Western Transportation Institute
MSU-Bozeman

September 2003
Volume 7,
Issue 2

ADVANCING RURAL TRANSPORTATION THROUGH RESEARCH AND EDUCATION

Education Key To Workforce Development

It's no surprise that developing and maintaining a safe and efficient transportation infrastructure is critical to the economic vitality of the United States. What may be a surprise is that our country could soon have a serious shortage of professionals who are qualified to work in the field.

A key component of the shortage is the aging transportation workforce, particularly those employed by public agencies. According to some estimates, 32% of the federal workforce will be at retirement by 2004, with an additional 21% eligible for retirement. According to other studies, 40% of state and local government employees will be eligible to retire in the next 15 years. Many transportation associations recognize workforce development as one of the industry's most critical problems, and have identified it as a priority action issue.

WTI is also focused on expanding and nurturing the next generation of transportation professionals. Since our inception in 1994, WTI has always had a strong education program, with an eye toward getting young people excited about careers in transportation. More than 20% of the University Transportation Center funding we receive goes toward educational activities. At the university level, we have put a strong emphasis on multi-disciplinary programs in order to attract students with a broad range of majors, skills, and points of view. Among primary and secondary students, we have tried to reach students of all ages, with a special effort to include groups that traditionally have been under-represented in the transportation and engineering professions.

In this issue of the newsletter, we are excited to report on the newest addition to our education program. This summer, we held our first Research Experience for Undergraduates (REU) Program, thanks to a grant from the National Science Foundation. Eight students from around the country spent ten weeks here in Bozeman, conducting first-hand research and learning how to prepare written reports and oral presentations based on their results. The program shows tremendous promise for teaching research and communication skills that are essential to both advanced study and professional careers in transportation.

Other articles will describe some of our successful ongoing education programs, such as our sponsorship of research projects by student organizations on the MSU campus. These relatively small amounts of funding often make it possible for students to attend national science and engineering competitions, which have proven to be great motivators for teamwork, innovative thinking and creative design.

Many of our research projects also have a strong hands-on educational component. The update on our Mobile Laboratory describes how students were instrumental in getting the lab up and running. Now the lab serves as an excellent resource to many students conducting graduate level research.

In fact, nearly all of our research projects rely on assistance from students at one time or another. On average, thirty undergraduate and graduate students are working at WTI during the school year, with more during the summer. The number and variety of student research opportunities offered by WTI is probably our greatest contribution to the development of the transportation workforce of the future, and we look forward to continuing and expanding our efforts in this area.

EDUCATION

A Summer Success: The Research Experience For Undergraduates Program

Contact: Susan Gallagher, Program Coordinator
e-mail: sgallagher@coe.montana.edu
Ph: 406-994-6559

The Western Transportation Institute's first Research Experience for Undergraduates (REU) program brought eight undergraduate students from various universities nationwide to Bozeman, Montana this summer. With funding from the National Science Foundation/Department of Defense, the REU program provided participants with real-world experience in rural transportation research during a ten-week summer program at WTI. The primary goal of the REU program is to heighten undergraduate student interest and participation in transportation research and to increase the number and diversity of students entering graduate programs and research careers in the transportation field.

REU students experience the fire training center during a visit to Salt Lake City Airport

Applicants selected to participate in the 2003 REU program were matched with a specific project representative of WTI's diverse research focus areas. The 2003 research projects included: Bozeman Area Transit System Design, Bozeman Area Bicycle Network Plan, Examination of Frost Depth Characteristics of Subgrade Soils, Bozeman Pass Wildlife Corridor Study, Evaluation of Lewis and Clark Trail ITS Kiosks, Changeable Message Sign Guide for Montana, Evaluation of Bridge Deck Stress Gages, and a study on Fish Passage at Road Crossings in Montana Watersheds Providing Bull and Cutthroat Trout Habitat.

In addition to working on their research topics under the direction of their mentors, students had many opportunities to attend various training seminars, field trips, and presentations in order to improve their academic and professional skills as well as to further their knowledge of rural transportation research. Training seminars during the program included a technical writing workshop, a professional ethics seminar, and a series of communications seminars.

REU participants attended two technical field trips during the summer to Yellowstone National Park and Salt Lake City, Utah. At Yellowstone National Park, students learned about general transportation challenges in National Parks, Animal Vehicle Detection Systems currently being tested in the park and a pilot project using

five males from seven different states and three different majors participated in this summer's program. At program end, students produced a final research report and provided a technical presentation on their projects to peers, WTI staff, and sponsors.

Response to WTI's first REU summer program has been extremely positive. Students were pleased to have a unique and substantive learning experience. Said one participant, "I think that this program gave me an opportunity to discover more about my field and opened my eyes to issues that I didn't know about." WTI staff was impressed with the high quality of the students' work and their contribution to the various research efforts. Based on this initial success, WTI looks forward to continuing with its REU program in the future.

REU Students gain first hand experience at field research while working on their projects

Automatic Vehicle Entrance Tags to decrease entrance delays at the gate. In Salt Lake City, Utah students toured the Salt Lake City International Airport and learned about heightened airport security measures since September 11. REU students also had an opportunity to tour the Traffic Operations Center and the Transit Management Center in Salt Lake to learn how these transportation management centers performed during the 2002 Olympics.

All REU participants were either junior or senior level undergraduates. Three females and

Student Transportation Projects: Hands-On Learning Teaches Valuable Skills and Engineering Principles

Contact: Susan Gallagher, Program Coordinator
e-mail: sgallagher@coe.montana.edu
Ph: 406-994-6559

As the MSU focal point for transportation research, one of the Western Transportation Institute's goals is to develop a multidisciplinary program in the field of transportation education. To meet this aim, WTI offers small grants to student associations from a variety of academic disciplines seeking to pursue a transportation-related activity. Student groups may apply for grants up to $2000 for activities that provide an educational or outreach experience in transportation to their members.

During the 2002-2003 academic year, four such grants were distributed. Two grants funded student projects in the MSU Electrical and Computer Engineering (ECE) Department. The first project involved the design of two small computer-controlled wheeled vehicles and an exploration of vehicle sensors and "smart car" technology. The computer controlled wheeled mobile robots that were produced as part of this project then competed in a Ball Aerospace Robotics contest held at Utah State University in March 2003.

ECE students are currently working on a second WTI grant-supported project involving the design and construction of an intelligent navigation and control system for a wheeled vehicle. This project is one component in the development and demonstration of prototype computer-controlled software and hardware systems relevant to transportation technologies. These systems are key to the future development of in-vehicle systems capable of

Pre-competition robot testing

ASCE concrete canoe being navigated during the competition in Boise Idaho

monitoring road, driver, and vehicle conditions and of taking corrective action when necessary. The project will be completed during the 2003-2004 academic year.

The MSU American Society of Civil Engineers (ASCE) student chapter also received WTI support to compete at the ASCE Pacific Northwest regional steel bridge and concrete canoe competition held in Boise, Idaho this April. A core of ten undergraduate civil engineering students built the canoe, which weighed approximately 150 pounds and earned them second place overall in the competition. The steel bridge team won ninth place in the regional competition, building a 23-foot-long bridge in 16.3 minutes.

Students in MSU's Department of Technology Education's Transportation Technology class have traditionally explored energy issues related to transportation. This year, with WTI support, they received hands-on experience with non-petroleum based vehicles by converting an MSU Facilities Services truck with a failing engine and 120,000 miles on it into an electric vehicle. Now that the vehicle is operational, tests will be conducted to explore the vehicle's feasibility for long-term personal transportation. In addition, the recycled, clean-fuel vehicle will be returned to Facilities Services for campus use.

ASCE Student Chapter Members

The Technology Education program at MSU aims to develop technological literacy and teaching skills among its students. High school students from around Montana were able to follow the progress of the electric vehicle project via a website (www.sparky.montana.edu/) set up by the students. A "How to" Manual will also be developed for public distribution for people interested in conversion of gasoline vehicles to electric operation.

"Sparky," Technology Education's Electric Vehicle

Grade Schoolers Enthusiastic About "Bridges and Dams"

Contact: Susan Gallagher, Program Coordinator
e-mail: sgallagher@coe.montana.edu
Ph: 406-994-7681

A primary goal of WTI's education program is to increase the diversity of students pursuing degrees and careers in transportation engineering. A continuing challenge in these efforts is the significant under-representation of women and minorities in all engineering fields. Women continue to make up only 10% of the engineering workforce and about 20% of enrollment in engineering colleges. The numbers for various minority groups are no higher.

WTI, with additional funding from the Engineering Information Foundation, implemented an outreach program in the spring of 2003 aimed at increasing the recruitment and retention of women and minorities in engineering. The program, created by Montana State University Professors Jerry Stephens and Anders Larsson, involves two-hour workshops about bridges and dams.

The Bridges and Dams outreach program is a collaborative effort between WTI and the Civil Engineering Department at Montana State University (MSU-Bozeman). Utilizing the MSU student base, WTI and the Civil Engineering Department recruited and trained eight female engineering students enthusiastic about K-6 outreach to conduct bridges and dams workshops for second through fourth graders. Local girls clubs were invited to participate in the outreach program as well as Native American schools in more remote tribal regions across Montana. The workshops involve an exploration of civil engineering as a discipline and incorporate a variety of hands-on activities that are designed to increase young girls' and minorities' interest in math, science, and engineering.

Although the program is still in its early stages, initial response has been overwhelmingly positive with enthusiastic endorsement on the part of participants at both the university and primary school level. Six workshops were held from February to May 2003 and more than 100 second through fourth graders have participated in workshops so far. Of these participants, 92 were girls and 13 Native Americans.

The outreach program fulfills two needs simultaneously: recruitment of future female and minority students to engineering and retention of current female engineering students. The project aims to increase the retention of women engineering students by fostering a sense of community among undergraduate and graduate students involved in the outreach program. Students gain networking opportunities with professional engineers also active with the program and receive a stipend for their participation. Second, by involving women engineering students from MSU as presenters, the program provides positive female role models to young girls, mitigates the sexual stereotyping of engineering as a male profession, and increases available information about career opportunities in engineering to elementary school-aged children.

In response to a questionnaire following the first semester of the program, all of the MSU students who facilitated workshops indicated that they considered their participation in the program worthwhile. They thought that community outreach was important in the engineering field and that their participation helped them to feel like part of the broader community. They also responded that through participation in the program they got to know and work with other women engineering students and to meet engineering professionals.

School teachers and Girl Scout troop leaders also gave favorable assessments of the program. On evaluation forms given to them following the workshop, all indicated that the activities were appropriate for the age-level, that the children found the activities to be interesting and fun, and that the facilitators were knowledgeable and well prepared.

The outreach program will continue in the fall of 2003 with both continuing facilitators and new recruits among female engineering students at MSU. Several more trips to tribal schools are also planned.

Outreach Targets Middle School Audiences

WTI introduced middle school aged students to engineering and transportation during two recent programs. Thirty 7th and 8th graders visited WTI in April as part of *Gear Up* (Gaining Early Awareness & Readiness for Undergraduate Programs), which brings youngsters from low-income backgrounds to MSU to develop their academic interests and aspirations. The students had an opportunity to discuss highway safety issues and devices with research staff, and then to build and test their own crash attenuators using a ramp, toy truck, and eggs.

Crash attenuator with egg passenger casualties

In June, sixteen 8th and 9th graders spent a week at WTI exploring the science of making and breaking during *Peaks and Potentials*, a campus summer experience for high-potential students who wish to pursue special topics of interest. At WTI, the students discovered how engineers design and build structures like roads and bridges and explored design software and other tricks of the engineering trade. The students then had the opportunity to get their hands dirty making their own concrete and bridges, and to test the strength of their creations by breaking them in the lab.

Load testing to the breaking point

These early outreach activities expand interest and awareness of transportation careers among young students. They also provide an opportunity to educate students about academic courses to pursue if they are interested in these fields.

Transportation Professor Joins MSU Faculty

Ahmed Al-Kaisy, Asst Professor Phd, Civil Engineering

Ph: 994-6116 e-mail- aalkaisy@ce.montana.edu

Montana State University – Bozeman, home of the Western Transportation Institute, has expanded its faculty specializing in transportation. This fall, the College of Engineering (Civil Engineering Department) welcomes **Ahmed Al-Kaisy, Ph.D**.

Dr. Al-Kaisy comes to MSU from Bradley University in Peoria, Illinois, where he served as an Assistant Professor in the Civil Engineering and Construction Department. He has teaching experience in many areas of transportation engineering, including traffic operations and management, traffic safety, signal optimization and control, highway design, airport engineering, and transportation systems. With an extensive research background in the fields of traffic flow, control, operations and safety, Dr. Al-Kaisy is widely published, particularly on the subject of freeway construction operations. He also has prior experience in both the public and private sector as a contractor, project engineer and highway design engineer.

Dr. Al-Kaisy holds a Ph.D. in Transportation from Queen's University in Kingston, Ontario, Canada. During his first semester at MSU, he will teach a Civil Engineering course entitled "Traffic Engineering and Intelligent Transportation Systems."

Mobile Laboratory: An Exciting Research and Educational Tool

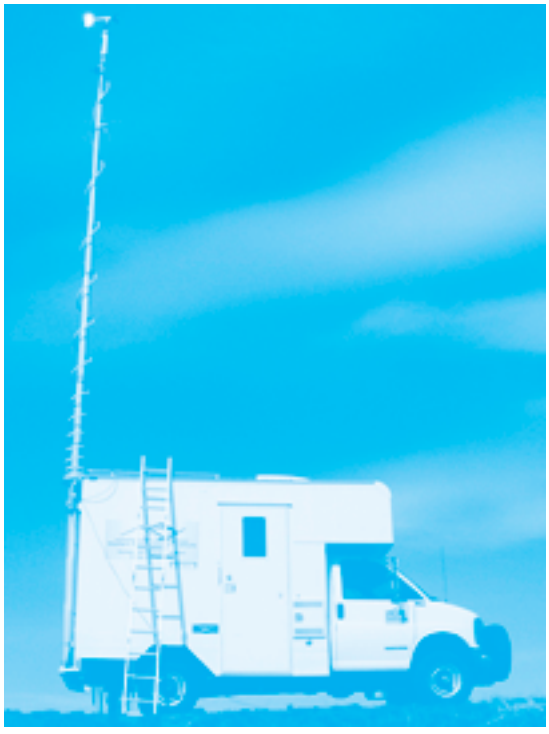
Contact: Robb Larson, Adjunct Assoc Professor
e-mail: rlarson@me.montana.edu
Ph: 406-994-6420

WTI's Mobile Lab is on the street, supporting a variety of transportation-related research projects and providing valuable educational experiences for students. The one-ton 4WD box van houses a collection of computers, communication & power systems and tools to support all varieties of research as well as the development and evaluation of new products & technologies for transportation.

Mobile Lab Project leader Robb Larson has relied heavily on student design and fabrication assistance to bring the Mobile Lab concept to fruition. Undergraduate student involvement - primarily through the Mechanical and Industrial Engineering department at MSU- has been instrumental in the creation of many of the rig's systems and devices. From installation of the pneumatic mast for the weather station to design & fabrication of a hydraulic stabilization system to interior wiring, ME and MET students have been involved in most phases of the project.

Graduate student Tylar Bunger's extensive use of the mobile laboratory during data collection for his Master's thesis is a prime example of system usage: From Summer 2002 through Spring 2003, Bunger utilized the mobile lab's power systems, base-station capabilities, and data acquisition systems to gather on-site weather data and solar radiation measurements. These inputs were used in a model to predict bridge deck surface temperatures versus time, using software developed at MSU. The Mobile Lab's infrared thermometer was used to record actual deck temperatures to validate the resulting bridge deck temperature vs. time model.

Figures 1 & 2: Mobile Lab gathering weather data on-site at the I-90 bridge overpass, and a snapshot from the resulting color-coded predictive temperature map.



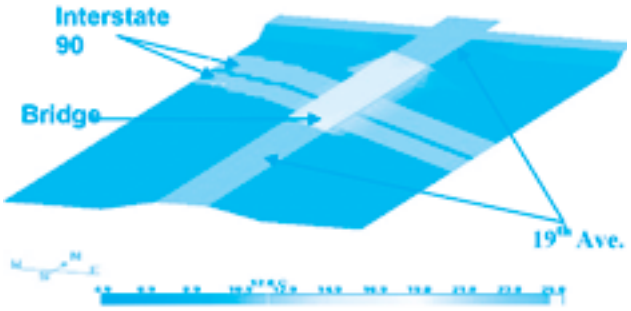
Bunger remained in voice and data contact with MSU via the van's web-enabled cellular link, and made good use of the on-board air conditioner and heater during his days and nights on-site.

In addition to the core transportation research task, the van has also proved useful in non-transportation related research. Dr. Paul Stoodley from MSU's Center for Biofilm Engineering (CBE) incorporated the van as a mobile power station during development of a Mobile Biofilm Unit. Stoodley and his team of researchers (including several students) have adapted biofilm flow cell systems developed at the CBE into a mobile system for real time and time-lapse microscopic monitoring of water sources such as lakes, streams and natural hot springs. The mobile lab's on-board generator, power inverter,

and multiple 120A/C outlets enable use of lab-grade equipment in a field setting.

Summer 2003 brought three new major sub systems online. The largest and most exciting implementation includes twin Iteris Inc. all weather mast-mounted traffic cameras. The camera system includes pan/tilt/zoom capability; twin time-lapse VCRs, full-featured Iteris Inc. control modules, PC frame grabber card and a wheeled, removable control cabinet housing all interior systems. The cameras and associated traffic detection hardware & software will permit use of the Mobile Lab as a roving traffic monitoring station, with capability for vehicle detection, classification, speed, and event-triggered time-lapse recording of images. Future plans include adapting the imaging components for use with infrared cameras.

Two other subsystems coming on line this summer utilize the van's on-board GPS system to tag acquired data with position coordinates for feature mapping: A laser-based highway striping reflectivity measurement system, mounted to the van's bumper, is presently undergoing calibration and testing. This device is a low-cost alternative to similar commercially available systems, and is designed to measure and map roadway striping retroreflectivity as a maintenance scheduling tool. The other GPS-based system is a roadway thermal mapping device that uses an infrared pyrometer to measure highway temperatures on the fly, tag data with GPS coordinates, and map the data for dissemination and display. An on-board data acquisition computer with National Instruments hardware and LabVIEW software handles the data logging tasks, and ESRI ARCVIEW software is used for creating color maps printable on the van's HP color inkjet printer.



Mobile Lab gathering weather data on-site at the I-90 bridge overpass, and a snapshot from the resulting color-coded predictive temperature map.

Funding for the Mobile Lab was provided through FHWA via the UTC program. Project PI Robb Larson is a permanent MSU faculty member and Adjunct Associate Professor in the Department of Mechanical and Industrial Engineering at MSU. An affiliated faculty researcher with WTI, he teaches courses in Engineering Design, Instrumentation, and Computer A pplications.

RESEARCH

Infrared Cameras: A New Option for Monitoring Road Conditions?

Contact: Chris Strong, Research Engineer
e-mail: chriss@coe.montana.edu
Ph: 406-994-7351

WTI recently completed laboratory testing of an infrared camera that may assist Departments of Transportation with the remote measurement of road weather conditions.

In recent years, the Oregon Department of Transportation (ODOT) has invested in a network of road weather information systems (RWIS), in order to provide maintenance staff with accurate information regarding current road conditions. These systems collect a variety of valuable weather data, including road pavement temperature, which is often closely tied to whether ice or snow will adhere to the pavement. There has been concern, however, that the pavement temperatures as measured by the in-pavement sensors may not be sufficiently accurate.

One technology that has been applied recently to try to improve the accuracy of pavement surface condition measurement is infrared. ODOT is investigating whether or not this technology may be used to improve ODOT's existing RWIS network. After identifying a camera (IceSight™) that reportedly measures phase change of water on asphalt, ODOT sought a preliminary evaluation in a controlled laboratory environment, before making a decision about widespread deployment.

Using Montana State University bozeman's cold weather chamber, researchers from the Western Transportation Institute set up seven controlled experiments. These experiments were designed to monitor different types of phase change with different surface conditions. For example, while one of the experiments monitored increasing temperatures on a surface with two centimeters of snow, a second experiment monitored lowering the temperature on a dry surface being sprayed with water to make ice. For each experiment, temperature and phase were measured every sixty seconds.

The primary objective of this study was to evaluate the camera's ability to identify phase change (i.e. snow to water, water to ice, etc.). In these experiments, the camera accurately identified most phase changes despite drastic temperature changes. It showed some difficulty in measuring the transition from water to ice, and in interpreting slush. The camera also had some difficulty on temperature measurements, probably due to the drastic temperature changes experienced in the cold weather chamber that would be unlikely to be replicated in an actual deployment.

Based on the camera's general accuracy in identifying phase change, WTI has recommended that the next logical research step would be a "real world" test under controlled conditions, using pavement sensors and visual inspection to assess the camera's accuracy. During a field test, a better assessment of the IceSight™'s air temperature accuracy could be gained because air temperatures would not be changing as drastically as in lab testing. The results of this experiment should indicate whether infrared is a suitable technology to replace or supplement current methods of detecting wintry road weather conditions.

WTI's evaluation also resulted in extensive documentation to facilitate future research. The final report includes procedures and suggested techniques for using the different software packages associated with the IceSight™ camera.

WTI ecologists track critter crossings of US 93 on the Flathead Indian Reservation

Contact: Amanda Hardy, Res Ecologist MS
e-mail: ahardy@coe.montana.edu
Ph: 406-994-2322

Roads and traffic have direct and indirect impacts on wildlife. One of the most visible effects is animal road kills, but other effects are less obvious. For example, roads and traffic can form a barrier for animals moving across the landscape. Mitigation measures can include wildlife fencing to prevent animals from entering the right-of-way in combination with wildlife crossing structures to accommodate the animals' needs to cross the road.

The reconstruction of US Highway 93 in Montana will include the installation of wildlife fencing and wildlife crossing structures. WTI has been contracted by the Federal Highway Administration and the Montana Department of Transportation to evaluate the effectiveness of these mitigation measures. WTI is also documenting how the reconstruction design process takes landscape and wildlife issues into account and how to apply the lessons learned to reconstruction projects elsewhere.

Often, studies evaluating wildlife crossing structures determine animal use only after the structure has been put in place. In contrast, the US93 evaluation will compare an estimate of animal movements across the road before construction with animal use of the crossing structures after construction. To estimate the pre-construction animal crossing rates, WTI recently installed 62 tracking beds next to US 93 at random locations in the Evaro, Ravalli Curves and Ravalli Hill areas, where wildlife fencing, undercrossings, and an overcrossing will be installed. Each tracking bed measures approximately 100 x 2.4 m, and contains about 15 tons of tracking substrate (sand with some crushed rock). Tracking beds are checked for tracks on a regular basis to determine which critters are moving near the road and to estimate the number of animal movements across the road.

Once the wildlife fencing and crossing structures are in place, tracking beds will be installed both in- and outside of the structures. The beds inside the crossing structures are not exposed to weathering that can cause tracks to disappear. These beds will provide a measurement of the absolute use of the crossing structures. The beds outside the crossing structures will enable WTI to make a comparison with the animal crossing rates before construction.

Thus far the tracking beds have worked well. The quality of the tracks of smaller animals, such as domestic cats, raccoons and skunks, varies with the moisture contents of the substrate. However, the tracks of deer and black bear, the study's two main animals of interest, are usually easily identified.

New Research Focus Area: Public Transportation and Mobility

Contact: Lisa Ballard, Research Engineer
e-mail: lballard@coe.montana.edu
Ph: (406) 994-6529

David Kack, Research Associate
Ph: 406-994-7526
e-mail: dkack@coe.montana.edu

In response to growing interest and opportunities in the field of rural mobility and transit systems, WTI has created a new research focus area: Public Transportation and Mobility.

Over the last two years, WTI has worked on several projects to increase the availability of transportation in rural areas and small towns through long-term planning, coordination, and the introduction of advanced technologies. Applying their expertise in this area, WTI staff members have also served on transportation and paratransit boards, further increasing their understanding of local needs. Future research opportunities that have been suggested through these activities include providing small transit systems with software to help them track and analyze the demand for rides, and coordination of public, private and paratransit services to maximize vehicle use and eliminate duplication of routes.

State and federal programs show a growing recognition for rural transportation needs, indicating a possible expansion of available funding sources. Many states, including Montana, have programs that fund rural transportation improvements, with preference given to those that can demonstrate local coordination. Federal funding for rural transportation assistance is provided through the surface transportation program, currently up for re-authorization. Senator Max Baucus of Montana recently introduced Senate Bill 2884, the Maximum Economic Growth for America through Investment in Rural, Elderly and Disabled Transit Act, or MEGA RED, demonstrating an increased interest in providing funding for community transportation.

The creation of Public Transportation and Mobility as a new WTI focus area will guide future project selection. The WTI website has already been reorganized to reflect this change. Recently completed and ongoing projects that are related to this focus area include:

Galavan Service Improvement Plan. WTI developed a five-year service improvement plan for Galavan, the principal paratransit provider in the Bozeman, Montana area. The plan identified system improvements that can help Galavan meet increasing service demands, and resulted in the development of software that helps to manage and schedule riders and produces utilization reports.

Paratransit Systems Operation Model. This project will develop and test prototype models of paratransit systems that can be used to evaluate routing, scheduling and dispatch alternatives. The models will be demand-driven, constructed to represent the decisions, objectives, and constraints involved in paratransit use.

Montana Statewide Coordinated Transportation Planning. This project, conducted in partnership with the Montana Council on Developmental Disabilities and the Montana Vocational Rehabilitation Program, is designed to develop a comprehensive "Handbook for Coordinated Transportation Services." The handbook, which will be completed within the next few months, will provide step-by-step planning guidance to social service agencies, transportation providers, and community members throughout Montana who are working to improve the transportation services available to the developmentally disabled. WTI will also produce a web-based version of the handbook that will incorporate a search engine, links to related refer-

ences, and a database of collected information.

Real Choice Systems Change Grant. As a member of the Montana Transportation Partnership (MTP), WTI is working with the Montana Center on Disabilities (acting as the statewide planners and advocates) to implement the transportation element of the federally funded Real Choice Systems Change grant. In the first component of the project, two pilot communities will receive assistance for conducting a coordinated planning process (using the handbook described above). The second component will consist of developing the requirements for a statewide reporting system that facilitates sharing of data on transportation systems.

Bozeman Area Transit Feasibility Study. The Bozeman community is studying the need for increasing transportation services in the city and surrounding region. Two WTI staff members served on the task force that created a Bozeman Area Transit Feasibility Study, which identified potential costs, options, and benefits of transit development.

Montana Statewide Demand-responsive Software. This project will allow a pilot test of the demand-responsive client management software developed for the Galavan paratransit system (see description above). Six community transportation providers around the state will test the software for one year to evaluate its effectiveness in simplifying scheduling, tracking client information and producing utilization reports.

Billings Paratransit Operations Review. Through this project, WTI will help the Billings MET Paratransit system select new computer-aided scheduling and dispatching software. WTI will also review and identify other technologies, such as Automatic Vehicle Location (AVL) and mobile data terminals, that may improve the efficiency and effectiveness of the system.

Big Sky Transportation District. WTI recently completed a customer survey and systems analysis for the Big Sky (Montana) Transportation district. Based on the results of this work, WTI is currently developing new routes and schedules for the system.

ITS: Alternative Transportation Solutions For California National Parks

Chris Strong, Research Engineer
e-mail: chriss@coe.montana.edu
Ph: 406-994-7351

Jaime Helmuth, Research Associate
e-mail: jhelmuth@coe.montana.edu
Ph: 406-994-7643

WTI, in conjunction with Texas A&M University and the Texas Transportation Institute, has completed an extensive report identifying intelligent transportation systems (ITS) that may help the California National Park system address its current and future transportation challenges.

The State of California contains 23 lands that are managed by the National Park Service (NPS). According to NPS statistics, 2001 saw a total visitation to NPS-managed lands in California of nearly 33 million visitors – exceeding any other state in the country. Park visitation levels are expected to continue to increase in the future, and the corresponding transportation system impacts may adversely affect both visitor experience and resource protection issues at the parks unless actions are taken.

Intelligent transportation systems (ITS) – systems which use advanced computer, sensing and communications technology to help improve the operation of the transportation system – may provide solutions to access and transportation problems in California's National Park units in a more economical and perhaps more environmentally friendly way than other types of transportation system improvements. For this reason, the California Department of Transportation (Caltrans) Division of Research and Innovation contracted with WTI and its partners to identify ITS solutions that may have applicability to California's NPS units.

To reflect the diversity of California's parks, this project focused on two parks – Golden Gate National Recreation Area (GGNRA) (an urban park) and Sequoia and Kings Canyon National Parks (SEKI) (a rural park). Park planning documents and regional transportation plans were reviewed for each park to understand how each park developed its transportation vision. Meetings with and surveys of key park stakeholders – including NPS staff, Caltrans district staff, county and local officials, concessionaires, transit agencies and local tourism councils – were used to provide more detailed information about current transportation needs and how ITS could meet those needs. Extensive visitor surveys were also conducted at each park, yielding over 200 responses from two sites within GGNRA and over 400 responses at SEKI. These surveys examined current visitor usage of transportation modes and information sources, and their perceptions of and likelihood to use various transportation alternatives, including ITS. These meetings and surveys revealed several categories of transportation problems at each park. Examples of these problems include roadway congestion, limited parking, a lack of planning data, and insufficient traveler and transit information.

In order to help define what ITS may be able to do in a national park setting, a set of ITS objectives were developed and divided into three groups corresponding to the national park mission: visitor experience, resource protection, and transportation system management. A few examples of these objectives include providing real-time information to visitors, encouraging use of alternative modes of transportation, and managing parking facilities.

ITS theme recommendations were developed for GGNRA and SEKI to address one or more transportation challenges and to achieve one or more of these ITS objectives. Potential ITS themes identified for GGNRA included roadway congestion forecasting; parking management, information and intercept systems; and transit trip planners. For SEKI, ITS themes included electronic entrance fee collection, campground reservations and information systems, and oversize vehicle detection.

Continued on page 15

National Rural ITS Conference a Success in Palm Harbor

This year's National Rural ITS (NRITS) Conference was held in Palm Harbor, Florida. ITS Florida served as the local host with other conference sponsors including the Federal Highway Administration, ITS America, the Federal Transit Administration, the Florida Department of Transportation, and the Florida Commission for the Transportation Disadvantaged.

FTA Administrator Jennifer Dorn delivered the opening keynote address. Her address focused on the special needs of rural transit and how ITS can serve those needs.

This year's conference attracted representatives from 35 states, Africa, and Canada. Twenty-five exhibitors were also on hand to display the latest technology applications for rural mobility and safety.

Over a two-day period, the technical program consisted of three concurrent program tracks: Public Mobility, Traveler Information/Communication Systems, and Safety & Operations. "Mini-seminars" were also presented on Emergency Response Needs in Rural Areas, Improving the State of the Practice for Rural ITS Maintenance, and How to Start a Rural ITS Program.

A round-table discussion, lead by 2003 NRITS Conference Program Chair Mike Pietrzyk, included local, state, and federal insights from three panelists on the future of rural ITS deployment. The background for this discussion was based on a recent USA TODAY article that illustrated how rural areas are fast becoming the "test cases for smart growth" in America.

WTI staff members Steve Albert, Lisa Ballard, Jeralyn Brodowy, Jaime Helmuth, Suzy Lassacher, Xianming Shi, and Chris Strong attended the 2003 NRITS Conference. WTI also had the opportunity to play a very active role in the conference, with staff members making presentations in all three program tracks. Steve Albert was a discussant for the "Where do we go from here?" session in the Public Mobility Track. Also in the Public Mobility Track, Lisa Ballard moderated the "Institutions and Expectations" session and made a presentation entitled: "Montana Public Mobility" during the Project Profiles session. Steve was the discussant for the Traveler Information/Communication Systems Track "How to start a rural ITS program?" session. Chris Strong and Jaime Helmuth moderated the "What are the Rural ITS Maintenance Issues?" session in the Safety and Operations Track.

Michael C. Pietrzyk, P.E.
President Transportation Solutions, Inc. (TSI)

Next year's NRITS Conference will be held in Duluth, Minnesota, at the Duluth Entertainment & Convention Center on August 22-24, 2004. More information can be obtained at www.itsmn.org and www.visitduluth.com.

Transportation Solutions, continued from page 14

In each case, the themes were developed to be consistent with the National ITS Architecture, a nationally adopted framework that helps to guide ITS deployment. This will help to ensure that ITS projects in the parks can be integrated into the larger regional context, providing the maximum benefit to park managers and the visiting public.

The variety of ITS theme recommendations suggests that ITS, while not a panacea, may potentially address many transportation challenges at a number of California's national parks. Several checklists were developed to help other sites explore the potential of ITS within their parks. These checklists are designed to help national parks:

- Develop a relationship with their local RTPA/MPO
- Conduct a transportation needs assessment
- Identify ITS themes for their park
- Develop ITS projects from ITS themes

The research project is now proceeding into phase 2, which features a park outreach video, a review of ITS measures of effectiveness, an ITS architecture and integration case study, and early-winner projects in GGNRA and SEKI.

NEW RESEARCH STAFF

Doug Galarus, Senior Research Associate

WTI is pleased to welcome Doug Galarus as a Senior Research Associate. Doug has more than 13 years of professional experience in programming and software development, multimedia development, management, instruction, technical writing and editing, and applied mathematics. One of his initial project assignments will be the development of an internal project management and time tracking system for WTI. He will also develop new or additional technology applications for existing projects, including a tablet PC platform for a tribal incident reporting project and a personal digital assistant (PDA) system for recording animal-vehicle incidents.

Prior to his arrival at WTI, Doug served as the Director of Applications Development for the Information Technology Office at the University of Montana, where he managed a team of developers that worked on database-driven web sites, web site design, desktop applications, interactive CD-ROMs, and kiosk development. In fact, he has previously worked in partnership with WTI on the touch screen kiosks created for the Greater Yellowstone Rural Intelligent Transportation System project, and on the development of a promotional CD about WTI.

Doug has worked in the private sector for a software development company, and also has extensive experience in education. He has served as faculty in the Mathematics and Computer Science departments of the University of Montana, and has created new curriculum and programs, particularly applying technology to education.

A Montana native, Doug earned his B.A. in Mathematics, his M.A.T in Mathematics, and his M.S. in Computer Science, all at the University of Montana in Missoula. When not at WTI, he enjoys spending time with his family: his wife, Jana; his father, Ed; daughter Rachelle; two Scottish Terriers, Duchess and Willow; and a cat named Daisy Kitty. Now settled in Bozeman, he also looks forward to boating and fishing in the rivers and streams in this area.

Doug can be reached at:
(406) 579-2494
dgalarus@coe.montana.edu

Suzanne Lassacher, Research Associate

Suzanne "Suzy" Lassacher began work as a Research Associate at the Western Transportation Institute in 2002. Her research skills and technological expertise were immediately put to good use. Suzy is the Principal Investigator on the Transportation, Research, Applications and Instrumentation Laboratory (TRAIL), aimed at demonstrating and evaluating various data acquisition, control systems, information delivery, and management systems in a small urban and rural environment. As part of the TRAIL project, systems will be deployed that relate to many of WTI's research interests, including weather

and winter mobility, highway infrastructure design and maintenance, wildlife and ecology, commercial vehicle operations, emergency medical services and public transportation.

In addition to her project research, Suzy also provides research computing support for WTI staff. Staff frequently calls upon her expertise with C, C++, Java, Dreamweaver, Flash Adobe Photoshop, HTML, UNIX, Linux, MS Windows, and hardware and systems to keep WTI research and operations running smoothly.

Originally from Tampa, Florida, Suzy graduated with a BA in Italian and a humanities minor from Florida State University and the Universita' di Firenze in Florence, Italy in 1990. She then went on to complete a Masters degree in Computer Science at Montana State University in 2002. Prior to accepting her current position at WTI, Suzy further developed her computer skills while working as a Graduate Research Assistant for the Precision Agriculture Project on the MSU campus.

Suzy can be reached via
Ph: (406) 994-6010
Email: suzannel@coe.montana.edu

Xianming Shi, Research Associate

Bringing a wealth of knowledge and substantial educational background, Xianming Shi first joined the WTI team as a Research Aide in 2002. Now, as a Research Associate, Xianming has immersed himself in a number of rural transportation projects, including WeatherShare, Recommendations for Winter Traction Materials Management on Roadways Adjacent to Bodies of Water, CANAMEX Smart Tourist Corridor, Frontier Pooled Fund, Greater Yellowstone Regional Traveler and Weather Information Systems, and Siskiyou Pass Incident Management. Xianming's specialization in road weather management and decision support, highway-runoff best management practices, quality control and evaluation of deicers and corrosion inhibitors, corrosion monitoring and protection for reinforced concrete structures, and industrial engineering methodology applications to transportation systems/programs has provided valuable insight into current and developing projects and proposals at WTI.

Originating from the Hunan Province in the People's Republic of China, Xianming relocated to Bozeman in 1999 after completing a B.S. in Corrosion and Protection, an M.S. in Applied Chemistry, and a Ph.D. in Chemistry. Once in Bozeman, he completed an additional M.S. in Industrial & Management Engineering at Montana State University and was a Ph.D. Candidate in Environmental Engineering at MSU as well. With a solid working history in both research and teaching related positions and a breadth of publications, Xianming offers WTI new avenues for expansion in nearly all of its research focal areas.

When he isn't adding another degree to the substantial list, Xianming enjoys Soccer, Table Tennis, Chinese Poetry, and spending time with his wife, Wenyan.

Xianming Shi can be reached via
Ph: (406) 994-7378
Email: xianming_s@erc.montana.edu

ADMINISTRATION

Deputy Director and Research Director Appointments Announced

Since its creation in 1994, WTI has grown from an initial staff of two, to its current size of 35 professional staff and affiliated faculty, plus 50 students from 13 MSU departments. In the same period, the value of WTI's research portfolio has increased from $75,000 to $8 million. This growth has allowed for a significant increase in the scope and depth of research activities. However, the expansion has also created a need for a more formalized internal structure. Following an extensive strategic planning process last year, the positions of **Deputy Director** and **Research Director** were created to facilitate the day-to-day administration of WTI and to ensure the ongoing high quality of research products. In addition, this change will allow WTI Director Steve Albert to focus on the outreach and partnership-building efforts that form the foundation of WTI's research approach.

John can be reached at

406-994-7357

jtaylor@coe.montana.edu

John Taylor, P.E. has been appointed to the position of **Deputy Director**. John has been a Senior Research Engineer at WTI since 2001 and has extensive previous experience in management. For nine years, he served as the Transportation Systems Manager for the Pima Association of Governments (Pima County, Arizona); prior to that he held a variety of increasingly responsible positions in the New York State Department of Transportation for over 27 years, the last seven of which were as Regional Director.

The Deputy Director, a position analogous to that of Chief Operating Officer, will provide the day-to-day leadership and management of staff and students. The Deputy Director will be responsible for all internal operations of WTI; he will interact with other MSU Departments with which WTI collaborates and otherwise assure that WTI retains its reputation for excellence. In addition, the Deputy Director will mentor less experienced staff and assure that the WTI education and technology transfer programs are based on sound strategic and tactical principles and practices.

Dr. Mike Kelly has accepted the position of **Research Director**. Mike has been a Senior Research Scientist at WTI since 2001. He has more than 28 years of post-doctoral experience managing, directing and performing human factors research and development on advanced transportation systems, communication systems and centers, aviation systems and industrial facilities. Mike has managed interdisciplinary programs related to advanced transportation systems funded for as much as $5.2 million.

The Research Director will provide leadership and management of University Transportation Center research and the overall WTI portfolio; he will guide the strategic and tactical direction of all research, and facilitate discussion among a growing number of staff and faculty throughout MSU. He will also be responsible for the development of a public and private sector Research Advisory Committee. The Research Director will be responsible for quality control and timeliness of deliverables to meet sponsor objectives. By interacting with other MSU Departments and outside research partners, he will build positive relationships that promote collaboration, ensure sustainability, and maintain WTI's reputation for excellence. In addition, the Research Director will work with the Director and Deputy Director, and the education and technology transfer programs to assure sound strategic and tactical principles and practices.

Mike can be reached at

406-994-7377

mkelly@coe.montana.edu

Community Outreach: A Busy Year For WTI Staff

Throughout the past year, WTI staff members have offered their time, talent and donations to numerous local organizations and causes in the Bozeman, Montana area.

Holiday Food Drive

During the 2002 Holiday season, WTI staff collected food, warm clothes and toys for needy families. More than 100 pounds of groceries and other items were donated to the Gallatin Valley Food Bank.

Donations for U.S. Troops

In the spring of 2003, WTI joined with other organizations to send care packages to active duty military personnel serving in the war in Iraq. Staff members filled two large boxes with snacks, toiletries, books, games, movies and other items for shipment to overseas troops.

Relay for Life

Staff and their family members participated in the American Cancer Society "Relay for Life" in July 2003, which raised awareness about cancer victims and survivors, and raised money for research. The seventeen members of the "WT Islanders" relay team took turns walking or running laps around the Bozeman High School track, continuously from 7 p.m. one evening until 10:00 a.m. the following morning. The "Islanders" won a special award for "Best Team Spirit". Many other staff members made financial contributions, resulting in a nearly $300 donation to the American Cancer Society from WTI.

Team WTIslanders "showing their spirit" during the Relay For Life fundraiser

Western Transportation Institute
416 Cobleigh Hall
MSU·Bozeman
Bozeman, MT 59717-3910

Issue 2, Volume 7, September 2003

Carla Little, Editor
Phone: (406)994-7925
E-mail: clittle@coe.montana.edu

This newsletter is published semi-annually by the Western Transportation Institute at Montana State University-Bozeman to inform readers about our research and outreach activities. Readers are encouraged to contact the Principal Investigator for project specific information. Contact the editor for reprint permission or other editorial concerns.

Come visit us on the Internet!
www.coe.montana.edu/wti