OTREC
OREGON TRANSPORTATION RESEARCH AND EDUCATION CONSORTIUM

OTREC NEWS
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INSIDE THIS ISSUE:

OTREC is a National University Transportation Center, and is a partnership between Portland State University, the University of Oregon, Oregon State University and the Oregon Institute of Technology

Researchers Study Socio-Economic Effects of Vehicle Mileage Fees

In recent years it has become evident that the gasoline tax (the primary way that highway user fees are collected at both state and federal levels in the U.S.) may no longer be able to generate the funds necessary to build and maintain the increasingly-expensive highway system. A vehicle mileage travelled (VMT) fee is a frequently mentioned alternative based on vehicle miles traveled instead of gallons purchased. However, concerns have been raised regarding the possible shift of tax burden to lower income groups or from urban to rural areas, and regarding the possibility of this type of tax discouraging people from driving alternative fuel vehicles. Dr. B. Starr McMullen and Dr. Lei Zhang at Oregon State University have developed analytical techniques that can be used to examine the distributional impacts of alternative fee structures. Graduate students Kyle Nakahara (Economics), Smita Biswas (Ag/Resource Economics) and Divya Valluri, (Civil Engineering) helped develop and test models that describe possible impacts of this policy change on different socio-economic and geographic groups.

McMullen's team developed static, OLS regression, and discrete-continuous choice models to assess distributional effects of alternative highway user fees for light vehicles in Oregon. Results of the research indicate that the impact of a change to VMT fee for the lowest income group amounted to a change of less than one percent of their income. As a comparison, the increase in total gasoline expenditures that was caused by increases in gas prices between 2001 and 2006 was over five percent of income for the lowest income group. The impact of the change to a VMT fee on rural areas was found to be much less than expected; on average a household in a rural location would pay less under a revenue-neutral VMT fee, whereas those in urban areas would pay slightly more. This was largely due to the lower overall average fuel efficiency in the rural vehicle fleet relative to the urban fleet and the greater number of miles driven on average by rural households.

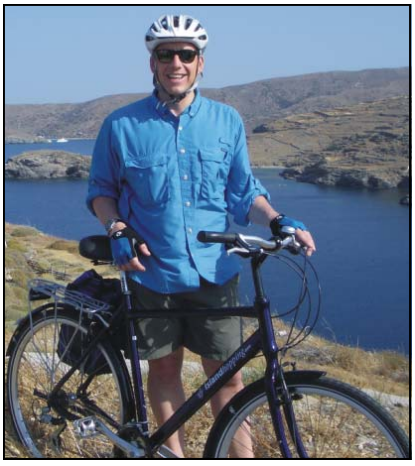
Regarding the third concern, research results suggested that a change to a VMT fee would not be likely to create a significant disincentive to purchase more fuel efficient or hybrid vehicles, because the change in fee structure had such a small impact on the cost of driving relative to the price of gasoline. However, further development of the discrete-continuous choice model is recommended to address this concern, as this type of model can better handle long-term questions of how people change their choice of vehicles in response to policy changes. Overall results from the team's models suggest that the VMT fee considered in the study would have a negligible impact on income distribution, would not adversely impact rural drivers, and may not significantly impact vehicle choice. The principal investigators note however that different policy goals (highway finance, vehicle emissions, insurance rates) may require different policy alternatives (i.e., congestion pricing, tolling, parking fees, hybrid subsidies, etc.), since it may not be possible to use one policy (such as a flat VMT fee), to achieve multiple objectives.

Preliminary results of this project were presented at the annual meeting of the Transportation Research Forum, the World Conference on Transport Research, and the New Directions in Asset Management and Economic Analysis Conference (TRB). This project was co-sponsored by the Oregon Department of Transportation.

Contact B. Starr McMullen, s.mcmullen@oregonstate.edu.

Above: Dr. B. Starr McMullen (left) and Dr. Lei Zhang, Oregon State University, have developed models to assess possible effects of VMT fees on low-income, rural vs. urban and hybrid vehicle users.

To read the final report for this project, visit the project page: http://otrec.us/main/show_abstract.php?prop_id=3



Director's Corner

Welcome to the latest edition of OTREC News. One of the most satisfying aspects of working at a university is commencement --the annual rite of passage where we celebrate our students' achievements, and watch them enter (or return) to the professional world. This year, OTREC faculty celebrated with many undergraduate and graduate students who finished their studies and entered the transportation profession. It will be exciting to watch them become the leaders of tomorrow. Given the many challenges we face, we need these well-educated leaders more than ever. **Congratulations graduates!**

This spring we were honored to host a visit by RITA Administrator Paul Brubaker and UTC Liaison Tom Marchessault. We had a full day of events involving students, faculty, administrators and external partners. We particularly appreciated ODOT Director Matthew Garrett's participation. Administrator Brubaker is incredibly energetic and passionate about taking RITA and the UTC program to the next level, and we greatly appreciated his time and ideas. We'd like to salute Tom Marchessault who will be retiring from the USDOT after many years.

We also participated in the summer UTC meeting and Council of University Transportation Centers (CUTC) meeting, held at San Jose State University (one of my alma maters!). We appreciate the great work of RITA staff, under the leadership of Dr. Curt Tompkins, to increase the visibility of the UTC program through new publications and communication tools. As always it was fascinating to learn about all of the great programs being implemented by the other UTCs across the country; we came away with new ideas that we will be implementing in Oregon.

Thanks to Hau Hagedorn, our Executive Committee and our 135 peer reviewers, we recently completed the third project selection process. A total of 28 new projects will begin in October. Many of our projects are being completed, and you will read more about their results in future newsletters. In closing, I would like to offer our sincere gratitude to our 376 peer reviewers who have reviewed our 190 proposals and final reports over the past two years. We could not function as a UTC without the support of these experts from around the world. In particular, more than 45 reviewers from the USDOT (including the FHWA and FTA) have supported our efforts, and we extend our special thanks to them. As always, please visit our website (www.otrec.us) for more details and contact me directly at bertini@pdx.edu for more information or to get involved in our programs.

Robert Bertini

Robert L. Bertini, Ph.D., P.E.
OTREC Director

OTREC Theme:
Advanced Technology, Integration of Land Use and Transportation, Healthy Communities

Faculty Profile—Miguel Figliozzi

Dr. Miguel Figliozzi believes that innovation in freight transportation and logistics are necessary for a sustainable and vibrant economy. That is, he believes freight research and innovation not only benefit private companies but also enable the optimal use of infrastructure, as well as ensuring environmental quality, livable communities, and economic growth. Dr. Figliozzi hopes to push these ideas further and help expand his students' analytical and policy capabilities in these areas.

Dr. Figliozzi joined the faculty of the Department of Civil and Environmental Engineering at Portland State University in the fall of 2007. Originally from Cordoba, Argentina, he completed his undergraduate studies at the Universidad Nacional de Cordoba. Dr. Figliozzi's later studies were completed in the U.S. at the University of Texas at Austin (M.S.) and the University of Maryland College Park (Ph.D.). He then taught at the University of Sydney, Australia in the Business School's Institute for Transport and Logistics. He was attracted to Portland State University in part because of the dynamic growth and energy of the transportation engineering research group.

Dr. Figliozzi teaches graduate courses in freight transportation, supply chain/logistics, networks and optimization, as well as the undergraduate introductory course to transportation engineering. His research interests and publication topics include: fleet management and vehicle routing, pricing in trucking and freight, the impact of congestion on carriers and commercial vehicle movements, web-based and GPS freight data collection and applications, maritime transportation and international freight, green logistics, shippers and carriers value of time and reliability and transport related supply chain disruptions. Recently Dr. Figliozzi attended the 10th International Conference on Applications of Advanced Technologies in Transportation (AATT) in Athens, Greece, where his paper was selected from over 600 entries for the Best Paper Award in the transportation planning category (see page 6). More information on Dr. Figliozzi's publications, research and teaching can be found at: http://web.cecs.pdx.edu/~maf/. Contact Dr. Figliozzi at: figliozzi@pdx.edu.

2008-2009 OTREC Projects

On June 9, 2008, the OTREC Executive Committee selected the top 28 research, education and technology transfer projects for funding in 2008-2009. Forty-nine proposals were received in March, and each proposal went through a rigorous peer review process. Peer-reviewers ranked the proposals on the basis of intellectual merit, broad impacts, relevance to OTREC's theme and the national transportation research agenda. Projects with ODOT as a co-sponsor are noted with *.

RESEARCH

*09-216 Overlooked Density: Re-Thinking Transportation Options in Suburbia, Phase 2; PI: Nico Larco, UO

*09-221 Factors for Improved Fish Passage Waterway Construction, Phase 2; PIs: David Sillars, OSU and Hamid Moradkhani, Trevor Smith, PSU

09-224 Healthy Communities and Urban Design: A Multi-Disciplinary National Analysis of Travel Behavior, Residential Preference, and Urban Design; PIs: Jessica Greene, Marc Schlossberg, Nico Larco, Yizhao Yang, UO and Daniel Rodriguez, Noreen McDonald, University of North Carolina

09-226 Maintaining Safe, Efficient and Sustainable Intermodal Transport through the Port of Portland; PIs: David Jay, Jiayi Pan, PSU

09-227 Evaluation of Bike Boxes at Signalized Intersections; PIs: Jennifer Dill, Chris Monsere, PSU

09-229 Implementation of Active Living Policies by Transportation Agencies and Departments; PIs: Jennifer Dill, PSU and Deborah Howe, Temple University

*09-230 Exploratory Methods for Truck Re-identification in a Statewide Network Based on Axle Weight and Axle Spacing Data to Enhance Freight Metrics; PIs: Chris Monsere, PSU with Mecit Cetin, University of South Carolina and Andrew Nichols, Marshall University

*09-232 Expanding Development of the Oregon Traffic Safety Data Archive, Phase 2; PI: Chris Monsere, PSU

09-239 The Effectiveness of Vertebrate Passage and Prevention Structures: A Study of Boeckman Road in Wilsonville; PI: Catherine de Rivera, PSU

*09-242 Financing Mechanisms for Capacity Improvements at Interchanges; PI: James Strathman, PSU

09-243 A Novel Design Strategy for Integrating Freight Rail Into Urban Settings: A Capping Study; PI: John Jeffrey Schnabel, PSU

09-248 Value of Reliability, Phase 2; PIs: Robert Bertini, PSU with David Levinson, Kathleen Harder, John Bloomfield, University of Minnesota

09-249 Improving Regional Travel Demand Models for Bicycling; PIs: John Gliebe, Jennifer Dill, PSU

09-252 Hurricane Wave Forces on Highway Bridge Superstructure: Psuedo-dynamic Testing for Bridge Subassembly; PIs: Daniel Cox, Tim Maddux, OSU

*09-255 Calibrating the HSM Predictive Methods for Oregon Highways; PIs: Karen Dixon, Ida van Schalkwyk, OSU and Chris Monsere, PSU

*09-256 Advisory Speed Safety Study; PIs: Karen Dixon, Ida van Schalkwyk, OSU

09-257 Future Flooding Impacts on Transportation Infrastructure and Traffic Patterns Resulting from Climate Change; PIs: Heejun Chang, Martin Lafrenz, Miguel Figliozzi, PSU

*09-261 Combined Seismic plus Live Load Analysis of Highway Bridges; PI: Michael Scott, OSU

*09-269 Exploiting a Next Generation ITS Data Warehouse for Improved System Performance and Congestion Monitoring; PIs: Robert Bertini, David Maier, Kristin Tufte, PSU

*09-270 Seismic Hazard Assessment of Oregon Highway Truck Routes; PIs: Peter Dusicka, John Gliebe, PSU

09-276 Analyzing and Quantifying the Impact of Congestion on LTL Industry Costs and Performance in the Portland Metropolitan Region; PIs: Miguel Figliozzi, Chris Monsere, PSU

09-277 Analysis of Travel Time Reliability for Freight Corridors Connecting the Pacific Northwest; PI: Miguel Figliozzi, PSU

EDUCATION

09-223 Trail Planning & Community Service Curriculum; PIs: Lynn Weigand, Jennifer Dill, PSU

09-247 designBridge: Integrating Transportation into Service Learning Design/Build Projects; PIs: Nico Larco, Juli Brode, UO

09-254 Rural Young Women Transportation Education Outreach; PIs: Roger Lindgren, Lawrence Powers, OIT

09-264 Expanding Service Learning Models in Transportation; PIs: Robert Parker, Bethany Johnson, UO

09-279 Bicycle and Pedestrian Design Curriculum Expansion Proposal; PI: Lynn Weigand, PSU

TECHNOLOGY TRANSFER

09-214 Transferring GIS/Community-Based Transportation Assessment Tools Nationwide; PIs: Marc Schlossberg, Nico Larco, UO

CTS Transportation Seminar Series at PSU

The Center for Transportation Studies at Portland State University offers weekly transportation seminars on Fridays at noon. The seminar is broadcast live on the web, and is open to the public. Viewers may submit questions by email before or during the seminar. The Winter and Spring 2008 seminars featured 20 guest speakers from a variety of universities, public agencies and organizations. In addition to students registered for credit, many professionals and guests also attend.

RSS OTREC offers free podcasts (audio files in mp3 format) of the CTS seminar series. Podcasts from seminars given by OTREC Visiting Scholars and others are available for download. Seminars cover a wide array of transportation topics from policy and planning to operations and freight. More than 170 seminars are archived in streaming video (many also available as podcasts) on the CTS website: http://www.cts.pdx.edu/seminars.htm

Summer 2008 RITA/CUTC Meeting

OTREC staff Carol Wallace, Hau Hagedorn and Robert Bertini participated in the RITA UTC Annual Meeting and the Council of University Transportation Centers (CUTC) Summer Meeting in June 2008. The meetings were hosted by the Mineta Institute at San Jose State University in San Jose, California. Dr. Bertini moderated a session on workforce challenges that included examples of what UTCs are doing to address the challenge through training and education. OTREC staff met with RITA University Programs Specialist Robin Kline and RITA Administrator Paul Brubaker. (Photo from left: Carol Wallace, Robert Bertini, Robin Kline, Hau Hagedorn).

Top: Dr. Robert Bertini (third from left) testifies before a U.S. House subcommittee in June. Bottom: Dr. Bertini with Congressman David Wu (right).

Bertini Testifies Before U.S. House Subcommittee

The U.S. House of Representatives Committee on Science and Technology's Subcommittee on Technology and Innovation invited Dr. Robert Bertini, OTREC Director, to provide testimony before the subcommittee on June 24, 2008. The Subcommittee Chairman David Wu (D-OR) called the hearing to review ongoing research and development related to surface transportation infrastructure. Dr. Bertini's testimony especially addressed the role of intelligent transportation systems and sustainability. With the theme of advanced technology, integration of land use and transportation, and healthy communities, the research undertaken by OTREC affiliate principal investigators demonstrates the strong linkages to sustainable, energy efficient transportation.

Other panelists included RITA Administrator Paul Brubaker, Caltrans Chief Deputy Director Randell Iwasaki, American Concrete Pavement Association President Gerald Voigt, and Dr. Christopher Poe from the Texas Transportation Institute.

Dr. Bertini's written testimony can be found on the web: http://www.otrec.us/content/doc/bertini_testimony_2008.pdf

Archived video of the entire hearing can also be found on the web: http://science.edgeboss.net/real/science/scitech08/062408.smi (Bertini's testimony begins at 25:48).

Detailed testimony and other information can be found on the Committee website: http://science.house.gov/publications/hearings_markups_details.aspx?NewsID=2236

OTREC's Role in Climate-Friendly Transportation

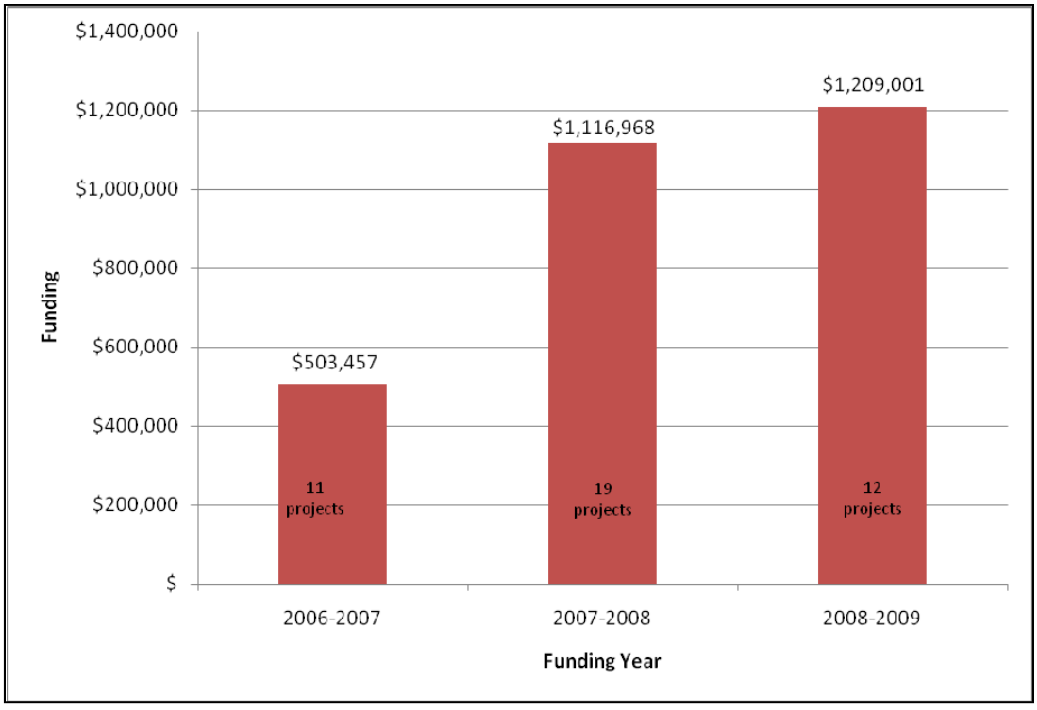
By Hau Hagedorn

As Oregonians, it is often easy to take for granted that the people of the state are good stewards of the environment. Historically, Oregon has a long-standing tradition in leading the way in innovative land use and transportation policies, as well as transportation systems that have become good examples of energy efficient and sustainable transportation decisions. This was very evident as the transportation leaders in Portland recounted their experiences in building the area's light rail infrastructure at the Building Future Transportation Leadership Workshop hosted by OTREC in January. Andy Cutugno, METRO Planning Director, talked about the move away from a highway-oriented system and towards a multimodal system, and preserving the Oregon environmental legacy as integral pieces of the framework that shaped this crucial land use and transportation system. As a state, particularly in the urban and small urban areas, the citizens of Oregon typically bike, walk, and take transit more than other areas of the country—all vital to a more livable Oregon. With increasing energy costs coupled with growing concern over the adverse impacts of greenhouse gas emissions, there arises additional opportunities to reexamine transportation policies, research and practice at the crossroads of a crisis and think about how to push the envelope to continue this tradition of innovation. In a recent report published in January 2008 and spearheaded by The Governor's (Ted Kulongoski) Climate Change Integration Group, it was found that greenhouse gas emissions are still growing at an alarming rate. Not surprising, the source of over a third (34%) of the emissions comes from transportation sources.

OTREC's Sustainable Transportation Research Areas

Sustainable Transportation Pricing and Tolling Strategies
Integrated Corridor Management
Congestion Management
Advanced Transportation Information Systems
Multimodal Archived Data User Service
Emergency Transportation Operations
Electronic Freight Management
Land Use and Transportation Linkage
Walking, Bicycling and Healthy Communities
Sustainable Freight Transportation Systems

OTREC is uniquely positioned to tackle the climate-friendly transportation research agenda undergoing much scrutiny regionally as well as nationally. One third of OTREC research currently undertaken relates to sustainability and intelligent transportation systems (a key climate-friendly transportation strategy). Another third relates to general sustainable transportation issues. But why stop here? In examining the transportation climate change strategies undertaken by the Climate Change Group mentioned earlier, it is clear that more research is needed in areas of cleaner and more efficient vehicle usage and low carbon fuels. The current challenges seem similar to the gas crisis and air quality issues experienced in Oregon in the 1970s. The transportation community in Oregon rose up to the challenge before, and it's time again for innovation to meet the transportation and climate-change challenges of today. OTREC aims to be a leader in this goal.



Above: Graph showing number and amount of OTREC-funded transportation research projects by year that are climate-friendly (OTREC is a new UTC, first project awards were for 2006-2007).

Hau Hagedorn is OTREC's Research Program Manager. She can be reached at hagedorn@pdx.edu.

OTREC Short Courses

OTREC is pleased to offer a two-day transportation short course in September. A detailed course description and registration information can be found on the OTREC web site: http://otrec.us/otrec_short_courses.php

Urban Traffic Solutions - September 23-24, 2008

IBPI Workshop—August 2008

The Initiative for Bicycle and Pedestrian Innovation (IBPI) at Portland State University will offer a week-long intensive workshop, "Comprehensive Bicycle and Pedestrian Design and Planning," August 3-8, 2008. This course will provide practitioners with the fundamentals of pedestrian and bicycle planning and design through classroom, field, and project experience. More information: http://www.ibpi.usp.pdx.edu/summerworkshop.php.

OSU Traffic Safety Workshops

The Kiewit Center and ODOT offer a series of traffic safety workshops at Oregon State University. More information: http://kiewit.oregonstate.edu/workshops.html. The first fall workshop is as follows:

Traffic Safety Liability & Risk Protection, September 19, 2008. More courses are planned for 2008-2009; check the web site for additions.

New Degree at OIT Moving Forward

In June 2008, the Oregon University Systems Provost's Council voted to advance the proposed Master of Science in Civil Engineering degree at OIT to the next step. An external review panel will be appointed by the Council and a site visit will be conducted in the 2008-09 academic year.

OSU Hosts NEES Tour

As part of the NEES 6th Annual Meeting held in Portland in June, attendees spent an afternoon visiting the O.H. Hinsdale Wave Research Laboratory at Oregon State University. Professors Daniel Cox, Solomon Yim, Christopher Higgins, Research Associate Tim Maddux, along with many other OSU faculty and students, hosted the tour, giving a live demonstration of the tsunami wave basin and large wave flume, and presenting an overview of the new $1.1M wavemaker. NEES is the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES), a network of 15 large-scale, experimental sites featuring advanced earthquake research tools. Below, NEES members watch as simulated hurricane waves hit a bridge model.

Dill Chosen for Civic Award; Testifies in D.C.

Congratulations to Dr. Jennifer Dill, PSU, who received a Civic Engagement Award from the Center for Academic Excellence at PSU this spring. The award is for her work to create the Initiative for Bicycle and Pedestrian Innovation (IBPI), a collaborative partnership between the Center for Transportation Studies at PSU, the Department of Planning, Public Policy and Management at UO, and the College of Engineering at OSU. Also in May, Dr. Dill participated in a congressional briefing in Washington, D.C. sponsored by the Congressional Bike Caucus and the Active Living Research program of the Robert Wood Johnson Foundation on Biking Your Way to a Healthier Community. Dr. Dill described her ongoing research of regional bike trips tracked by GPS-equipped bicyclists, and briefly discussed policy implications and further research needs.

Figliozzi Receives Best Paper Award

Dr. Miguel Figliozzi, PSU, participated in the 10th International Conference on Applications of Advanced Technologies in Transportation (AATT), held in Athens, Greece, in May. Dr. Figliozzi presented a peer reviewed paper, *An Iterative Route Construction and Improvement Algorithm for the Vehicle Routing Problem with Soft and Hard Time Windows*, which was selected from over 600 entries for the conference Best Paper Award in the transportation planning category. Dr. Figliozzi is pictured here (center) with conference chairs Dr. Matthew Karlaftis (left) and Dr. Samer Madanat (right).

STEP Spring Activities

This spring, members of the Students in Transportation Engineering and Planning (STEP) at PSU assisted the City of Portland with efforts to evaluate the Safe Routes to School program. Ten members counted parked bikes at 25 participating schools. The results will be correlated with student surveys, and STEP participants plan to assist the City with data analysis over the summer. ITS Lab and STEP students also volunteered at the 2008 PSU Design Competition, promoting interest in engineering and computer science to middle and high school students (graduate student Enas Fayed, right, shows a 3-D microsimulation)..

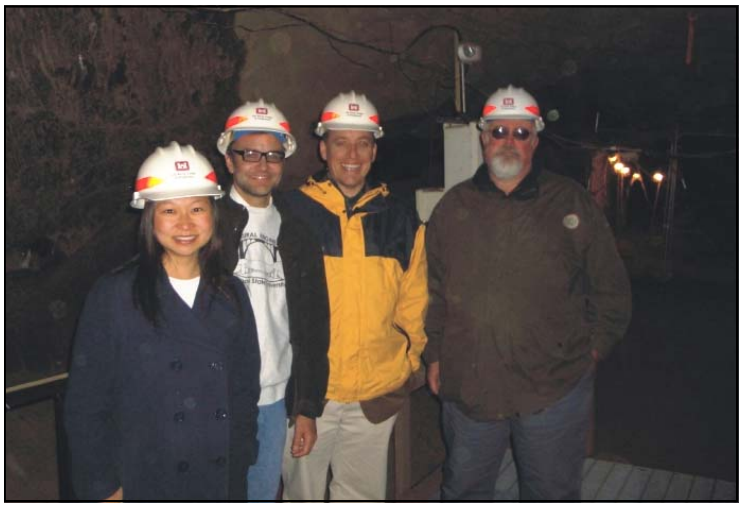
This spring STEP also toured local transportation firms, and hosted professionals who talked about careers in transportation. More about STEP: http://www.step.groups.pdx.edu/

Administrator Brubaker Visits OTREC

On May 1, 2008, USDOT Research and Innovative Technology Administration (RITA) Administrator Paul Brubaker and Thomas Marchessault, UTC Outreach Liaison for RITA, spent the day visiting OTREC. Mr. Brubaker and Mr. Marchessault were given an overview of OTREC's web proposal and project management system, and participated in faculty project "spotlight" demonstrations, and a special poster session with students. In the afternoon, Matthew Garrett, Director of the Oregon Department of Transportation, and Administrator Brubaker gave remarks on the future of transportation technology to an audience that included the OTREC Board of Advisors, Executive Committee, faculty, students and community transportation leaders at an OTREC reception. PSU graduate student Lisa Diercksen introduced the guests and spoke about her experience as a research assistant and OTREC Scholar. Administrator Brubaker spoke about the need for an interdisciplinary approach to transportation problems of the future, as evident in the multidisciplinary nature of OTREC programs that bring together faculty and students from civil engineering, urban studies and planning, public policy, architecture, business, computer science, environmental science, etc.

Region X Meets in Alaska

The Region X Transportation Consortium held its spring meeting in Fairbanks, Alaska in May. Representatives from northwest UTCs (OTREC, AUTC, TransNow, NIATT) and state DOTs attended the bi-annual meeting to discuss regional collaboration for transportation research and education efforts. The meeting was hosted by the Alaska University Transportation Center (AUTC), and included a tour of the Permafrost Tunnel Research Facility that is part of the Cold Regions Research and Engineering Laboratory. Photo (from left): Hau Hagedorn, Chris Higgins, Robert Bertini and Barnie Jones were the Oregon delegation and are pictured here standing in front of a 30,000 year old ice wedge.



Advisory Board Profile: Ruth Harshfield

OTREC Advisory Board member Ruth Harshfield is the Executive Director of the Alliance for Community Traffic Safety in Oregon (ACTS Oregon). ACTS Oregon is a statewide non-profit membership organization whose mission is to reduce fatalities, injuries and the severity of injuries resulting from vehicle crashes throughout Oregon. Her team works to impact the safety of child passengers and support communities working to address local traffic safety concerns. ACTS Oregon Child Safety Seat Resource Center hosts National Child Passenger Safety Technician Training courses and promotes the correct use and installation of child safety seats through safety seat check up events and distribution programs. As a course instructor, Ruth teaches classes and supports technicians with ongoing training and re-certification. The ACTS Oregon Community Traffic Safety Program works with over 60 Traffic Safety Committees and Commissions throughout Oregon, providing support with resources and information to help address local concerns. Managing the Building Safer Communities and Bicycle Safety Mini-Grant programs, ACTS Oregon directs over $82,000 in grant funds to local communities for projects such as a DUI Safe Driving Campaign, speed check projects, Spanish and teen radio programs, traffic safety fairs, bicycle safety rodeos, the 'Bikemobile' Traveling Safety Show, etc. Working with ODOT, Ruth is currently planning the 2008 Oregon Transportation Safety Conference that will bring together traffic engineers, law enforcement, community advocates, emergency responders and child passenger safety technicians for training and networking. Ruth has been with ACTS Oregon since it was incorporated in 1994, currently serves as the Advisory Board President for Oregon SAFE KIDS, and is a member of the Clackamas County Safe Communities Advisory Board. She earned a Bachelor of Arts in Sociology from Portland State University in 1976.

OTREC is a National University Transportation Center sponsored by the U.S. Department of Transportation's Research and Innovative Technology Administration

Web site: www.otrec.us ▪ E-mail: otrec@pdx.edu

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