

METRANS NEWS



CALIFORNIA STATE UNIVERSITY
LONG BEACH

Dedicated to solving metropolitan transportation problems through
research, education, and outreach.

Summer 2015 Volume 14 Issue 2

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METRANS, a partnership of the University of Southern California and California State University, Long Beach, is a US Department of Transportation designated University Transportation Center. Its mission is to solve transportation problems of large metropolitan areas through research, education, and outreach.

METRANS RESEARCH

METRANS Convenes Leading California-Based Researchers for Transportation Systems Optimization Workshop

Leaders in transportation system research throughout California gathered at the University of Southern California (USC) on May 8 for a Transportation Systems Optimization Workshop, co-sponsored by the USC Epstein Department of Industrial and Systems Engineering and METRANS.

Workshop organizers Maged Dessouky and Jong-Shi Pang, from USC's Daniel J. Epstein Department of Industrial and Systems Engineering, introduced presenters and the rationale for the daylong event.

"It's something that Jong-Shi Pang and I have wanted to do for some time," Dessouky said. "Some of the best research on transportation is taking place in California, so it made a lot of sense to gather this community of leaders to explore a range of ways to use transportation and control techniques in mobility and freight in an urban setting."

The workshop prompted presenters and attendees to connect, share insights, and explore collaborative research opportunities, Dessouky said. "Several of the presenters have also expressed interest in hosting follow-up workshops at their home universities next year," he added.

Workshop presentations were as follows:

- "Service Region Design for Urban Electric Vehicle Sharing Systems," Max Shen, University of California, Berkeley
- "Traffic Network Observability and Stochastic Estimation," Yue Yue Fan, University of California, Davis
- "Joint Traffic Routing and Signal Control in a Connected Vehicle Environment," Michael Zhang, University of California, Davis
- "Household-Level Economies of Scale in Transportation," John Gunnar Carlsson, University of Southern California
- "Peer-to-Peer Ride-Share Systems: Possibilities and Algorithms," R. Jayakrishnan, University of California, Irvine
- "Stability Analysis and Control Synthesis for Dynamical Traffic Systems: from Microscopic to Macroscopic," Ketan Savla, University of Southern California
- "Optimization in Real Transportation Systems," Genevieve Giuliano, University of Southern California
- "Dynamic User Equilibrium in Continuous-time and Pricing Strategies for System Optimum," Rui Ma, University of California, Davis
- "Load Balancing Using a Co-Simulation/Optimization/Control Approach," Petros Ioannou, University of Southern California
- "Efficient Algorithms in the Redesign of an Emergency Dispatching System," Fernando Ordóñez, Universidad de Chile



To view the abstracts and biographies of each presenter at the workshop, go to:
<http://www.metrans.org/event/workshopMay2015>



MetroFreight Director Genevieve Giuliano.

Giuliano Presents Freight Landscape Research at 9th IACP Conference

MetroFreight Director Genevieve Giuliano presented her research on freight landscape as a transportation and land use topic of interest at the 9th International

Association for China Planning (IACP) Conference at Chongqing University in Chongqing, China from June 19-21, 2015. The theme for the event was "New Urbanization: Smart Growth and Sustainable Development."

"Cities are growing exponentially in China and this presents a wide range of transportation planning challenges," Giuliano said, explaining that she used her freight landscape research to emphasize the importance of building freight into China's massive urban master planning efforts.

To make her case for freight planning, Giuliano introduced the conceptual framework for her freight landscape research and reviewed two case studies, the Los Angeles region and the San Francisco Bay Area. Although these metropolitan regions have very different geographies and population density patterns, they both revealed that severe conflicts between freight and passenger traffic occur in city cores.

"The results are remarkably similar across model forms and metro areas," Giuliano noted. "In urban cores, truck access is most difficult, parking and loading are more limited, and external costs are higher because more people are affected," she said. "All of these findings suggest a general relationship between development density and urban freight problems," she added.

Giuliano concluded her presentation with a progression of logical conclusions. "Density is a proxy for land values," she said. "Therefore we should be able to use density to proxy these effects on freight flows."

Given the enormous challenges China faces in planning and building a transportation infrastructure to address its boom in urban growth, Giuliano's freight landscape research provided a practical first step for planners to think more systematically and logically about urban freight. Planners, designers, scholars, scientists, and government officials from both China and elsewhere attended the conference.

IFSTTAR, City of Paris Collaborate in CITYLAB Project Kickoff

MetroFreight partner IFSTTAR (French Institute of Science and Technology for Transport, Development and Networks University Paris-East) and the City of Paris are participating in the CITYLAB European project consortium addressing the challenge of the Horizon 2020 program on "Smart, green and integrated transport." The consortium seeks to reduce impacts and costs of freight and service trips in urban areas. The project is coordinated by the Institute of Transport Economics (TOI), Norway over a three-year period, from May 2015 until April 2018.

The general objective of CITYLAB is to develop knowledge and solutions that result in roll-out, up-scaling, and further implementation of

cost-effective strategies. CITYLAB will also develop measures and tools for emission-free city logistics in urban centers by 2030. To reach that objective, CITYLAB will deploy a set of living laboratories ("living labs") that will engage cities and regions as dynamic and real-life contexts for research, innovation, and implementation processes. Those CITYLAB efforts will promote public and private measures that contribute to more efficient and sustainable urban logistics. There are seven CITYLAB living labs, which are located in Brussels, London, Oslo, Paris, Rome, Rotterdam, and Southampton.

The CITYLAB consortium has strong links to the two VREF (Volvo Research and Educational Foundations) Centers of Excellence (CoE) on Urban Freight, and will use these networks (MetroFreight and CoE-SUFS) to spread the living lab idea to other parts of the world. MetroFreight Paris Team Leader Laetitia Dablanc is in charge of developing the links between CITYLAB and U.S. partners, including from MetroFreight and CoE-SUFS.

Rodrigue Teaches "Hinterland Transport and Logistics" Graduate Course in China

MetroFreight New York Team Leader Jean-Paul Rodrigue taught a 35-hour graduate course titled "Hinterland Transport and Logistics" at Chongqing University in Chongqing, China, in June.

Rodrigue's course focused on the inland dimension of port and maritime activities. The growth of maritime shipping is placing pressures on ports to improve the capacity and reliability of hinterland services. Infrastructure investments such as the development of road and rail corridors and a closer integration between the port and its customers are among the main strategies that have been pursued to improve hinterland logistics.

The course focused on:

- The technical and commercial changes that have impacted the port hinterland, namely global supply chains and intermodal transportation;
- The concept of port regionalization and the emergence of large gateways and transport corridors servicing extensive regional markets;
- The strategies and policies that have been implemented to improve the logistics performance of hinterlands, including port centric logistics, inland ports and logistics zones; and
- The challenges of port and city integration, and issues pertaining to urban freight distribution, often labeled as the "last mile."

Korea Logistics Society Holds 2015 Spring Conference: Logistics Innovation Strategy for New Commerce Era

The Korea Logistics Society held its 2015 Spring Conference on May 29. The conference addressed logistics policy and strategies to deal with challenges in the 21st century era of global digital commerce. Various research papers, business case studies, technical solutions and tutorials were presented and exhibited. MetroFreight Seoul Team Leader Sangbeom Seo and Jee-Sun Lee, Associate Research Fellow from the Department of Logistics Research at the Korea Transport Institute (KOTI) presented outputs from MetroFreight research.

For further information about MetroFreight news, go to:
<http://www.metrans.org/news/MetroFreightJuly2015>



SWTWC seeks to develop a skilled and career-ready transportation workforce throughout SWTWC's eight member states – California, Nevada, Arizona, New Mexico, Colorado, Utah, Texas, and Oklahoma.

METRANS OUTREACH

SWTWC Establishes Steering Committee, Launches Network

The Southwest Transportation Workforce Center (SWTWC) officially launched its network and introduced its Steering Committee members during an online kickoff event on June 25.

The Federal Highway Administration (FHWA) funded the launch of SWTWC in concert with four other regional centers that form the National Network for the Transportation Workforce. Each center is dedicated to providing a more strategic and efficient approach to transportation workforce development.

"During our kickoff, we introduced our team and Center mission to our Steering Committee," said SWTWC Director Thomas O'Brien. "Our Steering Committee members are thought leaders from industry, academia, government, and labor who are dedicated to connecting and empowering the transportation workforce."

During the June 25 event, the SWTWC team also launched its constituent relationship management (CRM) software platform. It will enable Steering Committee members to easily review findings from the SWTWC Data Clearing House, share their expertise, and help build partnerships and alliances between strategic stakeholders to advance the transportation workforce.

Housed at the Center for International Trade & Transportation at California State University, Long Beach (CSULB), SWTWC is dedicated to:

- Performing labor market analysis and identifying workforce and training needs for various transportation sectors;
- Evaluating the effectiveness of existing educational materials; and
- Establishing a resource clearinghouse for educators, employers, and those on the transportation career pathway.

SWTWC is led by the METRANS partnership of the University of Southern California (USC) and CSULB. The SWTWC team is further strengthened by three nationally recognized team members: Mark Coppock, from the Texas A&M University Transportation Institute, who will lead the center's website development and administration; Fran Beauman, from the National Occupational Competency Testing Institute, who will lead curriculum development for Grades 6-12; and ICF International senior staffers, including Brian Cronin, who is an expert in transportation industry workforce development and will lead the labor force demand analysis tasks.

"SWTWC Steering Committee members will help our team build a network that will connect the resources and expertise of leaders in previously siloed fields of industry, education, labor, and government," O'Brien said.

Building the network will enable the SWTWC team to gain insights into stakeholder programs regionally and nationally, reduce duplication of workforce efforts within regions, states and local areas, and provide for a more efficient, effective approach to transportation workforce development across the U.S.

SWTWC will launch its Transportation Workforce Data Clearing House and official website later this year.

For further information about SWTWC, go to: www.ccpe.csulb.edu/swtwc

METRANS OUTREACH

Shen Receives Orange County Engineering Council's 2015 Outstanding Engineering Educator Award

USC Adjunct Professor Eric Shen was awarded the Orange County Engineering Council's 2015 Outstanding Engineering Educator Award earlier this year. Shen, who serves as the Director, Southern California Gateway Office, Maritime Administration, U.S. Department of Transportation (USDOT), received the award in February during the council's annual awards banquet.

"Eric Shen has built a long record of inspiring teaching. He draws the best out of his students, guiding them to produce professional quality work. He is a mentor to student groups and he works tirelessly to link students to practice. USC is fortunate to have Eric as part of our faculty," said Marlon Boarnet, Professor and Senior Associate Dean, USC Price School of Public Policy.



From left to right: James Moore, Eric Shen, and Marlon Boarnet at the Orange County Engineering Council's Engineers Week Awards Banquet.



2015 I-NUF

6th **METRANS International** Urban Freight Conference
 October 21-23, 2015 The Westin Long Beach Hotel, CA
 For info, go to www.metrotrans.org

METRANS OUTREACH

2015 I-NUF Conference Set for October 21-23

Since its establishment in 2006, the METRANS International Urban Freight Conference (I-NUF) has become an increasingly important event for anyone interested in the most recent research and trends in the movement of goods in metropolitan areas.

"The conference has become a place for a wide range of groups interested in urban freight research," said Thomas O'Brien, Executive Director of the Center for International Trade & Transportation and METRANS Associate Director "We provide a venue for these groups to get together and showcase best practices that would be of interest to transportation and logistics practitioners."

O'Brien credits METRANS Director Genevieve Giuliano for "realizing that there was a gap in the conference schedule and that there wasn't any home base for people really interested in the conflicts between urban freight, urban core revitalization, and the movement of people and goods." The biannual I-NUF conference addressed that gap, O'Brien said, adding that the attendance numbers have steadily increased each conference.

A signature feature in each I-NUF conference is its site visit, O'Brien said. The Kroger site visit in 2013 "was a huge hit," he said. "Kroger's state-of-the-art distribution center, which is

largely automated, gave attendees a chance to see technological advancements that can enhance last-mile delivery of food and other goods to throughout the region." This year's conference will include a tour of the state-of-the-art Middle Harbor terminal at the Port of Long Beach.

One of the strengths of the I-NUF conference is its ability to draw such a multidisciplinary range of researchers and private sector and governmental leaders. "During the last I-NUF, TRB's [Transportation Research Board] Urban Freight Committee sponsored two sessions and TRB's Young Members Council sponsored a social event," O'Brien said. He noted that this year's conference will also include TRB's Intermodal Freight Transport Committee and the American Society of Civil Engineers whose Freight Committee is expected to bring a strong contingent of their own members.

METRANS received more than 130 paper and presentation proposals from 18 countries. Guest speakers include Brett Parker, Cargomatic (an "Uber" freight company); Randell Iwasaki, Contra Costa Transportation Authority and Chair of the National Freight Advisory Committee; and Laetitia Dablanc, The French Institute of Science and Technology for Transport, Spatial Planning, Development and Networks.

I-NUF papers and presentations will focus on the following thematic areas:

- **Local/last mile pickup and delivery;**
- **Sustainable transportation;**
- **Trade nodes and hubs – ports, airports, distribution hubs;**
- **Freight modes – trucking, rail, water;**
- **Urban modeling and planning;**
- **New technology;**
- **Changing consumption, production and spatial organization; and**
- **Best practices.**

For further information about I-NUF 2015, go to: <http://www.metrotrans.org/2015-i-nuf-overview>

I-NUF 2015 will take place Wednesday, October 21 to Friday, October 23, 2015, at The Westin Long Beach, 333 E. Ocean Blvd., Long Beach, CA 90802.

METRANS OUTREACH

METRANS Faculty Address "Intelligent Freight Network" at ITS America Symposium

METRANS Director Genevieve Giuliano and METRANS faculty member Eric Shen shared insights on a range of issues related to advancing an intelligent freight transportation network during the ITS America Symposium on March 26 and 27 aboard the Queen Mary in Long Beach, California.

Former California State Assembly member Bonnie Lowenthal and Giuliano discussed the progress of the National Freight Advisory Committee (NFAC) during a luncheon panel. Shen served on a panel that addressed ways that ports are using technologies to improve freight flow efficiencies.

Shen, who serves as the Director, Southern California Gateway Office, Maritime Administration of the U.S. Department of Transportation (USDOT), concluded the symposium by conducting a technical tour of the Long Beach Harbor that highlighted new automation efforts at the Long Beach and Los Angeles ports. During the tour, Shen also discussed ways that state, county, and port leaders are cooperating to carry out a major bridge renovation.

METRANS OUTREACH

METRANS Industry Outlook Event

Focuses on the Future Transportation Professional

Industry and academic panelists gathered at USC for METRANS' third Industry Outlook event on May 20 for a spirited panel discussion focusing on "The Future Transportation Professional." Industry panelists were Michael Christensen, Port of Long Beach; Art Leahy, Metrolink; C.J. Nord, The Institute for Supply Management, Los Angeles; and Jake Racker, Kroger. Academic panelists were Elizabeth Graddy and James Moore from USC and Ingrid Martin from CSULB. METRANS Director Genevieve Giuliano gave opening remarks and introduced Thomas O'Brien, who moderated the panel discussion.

There was general consensus on the industry panel that future transportation professionals would need cross-functional communication skills to connect with interrelated sectors that comprise the global supply chain. Industry panelists also agreed that while technological skills are essential, more traditional project management and leadership skills are also invaluable. To develop those skills, Christiansen stressed the importance of internships to gain general job experiences. Racker also emphasized the merit of internships for emerging transportation

professionals and noted that students who worked with Kroger were unaware of supply chain career opportunities until their internship.

Midway through the event, the academic panelists joined the industry panel to offer educational perspectives. Graddy affirmed the industry perspective that students need to take advantage of "experiential opportunities" such as internships and mentorships to prepare for entry into the transportation workforce.

The academic and industry panelists also discussed the perception that millennial generation students engage notions of research and work with different expectations due to their extensive use of technology and social media. Several millennial students asked the panelists questions about how to prepare for the transportation workforce and ways to bridge intergenerational conflicts using both traditional and next-generation communication methods.

A link to a video recording of the event can be found at: <http://www.metrotrans.org/industry-outlook>



METRANS EDUCATION

Where Are They Now? Sandipan Bhattacharjee

Since graduating in 2003 with his Master's Degree in Urban Planning from USC's Price School of Public Policy, Sandipan Bhattacharjee has launched his own transportation-consulting firm while also keeping close ties with his alma mater as an adjunct faculty member.

Bhattacharjee describes his consulting firm, Translutions, Inc., as "a solutions oriented transportation planning and traffic engineering company."

As cofounder and principal of Translutions, Bhattacharjee prepares technical analyses of land development, transportation infrastructure projects, parking, and traffic impact, and operation analyses for clients throughout Southern California. He has extensive experience in preparing transportation analysis for inclusion in California Environmental Quality Act (CEQA) documents.

Bhattacharjee also teaches a master's level course on urban transportation planning and management at the Price School. "When I started working in 2003, I had no idea what a transportation planning consultant did," he said. "After a few years, I created this course based on what I had learned over the years."

The curriculum for the course remains dynamic, Bhattacharjee said. "The class is a little different each year to keep up with the way transportation analyses are conducted in California based on changes to CEQA."

One particular point of interest about Translutions that Bhattacharjee noted was that the firm's cofounder and other partner is his wife, Deepali Chausalkar, who also graduated from USC with dual master's degrees in urban planning and transportation engineering. "We met at USC," he said. "She was a research assistant at METRANS."

METRANS OUTREACH

Ioannou Awarded 2016 IEEE Transportation Technologies Award

METRANS Associate Director of Research Petros Ioannou was awarded the 2016 Institute of Electrical and Electronics Engineers (IEEE) Transportation Technologies Award in June. IEEE awarded Ioannou for his "contributions to the design, analysis, and implementation of adaptive cruise-control systems." For nearly a century, the IEEE Awards Program has paid tribute to technical professionals whose exceptional achievements and outstanding contributions have made a lasting impact on technology, society, and the engineering profession.

METRANS EDUCATION

METRANS Matches 20 Transportation Students with Mentors

METRANS continued the third year of its mentor program by matching 20 transportation students with professional mentors. The METRANS Mentor Program is designed to meet the needs of transportation students seeking a professional career in the public or private sectors. METRANS launched a small pilot program in 2012 with students who actively participated in METRANS seminars and activities. Those students were matched with METRANS Advisory Board professionals whose field of expertise best met the students' career goals.

The program accepts applications from all students at USC and CSULB interested in a career in transportation. The purpose of the mentor/mentee relationship is to guide students who plan to pursue a professional,

nonacademic career. Mentors provide a unique opportunity to broaden the students' educational experience through one-on-one interactions with industry professionals, an opportunity often missing in the students' formal education. Mentors provide valuable advice and counsel to students as well as experienced perspectives on the transportation profession.

The mentor/mentee relationship is intended to last through the academic year or until the student graduates, although many students and mentors remain in contact past graduation.

METRANS would like to formally recognize and thank this year's mentors:

Udit Agrawal

Software Development Engineer
Yahoo

Kate Amissah

Transportation Planner
LA Metro

Doran Barnes

Executive Director
Foothill Transit

Dan Beal

Consultant
Self Employed

Michael Christensen

Senior Executive for Supply Chain Optimization
Port of Long Beach

Fred Courouble

Courouble Design & Engineering Inc.

Jay Fuhrman

Transportation Planning Manager
LA Metro

Rawad Hani

Transportation Planner & Traffic Engineer
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South Coast Air Quality Management District

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Transportation Planning Manager
LA Metro

Julia Salinas

Transportation Planning Manager
LA Metro

Chen Wang

Supply Chain Operations Research Analyst
Nestle USA

Frank Zerunyan

Mayor
Rolling Hills Estates

Andres Fernando Di Zitti

Transportation Planner
LA Metro

For more information about the METRANS Mentor/Mentee program, contact METRANS Assistant Director, Victoria Valentine Deguzman, at VictoriV@usc.edu or (213) 821-1025.

METRANS EDUCATION

Port of Long Beach Partners with CITT to Launch Externship Academy

Understanding the critical need for high school curriculum that integrates port-related transportation and logistics into Common Core lesson plans, the Port of Long Beach and the Center for International Trade and Transportation (CITT) recently launched the Port of Long Beach Externship Academy. The weeklong Academy launched in June and included eleven teachers from the Long Beach Unified School District and two from private schools.

"The purpose of the Externship Academy is to give Long Beach-based teachers methods and resources to incorporate ports and goods movement content into their Common Core curriculum," said CITT Executive Director Thomas O'Brien.

During the weeklong externship, teachers participated in a harbor tour and Long Beach container terminal tour to gain insights into the importance of the goods movement industry. Teachers also worked with industry mentors to develop a supply-chain oriented Common Core and state aligned curriculum unit.

Throughout the 2015/2016 academic year, teachers in the program will implement the lessons they developed in their weeklong summer training

with mentors. Industry mentors will be invited to observe the lesson and participants' presentation of their final projects in Fall 2015. Teacher and mentor feedback will help both CITT and the Port identify future training needs and opportunities.

"The Port of Long Beach Externship Academy is an excellent example of the cross-cutting collaboration we seek to promote at the Southwest Transportation Workforce Center [SWTWC], which is the newest METRANS research center," O'Brien noted.



METRANS OUTREACH

Metro: A Critical METRANS Stakeholder in Urban Mobility and Student Professionalization



Phillip A. Washington was named the CEO of Metro in March. Washington previously served as CEO of Denver's Regional Transportation District. Under Washington's leadership, Metro will construct five major rail projects and a range of highway projects. In total, Metro's planned Rail and Rapid Transit Expansion projects and Highway Improvement projects represent the largest modern public works program in the United States.

The Los Angeles County Metropolitan Transportation Authority, more commonly known as Metro, plans, designs, builds, and operates transit and highway infrastructure for more than 9.6 million people within its 1,433-square-mile service area in Los Angeles County. Given the METRANS mission of solving "transportation problems of large metropolitan regions through interdisciplinary research, education, and outreach," Metro offers an invaluable real-world perspective to student and faculty researchers on the integrated management of passenger and freight systems and urban mobility.

Metro is also an extremely engaged member of the METRANS Associates Program, said METRANS Assistant Director Victoria Valentine Deguzman. "Metro is the largest employer and internship provider for METRANS students. At last count, there were more than 200 METRANS students from USC and CSULB who had taken employment or internships with Metro," she said.

METRANS launched its Associates Program in 2012 to promote collaboration between the academic community, corporations, and government bodies to share industry insights and best practices in the field to address emerging trends in goods movement and international trade. "In addition to the extensive employment and internship opportunities Metro offers METRANS students, Metro is

also a regular contributor to the METRANS "Lunch with a Practitioner" series, Valentine Deguzman said. "Metro has also logged the highest rate of participation in the METRANS Mentor/Mentee program," she added.

The METRANS Associates Program provides the core support for the METRANS Transportation Center, a joint partnership of the University of Southern California and California State University, Long Beach.

"The METRANS program has proven to be an invaluable resource for Metro's recruitment of talented individuals into the transportation field, filling key professional positions within our organization," said Metro CEO Phillip Washington. "Metro is proud to be a member on METRANS' Advisory Board and through this joint USC/Cal State Long Beach transportation research and education group, Metro and the public reap the benefits of better transportation policy."

For additional information about the METRANS Associates Program, contact Susan Bradforth at 213-821-3650 or bradfso@price.usc.edu. For further information about Metro, go to: www.metro.net.



Metro

METRANS EDUCATION

METRANS 2015 PhD Graduates

METRANS congratulates its newly minted PhDs. Their titles and dissertation topics are as follows:

Afshin Abadi, PhD in Electrical Engineering, USC, "Optimum Multimodal Routing Under Normal Condition and Disruptions."

Yasuhito Abe, PhD in Communication, USC, "Measuring for What: Networked Citizen Science Movements after the Fukushima Nuclear Accident."

Qian An, PhD in Industrial and Systems Engineering, USC, "Evaluating City Logistics Using Two-Level Location Routing Modeling and SCPM Simulation."

Vadim Andreevich Butakov, PhD in Electrical Engineering, USC, "Personalized Driver Assistance Systems Based on Driver/Vehicle Models."

Ray Calnan, PhD in Policy, Planning and Development, USC, "A Better Method for Measuring Housing Affordability and the Role that Affordability Played in the Mobility Outcomes of Latino-Immigrants Following the Great Recession."

Sandip Chakrabarti, PhD in Urban Planning and Development, USC, "The Demand for Reliable Travel: Evidence from Los Angeles and Implications for Public Transit Policy."

Harsha Honnappa, PhD in Electrical Engineering, USC, "Strategic and Transitory Models of Queueing Systems."

Yuting Hou, PhD in Policy, Planning and Development, USC, "Essays on Congestion, Agglomeration, and Urban Spatial Structure."

Mohja Rhoads, PhD in Urban Planning and Development, USC, "The Flexible Workplace: Regional Tendencies and Daily Travel Implications."

Agnelo Rocha da Silva, PhD in Electrical Engineering, USC, "Theory and Design of Magnetic Induction-Based Wireless Underground Sensor Networks."

Shahab Taherian, PhD in Engineering, CSULB (joint doctoral program with Claremont Graduate University), "Computational fluid dynamics analyses of ambient particle deposition in the human respiratory system and virus transport aboard a regional aircraft."

For further information about METRANS student awards, go to: <http://www.metrotrans.org/news/studentawards2014-15>

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METRANS Associates Program

The METRANS Associates Program (MAP) provides the core support for the METRANS Transportation Center. METRANS appreciates and thanks our current partners:

To learn more about MAP and its benefits, see www.metrotrans.org/metrans-associates-program

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APM TERMINALS



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