PhD students are assisting with the study. Campbell conducted surveys of banking and railroad companies for the study. The Association of American Railroads helped conduct the small railroad survey. Ndembe, with expertise in rail logistics and econometrics, is helping to analyze the data.

Benson notes that there is not much data publicly available on the investment needs of short line railroads. That's why the UGPTI's survey is so critical. The institute's previous work on the topic has enhanced responses to the survey because railroad managers saw the benefits of the previous study and recognize UGPTI as a trusted partner.

Mountain-Plains Consortium • Upper Great Plains Transportation Institute
North Dakota State University • Dept. 2880 • P.O. Box 6050 • Fargo, ND 58108-6050
T: (701) 231-7938 • F: (701) 231-7067
www.mountain-plains.org