



NATIONAL INSTITUTE FOR ADVANCED TRANSPORTATION TECHNOLOGY

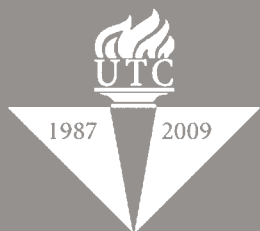
# NIATT

15th Anniversary

**ANNUAL REPORT**



Sustainable Energy and  
Transportation Laboratory



PREPARED FOR UNIVERSITY TRANSPORTATION CENTERS PROGRAM

RESEARCH AND INNOVATIVE TECHNOLOGY

U.S. DEPARTMENT OF TRANSPORTATION

FUNDING PERIOD JULY 1, 2005 THROUGH JUNE 30, 2006 - FY05

## THEME: ADVANCED TRANSPORTATION TECHNOLOGY

### MISSION

Our mission is to develop knowledge about and technology for transportation systems and vehicles that addresses critical problems facing our nation, our region, and our state.

### CORE VALUES

- Practical research on critical and relevant problems
- Experiential learning-centered environments for our students
- Environmentally-friendly and sustainable transportation
- Life-long learning
- Interdisciplinary, collaborative teams
- Integration of education and research

### OUR INSPIRATION

- How can we make our transportation systems more sustainable?
- How can we reduce the environmental impacts of our transportation system and preserve the Northwest's pristine environments?
- How can we reduce our dependence on petroleum use for transportation?
- How can we reduce delays and improve travel time reliability through improved traffic control systems?
- How can we improve the safety of our transportation systems?
- How can we improve the durability, reliability and life of our physical (built) transportation infrastructure?
- How do we make good choices in transportation investments?
- How can we improve the skills and abilities of transportation workers so that they can do their jobs more effectively?

*Cover photo:  
Rendering of NIATT's planned  
Sustainable Energy and  
Transportation Laboratory  
(drawing by Jessica Friend).*



*NIATT is located in the University of Idaho's Engineering/Physics Building, which was constructed partially with funding from the U.S. Department of Transportation..*

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This *Annual Report* highlights the activities and accomplishments that NIATT has achieved over the past eight years of funding as a University Transportation Center.

To access this report on the Internet, please visit NIATT at <http://www.webs1.uidaho.edu/niatt>

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**Credits:**

Michael Kyte  
Judy B. LaLonde  
Beth Case, UI Creative Services



## DIRECTOR'S LETTER

In 1991, the U.S. Congress passed the Intermodal Surface Transportation Efficiency Act, charting a new direction in U.S. transportation policy and funding. One new direction was the significant increase in the University Transportation Centers Program, including the establishment of the National Center for Advanced Transportation Technology at the University of Idaho. Our role in the UTC program was expanded in 1998 with the passage of the Transportation Efficiency Act, and we remained a part of the program with our successful competition in 2002. We are now celebrating our fifteenth year as a UTC!

SAFE-TEA-LU, signed into law in the summer of 2005, continued the expansion of the UTC program, increasing the number of transportation centers from 27 to 60, with annual program funding increasing by 260 percent to over \$79 million. Since 1998, the UTC program has made a substantial contribution to new knowledge and technology, as well as contributing more than 1500 graduates to the transportation work force. For our part, we have invested more than \$5 million in UTC funds in 75 projects involving more than 200 students.

The expansion of the UTC program presents both an opportunity and a challenge. The challenge is that the growth in earmarking (much of it designated to university research), has greatly restricted the U.S. DOT's ability to carry out its own national research program. The opportunity is that the UTC program can take the lead in carrying out DOTs research program. In the Pacific Northwest, we have taken the leadership to do just that by forming a new alliance between the four UTCs and state DOTs in Idaho, Oregon, Washington, and Alaska. The goal of this alliance is to increase collaboration by sharing our educational programs, pooling our UTC funds to meet national research priorities, and to undertake multi-state-funded transportation research projects.

In this year's annual report we present both a look back to our first fifteen years and a look forward to an exciting and challenging future. You will meet our past students of the year, each describing his or her experiences at NIATT and how these experiences have helped to shape successful careers in transportation. You will also hear from some of our partners as they describe the value that NIATT has added to their own work.

My sincere thanks to each of you – students, faculty and staff – as you continue to make our transportation program a success.

*Michael Kyte*

Michael Kyte, Director

## University of Idaho President Tim White

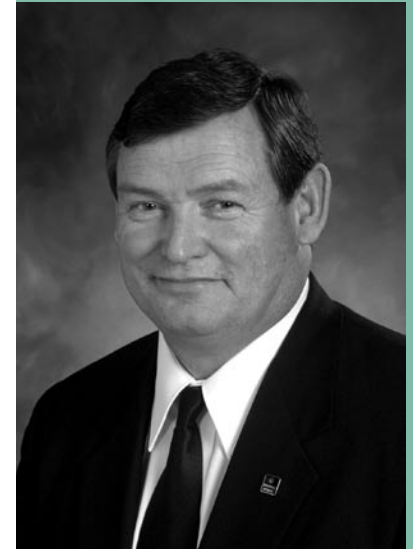
After becoming President of the University of Idaho and with the help of faculty, staff and students, I outlined an ambitious program, "The Plan for Renewal of People, Programs and Place." Bringing a new interdisciplinary approach to education and research at the university was a focus of this program.

One important component of the university's renewal is the research institutes. These institutes, including the National Institute for Advanced Transportation Technology (NIATT), are responsible for fostering innovation and an interdisciplinary approach to solving the complex and interlinked problems we face throughout the world today. NIATT is strategically positioned to promote science and technology, catalyze entrepreneurial innovation, steward the environment, and help us understand sustainable design, four of the five elements of "The Plan for Renewal."

NIATT has taken a leadership role in promoting sustainability, sponsoring a major conference on sustainable transportation held last year on the University of Idaho campus. The development of preliminary designs for a new campus building, the Sustainable Energy and Transportation Laboratory, resulted from the conference discussion. This new laboratory will house campus programs in alternative energy and fuels and provide maintenance and testing for our local transit system as they implement new and cleaner transit vehicles.

NIATT has also taken a leadership role with our State Department of Transportation to bring technologies and new knowledge developed at the University to the practitioners in Idaho and elsewhere to help them address critical problems of congestion, mobility and safety. I congratulate NIATT on 15 years of success in educating and training new transportation engineers and in the development of new knowledge and critical new transportation technologies.

The University of Idaho is very proud of NIATT and its many achievements.



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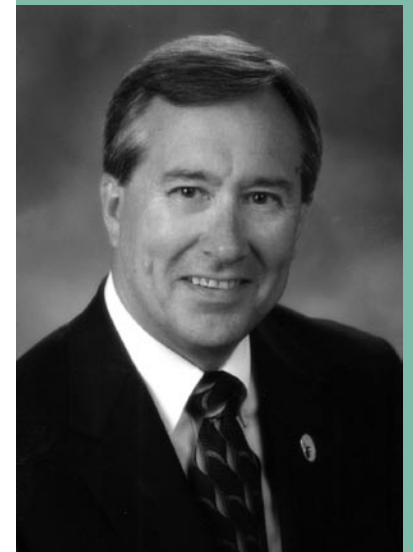
## Idaho Transportation Department Director David Ekern

As we move deeper into the 21st Century the country and Idaho realize more and more how the next generation of transportation systems will be significantly different than what our focus has been in the last centuries. We are focusing more and more on its international nature, intermodal connections, technology supported, and new customer aspects of our transportation business. And we realize the new challenges of innovative finance, streamlining our business practices and shaping the workforce to function in this emerging business model.

But to be successful with the new requires strengthening and building from our relationships that have stood the test of time and helped us build the foundations for new business ventures. NIATT is one of these key partners and represents an important portal to our future. NIATT has played a key role in helping ITD learn from research and find new ways to use its results to make our business more effective. Their extensive work in traffic and signal management has enabled Idaho to cost-effectively train new traffic management specialists and employ state-of-the-art signal technology as we begin to deal with growing congestion.

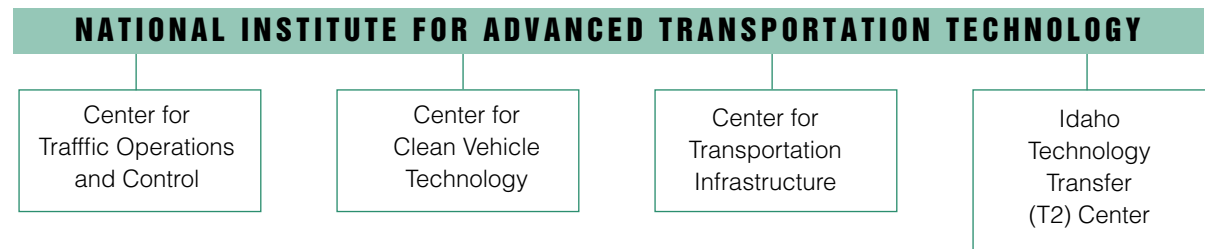
In addition, we know that improving safety to address the 260+ deaths and thousands of injuries each year on Idaho's roadways will only be addressed by taking new approaches in investment, policy direction and bringing all partners to the challenge. NIATT successfully designed and managed Idaho's first ever attempt to bring this new thinking to the issue. As prime designer of the Governor's ZERO DEATH Initiative, NIATT is helping us make the first steps to reverse these trends.

There is an old saying: "Those who fail to learn are doomed to repeat the past." NIATT and the University of Idaho are important partners in transportation who assure us that Idaho will not suffer this fate.



## MANAGEMENT STRUCTURE AND PRINCIPAL CENTER STAFF

The National Institute for Advanced Transportation Technology (NIATT) is one of six research institutes on the University of Idaho campus. Institute status was granted to NIATT in July 1998 in recognition of its university-wide, multidisciplinary activities. The institute, originally known as NCATT, was established in 1991 under the Intermodal Surface Transportation Efficiency Act (ISTEA).



Although the University Transportation Centers (UTC) program primarily supports the work of NIATT’s Center for Traffic Operations and Control and the Center for Clean Vehicle Technology, the UTC funding has a positive impact on the entire institute and our ability to deliver transportation technology. UTC funds are supplemented from a variety of sources, including the Idaho Transportation Department (ITD), Idaho Department of Water Resources, the U.S. Departments of Energy and Defense, the Federal Transit Administration, and the Federal Highway Administration. The research in the Center for Transportation Infrastructure is supported mainly by the cooperative agreement between NIATT and ITD. The Idaho T2 Center receives major funding from the Federal Highway Administration’s Local Technical Assistance Program.

### Management staff

Michael Kyte  
 Director, NIATT  
 Professor, Civil Engineering

Karen Den Braven  
 Director, Center for Clean Vehicle Technology  
 Professor, Mechanical Engineering

Judy B. LaLonde  
 Assistant to the Director, NIATT

Deborah Foster  
 Financial Technician, NIATT

Steven C. Taylor  
 ITS Integration Analyst, NIATT

Douglas Moore  
 Director  
 Idaho Technology Transfer (T2) Center

Bruce Drewes  
 Training and Research Manager  
 Idaho Technology Transfer (T2) Center

Ruthie Fisher  
 Administrative Assistant II  
 Idaho Technology Transfer (T2) Center

Irma Sixtos  
 Administrative Assistant I  
 Idaho Technology Transfer (T2) Center

## Karen Den Braven, Director, Center for Clean Vehicle Technology

I would like to thank NIATT, and especially Director Michael Kyte, for the opportunity to serve as the new Director of the Center for Clean Vehicle Technology. As energy issues become more important nationally, especially in transportation applications, technology is seen as one of the solutions to the growing problem of tightening energy supplies. As a researcher in NIATT for the past six years, I have witnessed the acceptance of technologies with which the CCVT has been involved. These include the increased awareness locally, regionally, and nationally of biodiesel and ethanol fuels and the availability in the marketplace of hybrid vehicles and clean, quiet snowmobiles. I look forward to working with the students, researchers and staff of NIATT as we continue to develop ideas and technologies which improve vehicle performance, safety, and efficiency.



## Don Blacketter, Director, Center for Clean Vehicle Technology, 1998-2005

Over the past seven years, the Center for Clean Vehicle Technology has made great progress in a number of areas that are critical to our region and nation. Our early work in the development of hybrid electric vehicles demonstrated that hybrids were viable--even in colder regions such as the Pacific Northwest. The FutureTruck competition raised the awareness of the hybrid potential, even for trucks and sport utility vehicles. Prior to these demonstrations, many vehicle manufacturers considered hybrid vehicles unfeasible. But when teams of college students, like NIATT's, showed that these vehicles could work and work well at reasonable costs, the public demanded that this technology be made available. Our hybrid vehicles continue to be a top showcase project for visitors to the University of Idaho.

We have developed ultra-capacitor technology that will significantly extend the life of batteries used in starting vehicles. The work has progressed to the point that we have filed for a patent and are working on licensing agreements for the technology.

Our participation in the Clean Snowmobile Challenge has led us to a number of engine technologies that previously were not thought possible. For example, the use of a four-stroke engine in recreational vehicles is now common despite the fact that only a few years ago, consumers thought a four-stroke engine would not provide the performance they needed. After winning the CSC two consecutive years with a modified four-stroke engine, it was clear that the technology was not only clean and functional, but could also meet consumer demands. Since then we introduced one of the first fuel-injected two-stroke engines in snowmobile technology. To make this viable, we developed engine-map strategies and machined our own specially designed head and used this technology in a sled that meets the emission standards of a four-stroke engine with the performance of a two-stroke engine.

We have continued our work in biofuels and bioproducts. We have developed flow reactors that will make the production of biodiesel economically viable. NIATT and the University of Idaho are considered national leaders in the development of biofuels technologies. Our annual biodiesel conference in Boise is attended by several hundred people from around the nation. We serve as a focal point for the state in showing that biodiesel works and can contribute to economic development of the state.

More recently the CCVT has expanded its research into vehicle safety. In this work, we are studying ways to improve the airbag manufacturing process to its reliability and thus improve vehicle safety.

Through support from the UTC program, the CCVT has become a national leader in vehicle research. The work has impacted hundreds of students and has provided the means for UI faculty members to become experts in their areas.



## NIATT AFFILIATE FACULTY

Ahmed Abdel-Rahim  
*Assistant Professor, Civil Engineering*

Fouad Bayomy  
*Professor, Civil Engineering*

Steven Beyerlein  
*Professor, Mechanical Engineering*

Donald Blackketter  
*Chair, Mechanical Engineering*

Karen DenBraven  
*Professor, Mechanical Engineering*

Michael Dixon  
*Associate Professor, Civil Engineering*

Jim Frenzel,  
*Associate Professor of Electrical and  
Computer Engineering*

Brian He  
*Associate Professor, Biological and  
Agricultural Engineering*

Brian Johnson  
*Professor, Electrical and Computer Engineering*

S. J. Jung  
*Professor, Geological Engineering*

James Kingery  
*Associate Professor, Range Resources*

Axel Krings  
*Associate Professor, Computer Science*

Stanley M. Miller  
*Professor, Geological Engineering*

James R. Nelson  
*Professor, Agricultural Economics/Rural Sociology*

Richard J. Nielsen  
*Associate Professor, Civil Engineering*



*Participants in Traffic Signal Summer Workshop check out a traffic simulation.*

Edwin Odom  
*Professor, Mechanical Engineering*

Paul Oman  
*Professor, Computer Science*

Charles Peterson  
*Acting Dean, College of Engineering*

Karl Rink  
*Assistant Professor, Mechanical Engineering*

Edwin R. Schmeckpeper  
*Associate Professor, Civil Engineering*

Dev Shrestha  
*Assistant Professor, Biological and  
Agricultural Engineering*

Judi Steciak  
*Associate Professor, Mechanical Engineering*

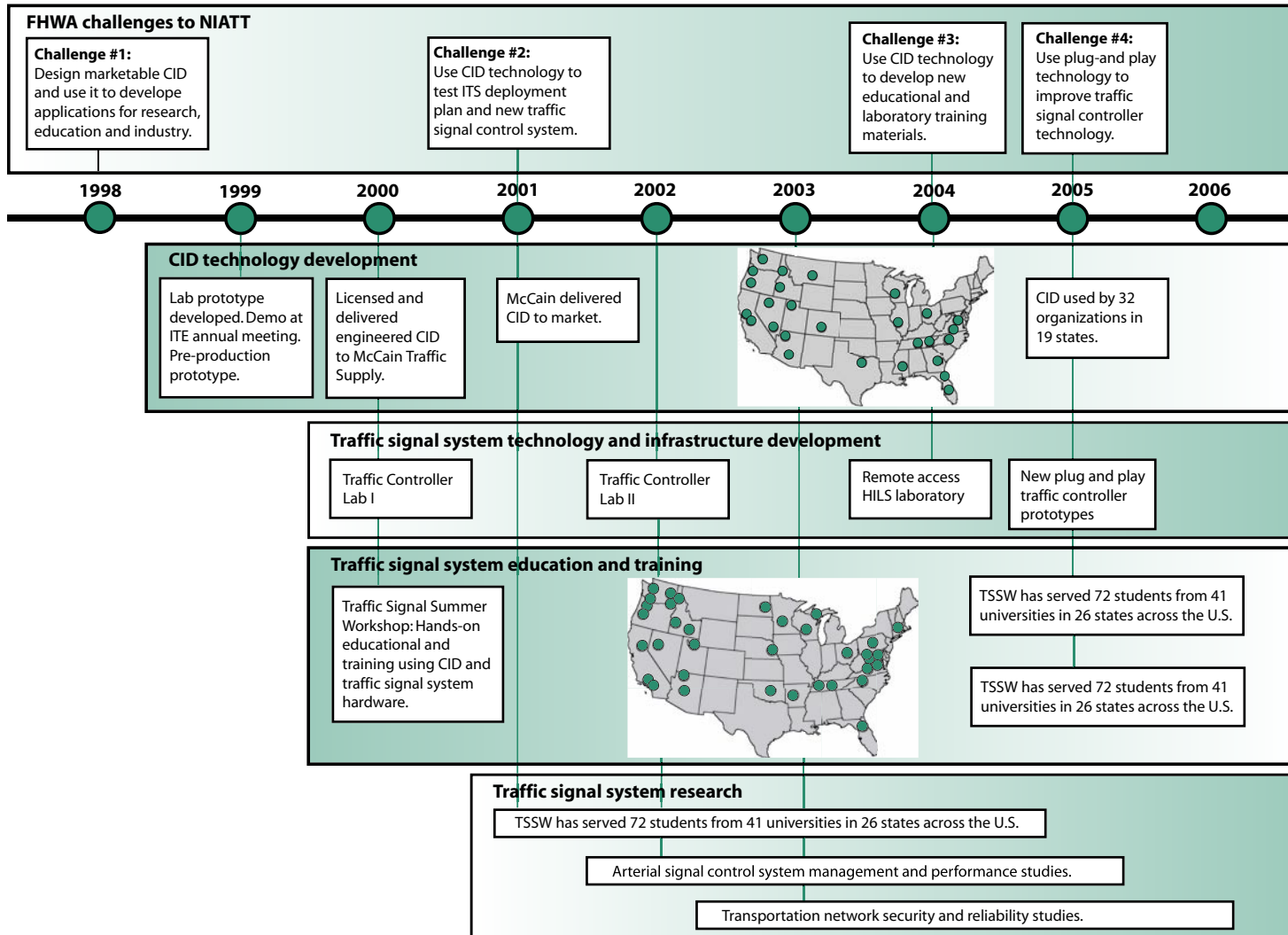
Jon Van Gerpen  
*Chair, Biological and Agricultural Engineering*

Richard Wall  
*Professor, Electrical and Computer Engineering*



# SECTION 1: NEW TRAFFIC SIGNAL CONTROL TECHNOLOGY

## MANAGING CONGESTION, IMPROVING SAFETY, REDUCING ENERGY DEMAND



When traffic signal control systems operate more efficiently, it helps

- Improve air quality and reduce fuel consumption
- Reduce congestion and save time for commercial and emergency vehicles, buses and the public
- Reduce the number of serious accidents
- Reduce aggressive driving behavior, including red-light running
- Postpone or eliminate the need to construct additional road capacity

"Managing Traffic Flow through Signal Timing," S. Lawrence Paulson, *Public Roads*, Jan/Feb. 2002. <http://www.tfhrc.gov/pubrds/janfeb02/timing.htm> (accessed 5/15/06)

The Controller Interface Device (CID), developed by NIATT at the University of Idaho and commercialized by McCain Traffic Supply, is a key product that has opened a new gateway in both research and practice in the area of traffic signal control and operations. We purchased eight CIDs for use in our Traffic Operations Laboratory, and we are using them to conduct research projects that investigate the development and evaluation of time-of-day traffic signal timing transition strategies, pre-emption strategies, dynamic maximum timing intervals. These projects would not be possible without the CID. I do believe that the CID has already proven its value in both research and practical applications.

Byungkyu (Brian) Park  
Assistant Professor  
Department of Civil Engineering  
University of Virginia

Two-thirds of all miles driven each year in the U.S. are on roadways controlled by traffic signals. At some urban intersections, traffic signals control the movement of more than 100,000 vehicles per day. Nearly 50 percent of all highway crashes and 25 percent of all fatalities occur at intersections. And over 20 percent of the fuel consumed by vehicles in urban areas is during delays at traffic signals. For example, the City of San Jose recently found that their signal coordination improvements lowered gasoline consumption by half a million gallons annually. These facts make a strong case for the important role that traffic signals play in managing congestion, improving safety, and reducing energy demand.

NIATT has responded to a set of challenges from the U.S. Department of Transportation to develop new traffic signal control technologies to address these three important issues. One of the key enabling technologies is the controller interface device, or CID, a communications device that allows researchers and practitioners to use traffic signal controllers in real-time simulations, testing controllers and timing plans in a laboratory environment before they are deployed in the field. During the past eight years, we have

- Designed and marketed a CID and used it to develop applications for research, education, and industry,
- Used CID technology to test an ITS deployment plan and a new traffic signal control system for small cities,
- Used CID technology to develop new educational and laboratory training materials, and
- Used plug-and-play technology to improve traffic signal controller technology and safety.

We have a multidisciplinary team of seven electrical, computer, and civil engineering faculty with expertise in traffic signal systems technology and operations and two state-of-the-art traffic control system laboratories. More than 100 students, both undergraduate interns and graduate research assistants, have worked on traffic control technology projects at NIATT during the past eight years.

## THE U.S. DOT/NIATT PARTNERSHIP: ALIGNING NATIONAL PRIORITIES WITH LOCAL EXPERTISE

We have always looked to the FHWA and the U.S. DOT to help us set our priorities for research, education, and technology transfer. We have included FHWA staff in the peer review panel for our Center for Traffic Operations and Control. We have worked closely with FHWA staff to align national research priorities with our own capabilities and interests.



*NIATT has successfully added significant new capabilities to the field of traffic engineering over the past several years. One of these is a fundamental change in the way we train engineers and technicians to understand and operate today's increasingly complex traffic signal systems. The need and demand for quality training in this field is immense. There is also a need to take this training on the road to get to the smaller less capable agencies that have limited budgets. One of the foundations of this has resulted from the commercialization of a Controller Interface Device that allows the interconnection of a real traffic signal controller with a simulated operational environment. In the coming years, I firmly believe that this effort will pay huge dividends in the form of better functioning traffic signals nationwide.*

*Another significant research effort at NIATT is a method (plug-n-play) to exchange information with devices such as traffic signal heads. This has the potential to add significant capability to traffic signal operation. It will also help move traffic signals away from the old world of contact-closure inputs and outputs. The first significant piece of hardware that this is being applied to is the countdown pedestrian signal heads. Currently these heads measure the previously timed pedestrian signal interval and assume it will always remain the same. This isn't a particularly good assumption for current operations. In the future, it will also allow for more dynamic operation of pedestrian signal intervals. Finally, it is starting to move tradition bound traffic engineers to thinking about new future modes of traffic signal operation. This in and of itself is significant.*

*Paul Olson  
Federal Highway Administration  
Western Resource Center*



### Geoffrey Judd 2001 Student-of-the-Year

Working on NIATT projects trained me to look for alternative solutions that others might not have thought about implementing. This ability has been especially valuable when trying to determine ways to improve operations along corridors. I often work with smaller cities to review projects and work with them when they do not have their own trained staff. The research I performed was in areas that have great potential across the nation to help relieve the congestion that is plaguing our major metropolitan areas. The funding helped me to establish a location and tools needed to evaluate this project.

I felt honored to be student-of-the-year and attend the gathering with the other students. It was great to meet such a wide diversity of students and hear about the research that they were doing. I knew that this group would provide breakthroughs in the field and that it would benefit all.

## Yuri Meresczak 2005 Student-of-the-Year



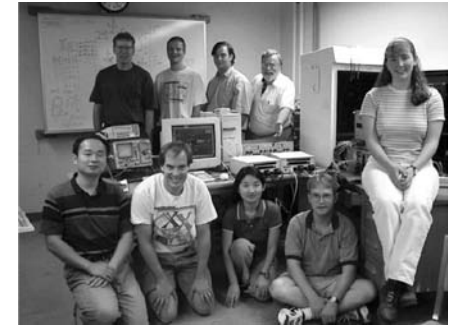
There is no question in my mind that my research assistantship with NIATT provided the springboard for me to

begin a career in transportation engineering. I had the opportunity to become engaged in an exciting, cutting edge NCHRP research project involving the study of modern roundabouts. Through this research, I began forming relationships with a number of people who are close colleagues of mine today.

Being selected NIATT Student-of-the-Year was both a tremendous and a humbling honor. I understood the fact that there were many other students in my class just as deserving of the award as myself. I also knew that along with receiving the award came a responsibility to continue to further my knowledge so I could contribute to the transportation profession.

## THE ENABLING TECHNOLOGY: THE CONTROLLER INTERFACE DEVICE

In 1998, FHWA issued a challenge to NIATT: develop a marketable controller interface device that could be used by researchers and practitioners and use it to develop applications for research, education, and industry. In the spring of 1999, a team of undergraduate and graduate students developed a demonstration CID as part of their capstone senior design class. That summer, an interdisciplinary team of electrical, computer, civil, and mechanical engineering students designed and built a laboratory prototype that was displayed at the 69<sup>th</sup> Annual Meeting of the Institute of Transportation Engineers in Las Vegas, Nevada. The following year, NIATT delivered the final engineered CID to McCain Traffic Supply, a traffic control company based in Vista, California. Since 2002, McCain, under license with the University of Idaho, has sold nearly 100 CID units to researchers and practitioners at 32 organizations in 19 states throughout the U.S.



*Team of students who designed and developed the prototype CID.*



*I think that NIATT has, and will continue, to provide excellent opportunities to improve the knowledge of those that are or will be working in the Traffic Engineering profession. An example is the development and production of the Controller Interface Device (CID), which has allowed students to gain a better understanding of TS-1 traffic signal controller functions while providing the industry with a very useful tool.*

*The Traffic Signal Controller Lab has created an interesting environment where students can work with traffic signal control equipment from different manufacturers and learn about the different features that are available in the traffic signal controllers and about signal timing parameters and creating small systems of traffic signals.*

*The Traffic Signal Summer Workshops have provided opportunities for many students and professionals to get "hands on" experience in traffic signal operations and create contacts for their future or continuing careers in Traffic Engineering. As a presenter at this workshop, I have had the opportunity to see many interesting ideas be questioned and tested in a controlled but flexible learning environment. Most participants say that it is a very intense, but satisfying week of learning and touching various parts of traffic signal operations.*

*In all of the cases above, I have had continued contact with individuals seeking additional knowledge as a result of the availability of facilities and projects from NIATT. Some of the contact is from the workshop participants who are now working in the industry, and are looking for information and guidance. In other cases, students are looking for information regarding specific features that they are experimenting with and testing in the Controller Lab. In all cases, I think that it is exciting to see the enthusiasm displayed as these individuals continue to grow and learn about the current technologies associated with traffic engineering and traffic signal operations.*

*Mike Boydston  
Assistant Traffic Operations Engineer  
Ada County (Idaho) Highway District*

## TRAFFIC SIGNAL SYSTEM TECHNOLOGY AND INFRASTRUCTURE DEVELOPMENT

As we developed the CID technology, we made a commitment to use the technology as we expanded our infrastructure.

In 2000, we opened our Traffic Controller Lab I, a joint teaching and research facility. The lab consists of seven workstations, each with a CID, a traffic controller, an Autoscope video detection system, DVD players and recorders, and two supporting computers. In 2003, sponsored jointly by UTC and ITS program funding, we opened our Traffic Controller Lab II, with the capability of studying up to twenty signalized intersections, interconnected with another new device developed by NIATT researchers, the Controller Interface Network device, or CIN. The CIN provides an efficient way to interconnect various intersection configurations for testing and evaluation. This lab provides the most extensive traffic controller research facility in the nation.

In 2004, we began the development of a set of tools to allow remote access to the Traffic Controller Lab II. These new tools will allow users from around the nation to take advantage of the lab's extensive capabilities. Beta testing of the remote access tools, known as RAHILS (or remote access hardware-in-the-loop simulation), began in 2005. A final version of RAHILS will be deployed later this year.

In 2005, we began work on the next generation of real time simulation models, or software-in-the-loop simulation (SILS). SILS provides the inclusion of a virtual traffic controller into the simulation system, eliminating the need for the CID hardware. We expect this work to be completed in 2007.

Also in 2005, we began development of the next generation traffic controller. Using plug-and-play computer technology and distribution network theory, we have now produced a prototype of an external pedestrian countdown timer. The successful testing of this component has shown the potential of a new approach to traffic signal controller design. We are partnering with Econolite Control Products on this venture, and have filed a patent on the inventions related to this technology.

The addition our Traffic Controller Lab II is a significant addition to research infrastructure, not just in the Northwest, but nationwide.

Ahmed-Abdel Rahim  
Assistant Professor



Idaho is experiencing unprecedented growth, both in terms of population and the number vehicle miles traveled. According to the U.S. Census Bureau, in 2005 Idaho was the fourth fastest growing state in the nation. Since 1978, the number of vehicle miles traveled has increased by 104 percent and the number of registered vehicles has increased 93 percent, yet the highway system has increased by only 3 percent. To manage this growth in traffic volumes, Idaho is fortunate to be home to NIATT, one of the leading transportation research centers in the nation. As such, Idaho has a unique opportunity to better meet the State's changing transportation research and training needs. Through the efforts of NIATT, new and/or improved technology products have been developed that can be used by local government agencies and practicing engineers. The Federal Highway Administration-Idaho Division supports the efforts and work of the researchers in NIATT's Center for Traffic Operations and Control. Their efforts continue to pay dividends for Idaho, the Pacific Northwest region, and the nation.



**Paul Coffelt,  
1999 Student-of-the-year**

It is good to make contact again with NIATT and to report that I am doing quite well and am right where I want to be with respect to my career at this point. As the ITS Program Manager of the City of Lynnwood, Washington, I manage the ITS projects funded through three federal grants totaling more than \$5 million. As the ITS Engineer, I am responsible for integration of various field devices into the Central System. We are planning to implement dynamic message signs for urban corridors and have identified where we will install the first six signs. Signs will display real-time congestion information so travelers will be able to make informed decisions of which major routes to take.

One final comment with respect to my roots at UI--I owe a debt of gratitude to my major professor Dr. Zaher Khatib and to Dr. Michael Kyte for support, guidance, and encouragement. I would also like to express appreciation for the NIATT assistantship that those early opportunities in ITS possible. The NIATT program offered opportunities, including being selected student-of-the year in 1998, that gave me the foundation and desire to pursue a successful career in ITS.

## TRAFFIC SIGNAL SYSTEM EDUCATION AND TRAINING

One of our core beliefs as we began our work on traffic control systems was the need to include actual technology in our education and training. Engineering students need to have hands-on experience with the real stuff, not just simulation, if they are to learn to design and operate traffic control systems.

In 2000, we held our first Traffic Signal Summer Workshop. Using the capabilities from our Traffic Controller Lab I, we hosted twelve transportation engineering students from around the U.S., providing them with a week of hands-on experiences in traffic signal design, signal timing, video detection, loop detector design, and real time simulation of traffic control systems using our CID technology. Since then, 72 students from 41 universities in 26 states have participated in our summer workshops.

One instructor summarized the experience of the workshop this way:

“I think the valuable part is that students don't just look at pictures or mathematical equations. They get a chance to tinker, make mistakes, and ultimately get various components up and running . . . much like they will have to in the real world. This means when they are on their first job and things don't work exactly as expected during a [system] turn-on, they will have their wits about them and know how to debug the system and get it running.”

The success of the summer workshop motivated the development of another cooperative project with FHWA. The MOST project, for mobile signal timing training, is part of FHWA's signal timing roadmap, designed to provide training for both university students and practitioners using a fundamental belief that generated our summer workshop: engineers need more experience using actual traffic controllers and they need to learn about traffic signal timing in an environment in which traffic controllers are the basic tool. As part of the MOST project, we have partnered with Purdue University, the University of Tennessee, PTV-America (the developers of the VISSIM micro-simulation model) and Econolite Control Products of Anaheim, California to develop a new software-in-the-loop simulation system. The system will link the popular VISSIM model with a virtual Econolite ASC/3 controller. The training materials that are being developed for the MOST project will be released in 2007.



*Traffic Signal Summer Workshop participants and instructors pose before a traffic controller.*



*Students work in the Traffic Controller Lab II.*

## TRAFFIC SIGNAL SYSTEM RESEARCH

We have used our new technologies (the CID, the CIN, and our other new traffic controller technologies) to continue to develop our knowledge base. We have focused on three strategic areas. Since 2004, we have funded 20 research projects in these three areas.

- We have developed guidelines for designing and deploying traffic signals systems for small and medium sized cities. We have used these guidelines as we have developed a design for the traffic signal and communications system for an ITS deployment project in our home city of Moscow, Idaho. We have developed traffic controller specifications for a new generation traffic control system for our state department of transportation. Our Traffic Controller Lab II has been used extensively to support this work.
- We have studied how traffic control systems can be more effectively used to support and manage arterial traffic systems. We have designed a new portable data collection system, consisting of twelve networked video cameras to record data in ways not previously possible. We are partnering with North Carolina State University to connect our video system with their new video data extraction system to generate data that can be used to better manage arterial systems.
- We have developed tools to manage transportation network security and survivability. As more IP-addressable devices are deployed, maintaining security for these devices becomes more important. We have completed two security and survivability studies for cities in Idaho.

The Ada County Highway District (ACHD) has partnered with NIATT the past eight years on many rewarding projects. ACHD used NIATT to lead the evaluation of Boise's first ITS freeway deployment. NIATT did an outstanding job in evaluating the benefits of this ITS deployment.

ACHD staff have assisted in the evaluation and testing of many NIATT projects, such as the innovative Controller Interface Device (CID). ACHD staff have also worked with university faculty in reviewing NIATT projects. ACHD staff have attended many advanced ITS technical training sessions at the NIATT facility in Moscow and have assisted in the annual Traffic Signal Summer camp.

Our agency is lucky to have such a high quality university transportation facility within Idaho, and we look forward to a continued partnership with NIATT.

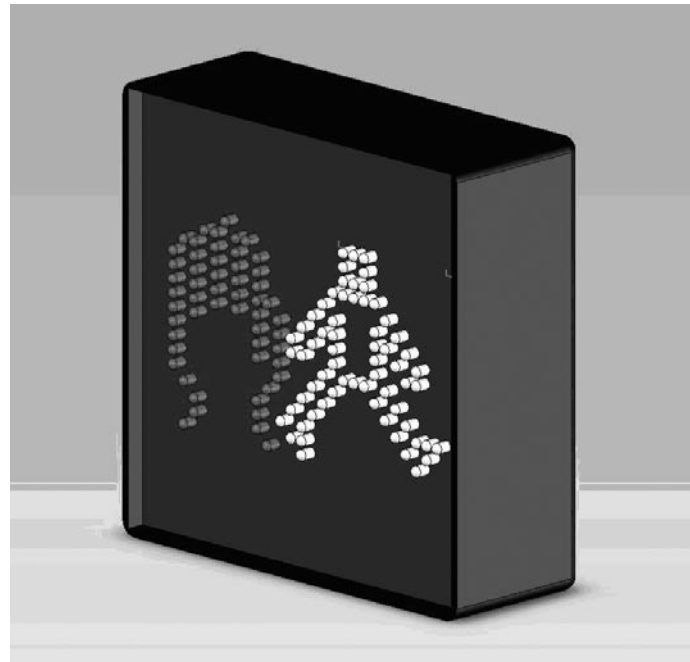
Jim Larsen  
*Traffic Operations Engineer  
 Ada County Highway District*





The research into Ethernet control and in particular plug-and-play distributed sensor networks has a strong symbiotic relationship with the embedded systems undergraduate course in Electrical and Computer Engineering. The concept of distributed network control is introduced in the advanced microcontrollers course. A group of seniors became so interested in the concepts involving Plug and Play distributed traffic signal control that they volunteered to work on the project. The four undergraduates and one graduate student collaborated to develop the demonstration system featured at the 2006 Engineering Expo. (The undergraduates won the competition for best technical presentation and the IRF innovation award.)

Richard Wall  
Professor, Electrical and Computer Engineering



*Pedestrian  
crosswalk  
signal*

## EXPANDING TRAFFIC SIGNAL CONTROLLER CAPABILITIES

A senior design team of four undergraduates who called themselves “The LiteBright Team,” along with support from a graduate student, developed a working prototype of a pedestrian countdown timer, the pedestrian crosswalk signal, and the pedestrian button with a wireless module. Each of these devices uses a microcontroller to allow network communication. At the University of Idaho’s Engineering Expo in spring 2006, the students demonstrated that their plug-and-play pedestrian countdown timer performed better and more accurately than the standard pedestrian countdown timer.

The senior design work was proof-of-concept for work initiated in 2004 to demonstrate the benefits of using a plug-and-play network to improve traffic signal performance, reliability and functionality. The first year’s work produced a prototype traffic controller system using a simplified model of a traffic controller. Graduate student Andy Huska and advisor Richard Wall made a presentation of their work at the annual TRB meeting at Washington, DC, in January 2006.

Reviewers at the summer 2005 TRB Signal Systems Committee agreed that the existing traffic controller technology is moving in the direction demonstrated by Wall’s distributed smart signal and sensor system. The demonstration system represents a technology that is advanced compared to current development efforts by traffic signal manufacturers, especially in the area of plug-and-play adaptability. Wall formed an oversight committee that includes Raj Gahman, Paul Olson and Dave Gibson of FHWA, Darcy Bullock of Purdue University, Tom Urbanik of the University of Tennessee, Gary Duncan of Econolite, along with NIATT researchers Steffan Warner, Brian Johnson, Ahmed Abdel-Rahim, and Michael Kyte to help guide future work.



## TRANSPORTATION SYSTEMS SURVIVABILITY AND SECURITY

Transportation is not only subject to normal, nominal failures, but is also a target for terrorism. With limited dollars available for mitigation efforts, officials managing transportation systems must have reliable information in order to make intelligent and informed decisions. Over the past three years, we have developed a survivability analysis of intelligent transportation systems from a combined infrastructure point of view. This unique analysis perspective looks at not only the traffic signal systems, but also at the communication network supporting that system and the power layer on which communication relies. In the past, such mitigation efforts have been unstructured, without clear priorities to protect ITS systems from failure or attack.

A multi-disciplinary NIATT research team with members from civil engineering, computer science, and electrical and computer engineering developed a Survivable Systems Analysis (SSA) tool. The SSA tool was tested first with the Moscow ITS system currently under development and proved the viability of the analysis approach. This past year, we repeated the analysis in a larger city, Boise, Idaho. The success of that effort shows that the analysis is scalable. Researchers made a presentation of the applicability of the SSA tool to transportation infrastructure networks in large cities to members of the Idaho Department of Homeland Security and the Ada County Emergency Planning Committee in April 2006.

UTC funds supplemented a grant from the National Science Foundation Scholarship for Service (SFS, aka Cyber-Corps) program for the security and survivability research. Three students wrote Masters' theses based on their research on this project and two students completed Master's projects. Two of the students now work in industry and three are now employed by federal agencies, working to secure our nation's critical infrastructures.

“Making transportation safer is a principle part of making the nation safer.”

*Ignition*,” Issue 7: Fall 2004.  
Transportation Research Board

In the past, if agencies had money to apply to mitigation projects—not to maintenance or fixes—there was no organized approach for them to take. Our work in the city of Moscow, and now the City of Boise, shows that because our Survivable Systems Analysis merges a number of points of view, it can help agencies prioritize and use their resources to make systems more resistant to failures from whatever source.

Paul Oman  
*Professor, Computer Science*





**Philip Rust**  
**2003 Student-of-the-Year**

My research assistantship with NIATT provided me with the opportunity to learn from and work with some of the best transportation professionals in the world. The hands on experience and contacts I gained through NIATT significantly accelerated my career enjoyment and advancement. None of this would have happened if that research wasn't leading the profession. I love what I do and I'm good at it because I learned from the best. Being selected student-of-the-year is evidence in my own life of the effectiveness of this program, and I have been deeply honored to be part of the NIATT research teams.

## GETTING BETTER DATA AND USING IT TO IMPROVE INTERSECTION DESIGN AND OPERATIONS

Michael Dixon's goal is to improve the operation of arterial signal systems. He has conducted a series of research projects in which he asks the question: what information do decision makers need in order to improve the design and operation of signalized intersections and make arterial systems function more effectively. These decision-makers could be people using the data off-line or algorithms that are a part of automated traffic control systems.

Four graduate students have been working with Dixon in the collection of data and modeling of signalized intersections. Dixon has assembled an extensive data set of traffic flow characteristics at signalized intersections and his students are now using these data to better understand intersection operations and how to improve these operations.

One of the projects collected right-turn-on-red field data from the cities of Lewiston and Moscow, Idaho. The data were compared with results from several standard simulation models, leading to improvements in the simulation. Other data are being used to improve delay measurement techniques.

Dixon is now designing a new field data collection system that includes twelve networked video cameras. This system will provide a more comprehensive approach to data collection. And, the better data that are available, the more effective we can make our traffic control systems.



Effective decision-making is based on sound data. We've collected and archived accurate high resolution data that will help researchers, nationwide, develop better decision-making tools.

Michael Dixon  
 Associate Professor  
 Civil Engineering

## SECTION 2: CLEANER VEHICLES ON THE ROADS AND IN NATIONAL PARKS

### MAKING VEHICLES CLEANER, MEETING ENERGY NEEDS, & IMPROVING SAFETY

1998

- CCVT established during planning for UTC grant. Partnerships begin with Automotive Resources.
- Idaho Department of Water Resources, and Valley Transit on clean engine research.
- First Place in Arizona Electrics for AVCT team. →

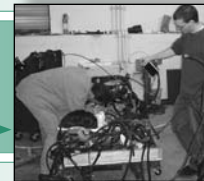


1999

- Invitation to participate in FutureTruck competition.
- Chassis dynamometer installed. \$200,000 donated by Ed and Mary Schweitzer.
- 1999 Dodge running on 100 percent yellow mustard biofuel delivers biodiesel to Yellowstone and hauls feedstocks back to the University for biodiesel production.

2000

- Invitation to participate in the Society of Automotive Engineers Clean Snowmobile Competition.
- Received DEPSOR grant for catalytic ignition and clean engine research.
- Renovation of Gauss-Johnson lab completed with space for vehicle research. →



2001

- Small engine dynamometer and emission test facilities upgraded.
- Received FHWA grant for clean vehicle and visitor studies in Yellowstone National Park in partnership with Western Transportation Institute.

2002

- Bioenergy 2002 attracts international participation.
- Snowmobile captures first place and King-of-the-Hill Award.
- Vandal Trolley and the BioBug running on biofuel go into service. →



2003

- Snowmobile repeats victory.
- Biodiesel lubricity studies begin.

2004

- FutureTruck team develops ultracapacitors and files a provisional patent.
- Explosion Dynamics Laboratory opens to study leaks in airbag initiators.
- Converted aquanol van displayed at Engineering Expo. →



2005

- Catalytic reactor work begins modeling the 400 chemical reactions involved in ethanol-water combustion.
- Researchers present studies of airbag initiators at International Congress on Thermal Stresses.
- Hydraulic assist system developed for heavy weight vehicles.

2006

- CAD lab provides use of powerful, sophisticated tools for engine modeling.
- Planning continues for \$10 million Sustainable Energy Lab and Transportation Laboratory with \$1 million grant approval.



#### David Alexander 2002 Student-of-the-Year

As a NIATT research assistant, I completed a Ph.D. in mechanical engineering. Not only did NIATT make this possible through funding support, I also had the opportunity to work with advanced and emerging hybrid electric vehicle technology, which in a small rural town in Northern Idaho is next to impossible. The quality of research that was expected as a NIATT research assistant helped me to grow professionally and academically. I have been able to continue in the field of advanced vehicle technology because of the strong foundation provided to me through the assistantship. Being selected NIATT Student-of-the-Year was an honor and a responsibility. I continue to strive for excellence in my career and hope to give back to NIATT, through professional achievements, the recognition it deserves.

## BIODIESEL KEEPING YELLOWSTONE NATIONAL PARK “GREENER”



Yellowstone National Park and the University of Idaho have had a long-term working partnership on projects such as the biodiesel demonstration in Yellowstone as well as the annual Clean Snowmobile Challenge. UI and NIATT's continuing support of the development of clean, quiet snowmobiles has proved to be very beneficial to Yellowstone National Park, and more importantly, the National Park Service.

The park embraces the concept of collaborating with UI to promote sound environmental stewardship within the world's first national park.

Jim Evanoff  
Environmental Manager  
Yellowstone National Park

During the past decades, the United States has become increasingly dependent on imported oil to meet its energy demands. Over 50 percent of the petroleum consumed in the United States is imported from overseas. Several times during the past two decades the country has been reminded of its vulnerability to relying on overseas oil. Home-grown alternative fuels such as biodiesel can not only reduce our need for imported oil but also can help reduce air pollution.

Biodiesel production and utilization has been under study at the University of Idaho since 1979 by Charles Peterson, agricultural engineering professor and researcher, and has been internationally recognized as a pioneering research program in this field. University of Idaho research has produced significant information concerning biodiesel feedstocks, production, engine durability, emissions, biodegradability and carbon sequestration.

For the "Truck in the Park" project in Yellowstone National Park that began in 1995, UI produced the fuel used in a donated diesel truck using rapeseed ethyl ester biofuel from feedstocks in Montana and Idaho. When the truck reached 100,000 miles, UI researchers tore its engine apart and analyzed it. These lab tests showed that the engine had "virtually the same" horsepower and mileage as the same engine running on fossil fuel. The research shows that biodiesel has greater biodegradability and reduced emissions, odor and smoke than petroleum diesel fuel. Yellowstone Environmental Manager Jim Evanoff still drives that first biodiesel truck running on 100 percent biodiesel (see sidebar).



*Charles Peterson named Innovator of the Year in 2002 by the Idaho Business Review.*



*The Biodiesel Dodge pickup undergoes testing on chassis dynamometer.*

## Nathan Bradbury 2006 Student-of-the-Year



As a sophomore in mechanical engineering, I began my involvement in the Clean Snowmobile Challenge (CSC) (see p. 28). During my junior year, I received a

internship from NIATT that allowed me to spend more time on the CSC project. That year the team received first place at the competition using a four-stroke powered snowmobile. With in internship in my senior year, I continued working on the CSC project, helping a graduate student develop a gasoline-electric hybrid power plant for snowmobile applications. Additionally, I began researching other technologies that could be used to produce clean snowmobile engines, beginning to develop a gasoline direct-injection two-stroke engine for the sled. After presenting the project at the 2004 SAE CSC, I received an internship at BRP working in the advanced engines and development group. That fall, I returned to the University of Idaho to begin working towards my Master's degree in mechanical engineering. My Masters project focused on continuing research and development of the GDI two-stroke engine as well as developing a turbocharged two-stroke GDI engine. After receiving my Master's degree, I was employed in the transportation industry, designing commercial commodity and flatbed trailers. I fully believe that without NIATT and its support of the CSC and my education, I would not have received as fruitful of an education, the experiences with engine development and their environmental impact, and the employment opportunities in the transportation industry.



*At the Engineering Expo, Cami Johnson, a senior Biological and Agricultural Engineering student, attracts attention to the Biobug with a miniature remote-controlled VW.*



*Biodiesel Bug at Yellowstone Park.*

Yellowstone was the first national park to use biodiesel for vehicles running in the park. Now, nearly all national parks use at least a 20 percent biodiesel in their park vehicles, and some have pumps for public use of biodiesel in the parks.

UI has continued testing a number of vehicles including a yellow Volkswagen Beetle and two pick-ups than run on 100 percent biodiesel. The Vandal Trolley, used at least weekly on the UI campus for special events, is a prototype "people mover," using 20 percent biodiesel fuel for efficient short distance transportation. The "Biobug" and the Trolley attract attention wherever they show up in public and provide a platform for promoting the advantages of biodiesel.

I'm often asked why we promote biodiesel when there isn't enough feedstock to produce sufficient biodiesel to replace petroleum products. I remind those "nay-sayers" that we already have a diverse fuel economy in this country. Biodiesel is a new option that will take its place alongside our current fuel choices. Even a percentage of biodiesel use will promote a greener environment and help prevent further global warming.

Jon Van Gerpen  
 Head, Biological and Agricultural  
 Engineering Department, UI

## IMPROVED BIODIESEL PRODUCTION

The increasing popularity of biodiesel has generated demand for its commercial production, which in turn calls for technically and economically sound methods of production. NIATT research has focused for the past three years on biodiesel production. Brian He began exploring the applicability of a homogeneous reactive distillation (RD) technique for transesterification of seed oils for biodiesel preparation. Reactive distillation is a chemical unit operation in which chemical reaction and product separation occur simultaneously in one unit.

In biodiesel production, excess alcohol is created by internal alcohol recycling. Recycled alcohol creates a locally excess alcohol to oil ratio, which drives the reactions in the series of mini-reactors to completion. Therefore, the excess alcohol needed at the input stream is considerably reduced compared to most existing biodiesel processes that require at least 100 percent excess alcohol. The RD technique shortens the reaction significantly from that of a conventional process and greatly increases the productivity.

In 2006, a preliminary study of converting the low-grade glycerol derived from biodiesel production to primary alcohols and applying them back to the biodiesel production process was conducted by He. Ideally, using a thermochemical conversion method, liquid glycerol, a by-product of biodiesel production, can be converted to methanol, ethanol and other short-chain alcohols, which could account for about two-thirds of the alcohol requirement for biodiesel production. If such a method is feasible, the crude glycerol, currently a problem for industry, can be recycled back into biodiesel production. As a result, the cost of biodiesel production could be reduced considerably.



*Jon Van Gerpen (left), department head of biological and agricultural engineering, demonstrates the biodiesel process for UI President Tim White.*

## ENGINE CONVERSIONS TO AQUANOL — A CLEAN ALTERNATIVE FUEL

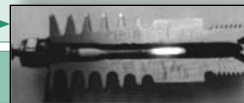


1999

- Preliminary fuel and reactor calculations.
- Conversion of small Yanmar engine to aquanol.

2000

- Basic reactor design completed; performance and emissions testing completed on Yanmar engine FTIR gas analysis spectrometer donated by Micron incorporated into a computer-controlled Emissions Analysis Test Bench by senior capstone design class.
- DEPSCoR grant from U.S. Army Research Office support work with catalytic igniters.



2001

- Initial reactor setup and equilibrium calculations; Valley Transit van conversion to aquanol begins.

2002

- Mixing nozzle design, fabrication, and test; continued data acquisition on Yanmar platform.
- Chassis dynamometer installed to perform preliminary emissions tests on demonstration vehicles.



2003

- Gas-phase kinetics calculations; redesign of flow reactor and FTIR spectrometer for Small Engine Laboratory.
- Senior design team displays an alternative fuels mixing station at Engineering Expo.

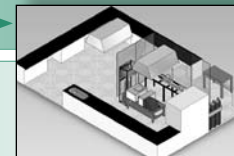
2004

- Finite element model and light-off temperature measurements of lean propane-air mixtures.
- Performance and emissions testing on converted van.



2005

- Converted van displayed at Engineering Expo.
- Laboratory setup in Boise including NSF equipment for catalytic reactor research.



2006

- Work in progress presented at the spring Combustion Institute meeting.
- Jeremy Olberding expected to defend his MS thesis this summer, receiving the 14th MSME degree from engine research.



### Dan Gerbus 2000 Student-of-the-Year

While in grad school I was focused on the minute details, maintaining the pace, and meeting expectations. I did not step back and look at how I or my work impacted others and what role I played in the system. Receiving the Student-of-the-Year award was a surprise. It felt great to be recognized. I gained a new perspective of my research. Throughout undergraduate studies, I was primarily focused my own development and goal to get my B.S. and learned what has already been discovered. However my graduate work had a much broader influence, working in areas that had not been fully defined. I have been more aware of what impact I make and it has been valuable in helping make decisions when it comes to prioritizing activities and goals.



### Dan Cordon 2004 Student-of-the-Year

As a doctoral candidate, the Small Engine Laboratory for which I am responsible has been funded by NIATT since it first began development. The UTC funding ensures that the equipment and infrastructure are maintained in good working order, which is critical to performing research in a timely manner.

Being awarded the Student-of-the-Year was a great honor for me. It is nice to be recognized for all the effort that goes into research projects. Additionally, funding from the award allowed me to attend and present papers at conferences when I would not have had resources to do so otherwise. I have had a passion for vehicles since childhood, and it has been a real blessing to have NIATT as a Northwest UTC so I can pursue my automotive interests without having to leave the area.

Aqueous fuels have the potential for lower emissions and higher engine efficiency than can be experienced with gasoline or diesel fuels. Past attempts to burn aqueous fuel have been unsuccessful due to difficulties in initiating combustion. NIATT researchers adapted and used catalytic igniter technology to successfully ignite aqueous mixtures in both gasoline and diesel engine conversions, as others study the reaction mechanism of the catalytic igniter and aquanol fuel. The goal of this combination of basic and applied research is to develop engine technology that reduces the impact of vehicles on the environment.

Nearly 100 students, both undergraduate interns and graduate research assistants, have worked on engine technology projects during the past eight years. In addition, what researchers have learned from their projects is now introduced into the mechanical engineering curriculum through two courses: Combustion and Air Pollution and Combustion Engine Systems.

Various projects have been completed not only with UTC funds, but with sponsorships from the Idaho Transportation Department, the Idaho Department of Water Resources, the Idaho Space Grant Consortium, and the U.S. Department of Defense. These include small engine testing, conversion of fleet vehicles with spark ignition engines, and conversion of utility vehicles with turbocharged direct-injection diesel engines.

In a multi-year project, a Valley Transit van was converted to run on aqueous fuels (fuels with up to 60 percent water) to use with catalytic ignition systems. The result, proved by extensive testing that compared the performance of the passenger van operating with gasoline with the same van operating with aqueous ethanol, is a robust, reliable vehicle platform for evaluating an alternative fuel handling system that shows no sign of corrosion with improved gasoline fuel economy and emissions.



*Graduate students Jeremy Boles, Dan Cordon and Matt Walker pose with an engine outside of the Small Engine Laboratory.*





*NIATT has made—and continues to make—positive differences for Valley Transit in the ways we provide public transportation in north central Idaho.*

*NIATT faculty and staff make key contributions to issues involving alternative fuels and technologies and related efficiencies of operation, thus making improvements to transit services in this part of the world. Key examples include everything from the aquanol-fueled Valley Transit van, ongoing work in biodiesel alternatives, and assistance in “real-time” tracking of transit buses on the internet.*

*This positive influence extends past a student's time at the UI and NIATT, with a reach that has nation-wide implications. For example, NIATT graduates working in private enterprise are cur-*

*rently using Valley Transit vehicles as test beds for fuel improvement mechanisms which they hope to market nationally. We are continuing to work together for the mutual benefits of providing a “real world” transit operation accessible to student projects which will, in turn, offer improvements in operational efficiency and better transit services to our (Valley Transit) clients.*

*I've been pleased to have been able to work with the University of Idaho NIATT faculty, staff and students over the past several years. From the director and throughout the ranks, all involved have offered a collegial, welcoming and assistive approach that has improved Valley Transit's ability to offer public transportation services in north-central Idaho and south-eastern Washington.*

Tom LaPointe  
Executive Director/CEO  
Regional Public Transportation dba Valley Transit

Each year, students working on engine conversion to aquanol projects have presented papers at the regional Combustion Institute meetings. Results of eight years of research in engine performance with catalytic reactors has generated a base of experimental and analytical data that can be used to support the implementation of new low-emissions engine concepts on vehicle platforms.

The Idaho Energy Division, a part of the Idaho Department of Water Resources, is the state energy office. It has long been involved in alternative fuel programs and enjoys a close and rewarding working relationship with NIATT and the University of Idaho. We believe that NIATT fills a vital need. Alternative fuel technology has exploded into one of the most exciting segments of the international economic and industrial arenas. It combines national energy security strategies, environmental protection techniques, an engine for economic development, and other critical elements to make it a front burner issue in the United States. The University of Idaho is recognized worldwide as a pioneer and leader in biofuels research.

John Crockett  
Renewable Energy Specialist  
Energy Division of the Idaho  
Department of Water Resources





**Joseph Marek, MSCE 1988: Traffic Engineer and Development Review Manager, Clackamas County, Oregon**

I have had the opportunity to be involved with NIATT since 2000 as an instructor for the Traffic Signal Summer Workshop. What I have always appreciated about NIATT is its focus on skills for the real world centered on practical applications and field work in an environment that requires team work, sound communication and mutual respect. In my opinion, this type of teaching encompasses the needs for today's work force. Technical people must be able to work as part of multi-disciplinary teams and be able to convey complex ideas to those with a variety of experience, expertise and knowledge.

My continuing involvement with NIATT has helped keep me abreast of leading edge technology in my field of interest, traffic engineering. As a County Traffic Engineer, our focus is more day-to-day running of the system, and interactions with NIATT help keep me aware of new technologies and better plan for the future of the County's road system.

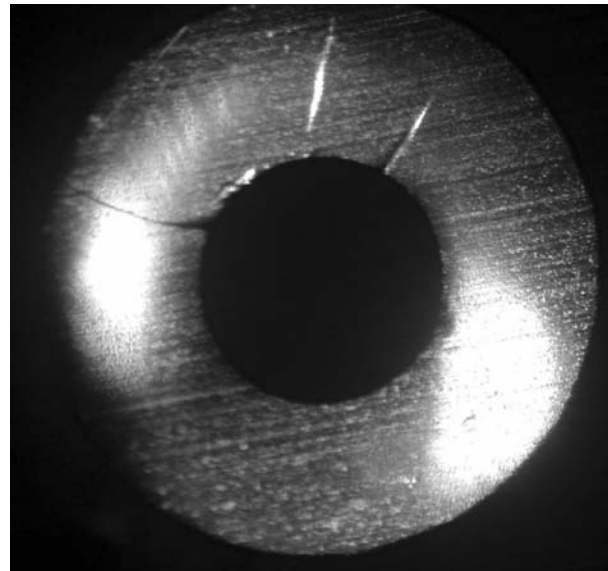
I certainly am thankful for both the NIATT and the University of Idaho both for my formal education and my continued education as a professional. I believe both entities instill the critical combinations of education, values and work skills into all of their students. And because of this I am most grateful.

## AIRBAG SAFETY

Airbags were responsible for saving nearly 15,000 lives between 1975 and 2003. Currently about 150 million vehicles in the United States are equipped with airbags, and these airbags are expected to function properly during a long vehicle life span. The pyrotechnic initiator within the airbag is responsible for deploying the airbag in crash situations and its reliable performance, without failure or diminished performance for the life of a vehicle (estimated to be 15 years), is critically important.

Due to the susceptibility of components to corrosion induced by moisture or other contaminants, bridge-wire initiators are intended to be hermetic and impervious to the surrounding environment. Moisture in the bridge-wire region of the initiators may lead to corrosion and degradation of bridge-wire itself or other pyrotechnic materials. In the airbag initiator, when the appropriate electrical signal is sent, the bridge-wire is rapidly heated, resulting in the ignition of the pyrotechnic charge. If the bridge-wire is damaged, the airbag fails.

Studies at the University of Idaho have shown that the glass-to-metal seals of initiators may be found to contain cracks or other flaws. The goal of Rink's research conducted over the past two years has been to determine if cracking could result from thermal stresses induced during the manufacturing process and marks the beginning of vehicle safety work in the Center for Clean Vehicle Technology.



*Initiator showing three cracks in the ring.*

The major piece of equipment needed for this research, a Radioisotope Tracer-Gas Leak Detection System (valued at more than \$150,000) was donated for Rink's use by IsoVac Engineering, Inc. This equipment is used by many US and foreign electronic companies and government agencies. Its use in NIATT's Explosion Dynamics Laboratory is unique to US universities and will provide a distinct competitive advantage when we seek external research funding.

The results of this research are of interest to both the automotive and aerospace industries. Presentations on initial results of the research were made at the Sixth International Congress on Thermal Stresses in Vienna, Austria, in 2005.

# SECTION 3: BRINGING NEW PROFESSIONALS INTO THE TRANSPORTATION WORKFORCE

Our nation's prosperity depends, in large measure, on the scientific and technological discovery and innovation, which in turn relies on a highly productive workforce with strong research and development abilities and competitive spirits. But with the graying of the current workforce, it is logical to assume that retirements among science and engineering workers will increase dramatically over the next two decades thus reducing our capabilities in these critical areas.

We utilize the UTC grant to help fill the need for highly skilled and educated engineers in the field of transportation. Participation in student competitions provides our graduate and undergraduate students with hands-on, team-oriented and realistic engineering experiences that complement and refine the skills taught in the engineering curriculum.

## CLEAN AND QUIET SNOWMOBILE DEVELOPMENT

2000

- Invitation to compete in SAE Clean Snowmobile Challenge.

2001

- UI Sled takes 5<sup>th</sup> place with emissions well below minimum standards.
- Sled dynamometer and software added to Small Engine Laboratory.

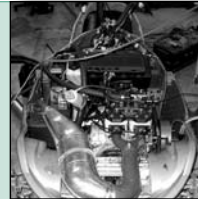


2002

- Special topics classes for snowmobile design and operation added to mechanical engineering curriculum.

2003

- Captures 1<sup>st</sup> place and 4 trophies, including the coveted King of the Hill.
- Sled dynamometer and software added to Small Engine Lab.
- Sled tested at Southwest Research Institute: "The UI CSC 2002 sled . . . generated the lowest emissions of all sleds [including commercial sleds] tested."
- NIATT receives FHWA \$300,000 grant for clean vehicle studies in National Parks.



2004

- Snowmobile repeats victory with the quietest sled, the best performance, fuel economy and value and lowest emissions.
- CSC competition impacts National Park Services statement concerning snowmobile use in Yellowstone and Teton National Parks.

2005

- Three senior design projects and a special topics class support snowmobile development.
- Two-stroke development continues with new injectors.
- Team takes first in oral presentations and second place in competitions for acceleration and static display.



2006

- Idaho Department of Water Resources contributes to equipment upgrade in the Small Engine Laboratory for snowmobile testing
- Polaris donates snowmobile chassis.
- Two-stroke snowmobile completes 100 mile endurance run at competition. Team takes first in static display, oral presentation and lightest sled; second for their written paper and the lowest cost snowmobile .



I'm doing some engineering, which is what I want to do, and I'm involved with students who are further along in their studies than I am. I'm having a good experience and making good contacts, and it's a lot of fun!

Scott Nedrow  
Sophomore, 2004 team



**John Ringert, BSCE 1989, Kittelson and Associates, Boise, ID.**

NIATT has played a key role in the development of transportation professionals and technology in the northwest United States. NIATT provides state-of-the-art solutions to managing traffic as well as training for both students and professionals. This hands-on assistance has had a significant impact within Idaho as well as Oregon and Washington. The quality and commitment of NIATT has made the University of Idaho a key nationally recognized recruiting and training center for transportation engineering companies.

Prior to the formal creation of NIATT, the University of Idaho provided the foundation for my career in transportation planning through courses and hands-on work on traffic operations research. Since that time I have grown through my association with NIATT, professionally by teaching a yearly short course at NIATT as well as utilizing training materials provided by NIATT. I believe NIATT and similar centers across the country are key elements in solving our future transportation challenges and the professionals that are needed to meet those challenges.

The University of Idaho's entry into the 2001 SAE Clean Snowmobile Challenge (CSC) provided proof-of-concept for a clean and quiet snowmobile using a four-stroke engine, exhaust after-treatment and electronic fuel injection. This combination provided excellent emissions and fuel consumption performance while maintaining acceptable power levels. In 2002, the UI improved on this design by fine-tuning the engine, using higher efficiency components to improve power transmission, and adding sound damping to reduce noise. For 2003, the University of Idaho continued to improve on this design with a larger displacement engine, a tuned exhaust, and a new strategy on noise emissions. Results included achieving First Place overall in the competition and five other awards.

However, "nobody wants to ride a fuel-efficient sled that rides like a slug," jokes Karen Den Braven, Director of NIATT's Center for Clean Vehicle Technology and Clean Snowmobile Team faculty advisor. The student team felt they had nothing to gain by using the same platform as they had in previous years and developed a new design that combined two-stroke engines with a high-tech fuel injection system, thus reducing emissions and noise. Two-stroke engines are powerful and require little maintenance but are traditionally loud, dirty and fuel-inefficient. The team's goal was to re-engineer a clean and quiet sled using gasoline direct-injection, exhaust after-treatment and an extensive use of sound reduction materials.

The University of Idaho's entry into the 2004 SAE Clean Snowmobile Challenge was a proof-of-concept gasoline direct-injection (DI) two-stroke powered snowmobile. The direct-injection system was designed to decrease exhaust emissions and improve fuel economy without reducing the power output of the engine. An oxidation catalyst was used to further reduce the emissions. Engine noise was reduced by using two exhaust silencers and sound absorbing materials. Chassis noise was reduced using a spray on material that absorbs vibrations transferred through the chassis. The final design was a lightweight, fuel efficient, clean, quiet, and fun-to-ride snowmobile.

Improvement to the two-stroke sled continued in 2005 and 2006. At the spring 2006 competition, the snowmobile team not only braved 24 inches of snow and winds from 30 to 50 miles/hour, but also captured the first place in the static display and oral presentation categories.

Over the six years of competition, four students have been offered summer internships at Polaris or Bombardier Recreational Products; 52 number of students have completed mechanical engineering courses directly related to the snowmobile engineering and; 7 senior design projects have been associated with the snowmobile project.

*(See also <http://www.mtukrc.org/csc2006pix/index.html> and <http://students.sae.org/competitions/snow/>)*



*NIATT's clean snowmobile captures prized "King of the Hill" award.*

## ELECTRIC CAR/FUTURETRUCK

1998

- Camaro Z28 converted to electric wins Arizona Electrics Race. Governor Kempthorne takes a ride.

1999

- Invited to compete in FutureTruck competition--only school in Northwest out of 15 engineering schools in country.
- Over \$200,000 in outside funding pledged.
- National exposure through sponsors.



2000

- CMAQ grant from the City of Moscow supports FutureTruck development.
- UI FutureTruck only entry able to drive off the carrier arriving at the competition.

2001

- More than 50 students involved in FutureTruck development.
- Innovative passive cooling system used on 2001 FutureTruck.
- Team wins Spirit of the Challenge Award.



2002

- One of three entries in FT competition to meet ULEV standards.
- Special topics classes for vehicle design and manufacture added to mechanical engineering curriculum

2003

- FutureTruck invited to SAE Congress.
- Wins Cisco Systems Telematics 2nd Place Award.



2004

- Combustion engine using a biofuels blend.
- Final entry in FutureTruck competition with those ultracapacitors (provisional patent filed)

2005

- Senior design team demonstrate hydraulic assist system for heavy weight vehicles.

2006

- FutureTruck showcases at numerous public events including Engineering Expo, visits by congressional delegates, and potential UI students.
- Vehicle continues to be a model for technology development and adaptation.



Behind the environmental hype and 'changing the world' rhetoric, the FutureTruck competition had a real purpose: giving engineering students the opportunity to shepherd a project from start to finish, and live or die on decisions made along the way. . . .

*Automotive Design and Production*, Christopher A. Sawyer, Executive Editor. <http://www.autofieldguide.com/articles/090202.html> (accessed 10/6/03).



**James Colyar, BSCE 1995:  
FHWA Highway Research  
Engineer**

While an undergraduate civil engineering student, I had the great opportunity to work at NIATT. My time with NIATT gave me exposure to real-world transportation research projects not typically available in undergraduate classes and the chance to learn from top-notch researchers. NIATT and the University of Idaho provided me a solid foundation to begin my career as a transportation engineer. Now, ten years after graduating, I've seen that NIATT has a well-deserved national reputation for research that advances the state-of-the-practice and state-of-the-art in the field of transportation.



2004 AVCT members pose at the competition.

Because of their successful background in electric vehicle development, NIATT's Advanced Concepts Vehicles Team (AVCT) received an invitation to participate in the FutureTruck competition. This unique five-year engineering program brought together the resources of industry, government, and 15 universities in a cooperative effort to address important environmental and energy-related issues posed by the growing demand for sport utility vehicles (SUVs). FutureTruck was sponsored by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, Ford Motor Company, General Motors Company, and a variety of other sponsors and was managed by Argonne National Laboratory's Center for Transportation Research.

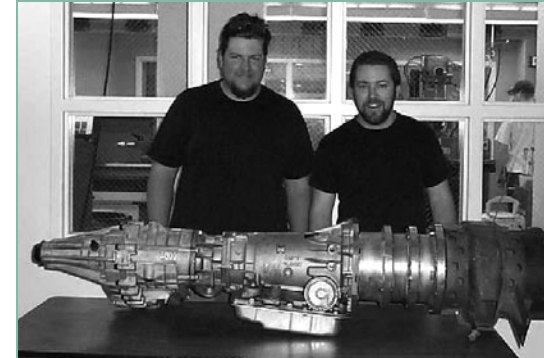
AVCT team members, including both undergraduate and graduate engineering students, were challenged to reengineer a conventional production vehicle into a lower-emissions vehicle with at least 25 percent higher fuel economy, without sacrificing the performance, utility, safety, and affordability consumers want. To meet these challenges, students employed cutting-edge automotive technologies, implementing hybrid electric design strategies. In the first two years of the competition, working with headline sponsor General Motors Corporation, FutureTruck teams modified Chevrolet Suburbans. The final three years of competition, co-sponsored by Ford Motor Company, saw the teams working on Ford Explorers.

Our 2004 FutureTruck placed sixth in a field of 15 at the FutureTruck competition, the best showing in UI's four years of competition. Sixty-seven students across the UI campus were members of the team that partnered to build the vehicle. The vehicle had an ultracapacitor-based storage system. Ultracapacitors have inherent advantages over batteries in some applications. They are more efficient, last many years longer, and perform better in extreme conditions than the lead acid batteries found in all of today's vehicles. In vehicles, the battery plays a crucial role, providing the power necessary to start the engine. The research on the ultracapacitor technology, begun by senior electrical engineers in a capstone design class, has led to a patent application for a battery and ultracapacitor-based energy storage device. This design integrates the battery and capacitors into an electrical device that is lighter and prolongs the life of the battery by many years.

The electric vehicles and the FutureTrucks have been and remain showcases for both the College of Engineering and the University of Idaho. Along with the snowmobile and the biodiesel-fueled vehicles, the FutureTruck is displayed at car shows, Vandal Friday, local high and elementary schools, Earth Week, and Women in Engineering Day. In 2004, it was displayed along with a Toyota Prius and a Honda Insight at an American Society of Mechanical Engineers organized Hybrid Electric Vehicle Expo in Boise, ID.



*Frank Albrecht (left) team advisor, with some AVCT members showing the SUV's ultracapacitors.*



*Eric Clarke (right) with the drivetrain designed for the FutureTruck Suburban.*

**Eric Clarke, MSME 2001: Sr. Test and Development Engineer, PACCAR Technical Center**

During my education at the University of Idaho, NIATT not only nurtured my professional and analytical development, but also assisted me financially with internships and work-study programs from my undergraduate through graduate program. With their support, I worked in a technical environment of interest while maintaining my financial obligations. NIATT helped me achieve my goal of receiving a good education and finding a job in the transportation field.



**Julie Kuhn, BSCE, 1993: Kittelson & Associates, Portland, OR.**

I was an undergraduate working with Dr. Michael Kyte in the days before we received the NIATT designation. As an undergrad, I was privileged to work with Dr. Kyte on research that led to the drafting of the unsignalized intersection chapter of the 1994 Highway Capacity Manual. This research led to a graduate-level understanding of traffic engineering concepts in my undergraduate program. When I attended graduate school several years later, I found that my undergraduate experience with Dr. Kyte surpassed many of the experiences I had as a graduate student at another top grad tier school. More importantly this experience led to the fostering of my first career mentor in Dr. Kyte, which I have found to be invaluable. I still keep in touch with him periodically through the research and projects our firm does with the University. I truly treasure and appreciate my time at University of Idaho under Dr. Kyte and feel that it provided me with the critical thinking skills and confidence that I need to succeed in my career.

## SECTION 4: IMPROVING OUR TRANSPORTATION RESEARCH & EDUCATION INFRASTRUCTURE

We have used UTC funds, leveraged with university support and funding from industry and government, to enhance our research and education infrastructure. Quality equipment and laboratory space are both necessary to establish credibility for published research and to put NIATT in a more competitive position to acquire external research funding. By exposing students to technology and equipment used by professional engineers, we improve the quality of our students and put them in better position to get good jobs.

Our increasing external research funding, including the level of funding from the UTC program, has led to a commitment from the University of Idaho to increase its support for transportation research and education. Two new faculty positions in transportation engineering have been filled since 1998. And, other departments in the College of Engineering, College of Science, and College of Letters and Social Sciences have filled open positions with faculty with interests and expertise in transportation. These departments and colleges have also participated with NIATT in the purchase of new laboratory equipment.

<b>1998</b>	<ul style="list-style-type: none"> <li>• New transportation engineering faculty member through Governor's Initiative.</li> <li>• UI increases its annual operating support for NIATT.</li> </ul>	
<b>1999</b>	<ul style="list-style-type: none"> <li>• Gauss-Johnson Building renovation provides new space for a small engine bay, senior design suite, and a garage for FutureTruck work.</li> <li>• Highway Design Lab upgrade supported by Idaho Transportation Department.</li> <li>• Traffic Controller lab redesigned for Traffic Signal Workshop.</li> </ul>	
<b>2000</b>	<ul style="list-style-type: none"> <li>• Installation of chassis dynamometer.</li> <li>• Third transportation engineering faculty hired.</li> <li>• Idaho Technology Transfer Center hires new training staff.</li> <li>• Micron donates FTIR spectrometer.</li> </ul>	
<b>2001</b>	<ul style="list-style-type: none"> <li>• Catalytic reactor construction continues.</li> <li>• Snowmobile chassis dynamometer added to Small Engine Laboratory.</li> </ul>	



2002

- Major upgrade of Traffic Laboratory II begins.
- TRANSIMS server and software purchased.

2003

- Optimum Power Technology, MathWorks, National Instruments and PTC donate software for FutureTruck development.
- Northwest Signal Supply Company donates controllers for Traffic Lab.
- Explosion Dynamics Laboratory established with donated Radioisotope Tracer-Gas Leak Detection System.



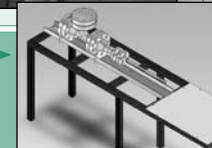
2004

- \$1 million grant received from Federal Transit Administration to be used to construct a \$10 million Sustainable Energy Laboratory and Transportation Laboratory.
- Construction of a continuous-flow reactor for economic biodiesel production begins.
- \$100,000 of equipment purchased with NSF equipment grant of \$67,000 combined with University funds for catalytic ignition reactor for anticipated Energy Lab in Boise, Idaho.
- Donations from Econolite Control Products, Western Traffic Systems, McCain Traffic and PB Farradyne of nearly \$500,000 invested into Traffic Laboratory II.



2005

- Energy Lab opens in the newly constructed Idaho Water Center in Boise, Idaho.
- \$19,000 internal funds and \$5000 from the Idaho Department of Water Resources used to purchase eddy current dynamometer and certified five-gas analyzer for Small Engine Lab.
- \$36,120 internal funds used to purchase and install Agilent 6980N Gas Chromatograph in the Biofuels Research Laboratory.
- Mindworks, a physical space, working prototypes, software tools and library of on-line resources about various machine components and shop practice support mechanical engineering capstone design completed after a three-year effort.



2006

- Advanced CAD lab supported by College of Engineering and the Mechanical Engineering Department opens, providing use of powerful, sophisticated tools for engine modeling.
- Polaris donates snowmobile chassis.
- More than \$50,000 worth of equipment with UI funds purchased to build a mobile data collection system.



## SECTION 5: TECHNOLOGY TRANSFER EVENTS

### SUSTAINABILITY CONFERENCE

In 2005 NIATT, in collaboration with University of Idaho President Tim White, organized and held a two-day conference –“Sustainable Transportation on Campus and in the Community.” The workshop brought more than 200 friends and experts to the University of Idaho to work on five problems of local or regional interest:

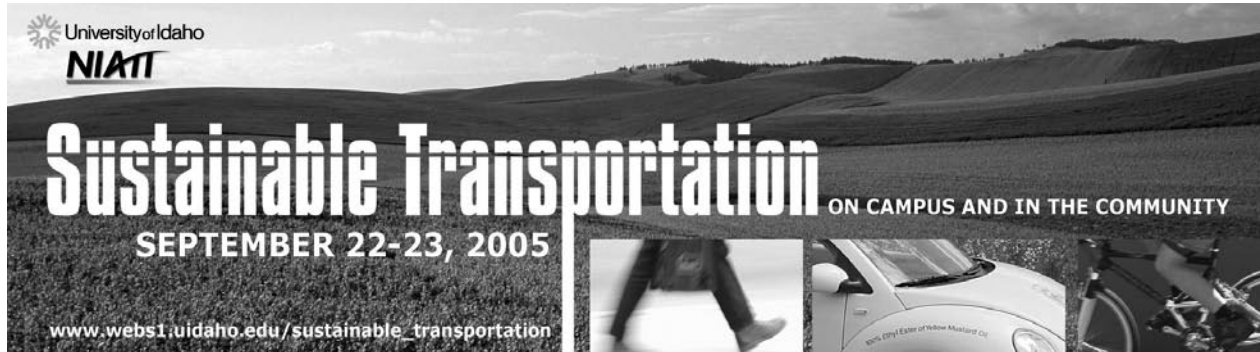
- How can we make transportation to and within the University of Idaho campus more sustainable and environmentally-friendly?
- How can we design and build a Sustainable Energy and Transportation Laboratory?
- How can we integrate sustainability into our curriculum?
- How can we use sustainability concepts in land use and transportation decisions within the Moscow community and region?
- How can we develop a biodiesel fuel production facility on the Palouse?

In addition to final reports and web-based streaming video of the conference discussions, the conference produced the following results:

1. A weekly seminar on sustainable transportation was held during the spring 06 semester. The purpose of the seminar was to apply principles of sustainable transportation and to a project now under consideration by the City of Moscow. The seminar considered the implications of the ring road project from an interdisciplinary perspective. Participants in the seminar were drawn from three University of Idaho colleges, local agency staff, and the community.

(See <http://www.webs1.uidaho.edu/ce501-400>)

2. UI President Tim White and his Blue Ribbon Committee for Strategic Reinvestment has funded two projects that were generated as a result of the conference. These two projects, out of 43 pre-proposals submitted, will provide nearly \$2 million over the next five years to improve sustainability on campus and in the community.
  - “Building Sustainable Communities: A New University and Community Partnership,” \$1.6 million over five years to a team of 13 faculty and staff, led by Steve Drown, chair of the Landscape Architecture Department, and Steve Hollenhorst, chair of the Conservation Social Sciences Department. The initiative will



establish an academic program in bioregional planning and community design; outreach to communities with sustainable community planning and development; and training for elected officials and professionals to plan and manage community resources for sustainable futures.

- “Sustainable Idaho: Learning Together, Leading the Way,” \$450,000 over five years. Maxine Dakins, associate professor of Environmental Science, and Chris Dixon, academic and administrative coordinator of the Environmental Science Program, will lead a team of faculty, staff and students to bring institutional sustainability to the university and to communities throughout the state.

The President’s Blue Ribbon Committee was formed to select multidisciplinary and interdisciplinary teams of faculty, staff and students who developed proposals for initiatives that could deliver positive and lasting impacts across the breadth of the university to better serve the state and beyond.

(see news release at <http://www.today.uidaho.edu/Details.aspx?ID=3499>)

The Symposium and Workshop on Sustainable Transportation was well planned and well-attended. The event not only served to engage a broad cross-section of the experts and thinkers in Sustainable Campuses and Transportation in a productive dialogue, but the workshop also brought to light some of the stakeholder issues that will be challenges to broad implementation, including strong feelings representing build and no-build philosophies.

Jean Brittingham



*Jean Brittingham along with her husband Donald Forbes, author of A Template for Sustainable Transportation and keynote speaker and workshop leader at the NIATT conference.*

## GOVERNOR'S SAFETY CONFERENCE

Deaths and injuries resulting from traffic crashes are a serious public health issue. In 2004, 260 people were killed in traffic crashes in Idaho. More than 14,734 people, or nearly one out of every hundred Idaho residents, were injured in a traffic crash during 2004. Traffic crashes continue to be a leading cause of death in children and young adults between the ages of 3 and 33. The economic loss to Idahoans due to traffic crashes in 2004 was \$1.65 billion. Fatal and serious injuries represented 73 percent of these costs, or over \$1.2 billion. The impact to local communities with respect to medical costs, lost wages, insurance costs, and property damages, as well as taxes to support police, fire, emergency medical services and legal and court costs, is significant.

To address this problem, Idaho Transportation Department Director David Ekern asked NIATT to lead a planning team to plan, host, and deliver the Governor's first ever Summit on Highway Safety. The objective of the summit was to bring together senior management from the private and public sector in Idaho to develop a comprehensive statewide highway safety plan. One of Ekern's goals was to change the nature of the debate, from reducing safety rates to reducing the number of people killed and severely injured.

The summit, with the theme "Toward Zero Deaths," was held in Boise, Idaho, in October 2005 with over 125 participants. Keynote speakers included Tony Kane, Director, Engineering & Technical Services, AASHTO; Rich Cunard, Engineer of Traffic Operations, Transportation Research Board; Brian McLaughlin, Senior Associate Administrator at NHTSA; Kathy Swanson of Minnesota Department of Transportation Rudy Umbs, Traffic Safety Engineer, Federal Highway Administration; Chuck Winder, Chair of the Idaho Transportation Department Board of Directors; and Dave Ekern, Idaho Transportation Department Director.

Following the general session with keynote speakers, subject matter experts led the following five breakout sessions:

- Road-related crashes
- At-Risk Drivers
- Inappropriate Driver Behavior/Safety Restraints
- Communications/Emergency Response
- Vehicles and Pedestrians

A statewide safety plan is now being developed, using information generated at the summit. In addition, regional partnerships between ITD and other stakeholder groups are being formed to address highway safety issues throughout the state. Finally, ITD has established a \$15 million per year investment program that will be targeted to critical safety corridors in the State.



See also: [http://www.webs1.uidaho.edu/highway\\_safety/](http://www.webs1.uidaho.edu/highway_safety/)

Achieving substantial reductions in the number of lives lost to traffic crashes in Idaho is more than a goal or priority. It is a necessity. We have the ability; we have the expertise; we have the desire. Now we must have results.

Dirk Kempthorne  
*Idaho Governor*

## BIODIESEL CONFERENCES

America's current and future energy needs require that people become more knowledgeable about and aware of alternative fuels and vehicles and energy resource options. With a solid background in biodiesel production and utilization, UI researchers are in a unique position to do just that. Three workshops that were pivotal in the development of the biodiesel industry were planned and conducted by UI personnel. These conferences were "Commercialization of Biodiesel: Establishment of Engine Warranties," held in Moscow, Idaho, in 1995; "Commercialization of Biodiesel: Environmental and Health Benefits," held at Mammoth Hot Springs, Yellowstone National Park, in 1997; and "Commercialization of Biodiesel: Producing a Quality Fuel," held in Boise, Idaho, as part of the kickoff event for the 200,000-mile large truck biodiesel project. University of Idaho personnel also took a major lead in producing "Bioenergy 2002," a national conference on bioenergy held in Boise, Idaho, in September, 2002, which drew a wide audience from approximately 35 countries.



A June 2005 conference, "Bio Fuels Production and the New West," organized by the Center for the New West and National Commission on Energy Policy, featured UI Researcher Charles Peterson, U.S. Sen. Larry Craig, R-Idaho and a Center for the New West trustee, opened the conference at the Boise Centre on the Grove. David Garman, U.S. Department of Energy assistant secretary of energy, energy efficiency and renewable energy, and other speakers explored the potential for biofuels and their implications for the West. R. James Woolsey, former CIA director and vice president of the Washington strategy and technology consulting firm Booz Allen Hamilton, addressed the conference participants via satellite.

UI remains active in educating the public and potential users of biodiesel. In 2004, biodiesel researchers at UI received a \$950,000 USDA grant to bring nationwide education to the public about biodiesel fuels made from oil crops, the only university to receive such funding. Each year, the focus of the outreach changes. In 2004, UI held a conference that reached out to state fleets and DOTs. Twenty-five states were represented by the 110 attendees. A Biodiesel Utilization Workshop for School Bus Fleets was held in Boise, September 2005. In 2006, the emphasis has changed to production. A workshop is planned for June 2006 in Coeur d'Alene, Idaho, that is attracting county and state agricultural extension agents who want to learn more about biodiesel production.

For more about UI research in biodiesel fuels, see page 20.

## REGION X COLLABORATION

NIATT joined with other UTCs and state DOTs in what TransNow Director Nancy Nihan called an “historic meeting” to improve research and education collaboration in the Pacific Northwest. In October 2005, UTC directors and research managers from the state DOTs from Washington, Oregon, Alaska and Idaho universities met to “communicate, collaborate and optimize [the] region’s resources to meet the transportation education and research needs of the 21<sup>st</sup> century.” At that meeting, four task forces were organized: 1) Education, 2) Research, 3) Training and 4) Teleconferencing. Each group will study ways in which the Northwest UTCs and state DOTs can more effectively work together in these four areas.

A workshop focusing on ways to improve research collaboration and to better align research projects with national transportation needs will be held in Seattle, Washington, in June 2006. The workshop will bring together Northwest university researchers, state DOT research directors, and senior DOT staff to identify ways in which NW university transportation centers can undertake research projects to solve critical national research priorities. Key US DOT staff and representatives from FHWA, FTA and RITA will join UTC center directors, state DOT research directors, UTC researchers and students.

Participants will

- (1) Highlight research capabilities and interests of university transportation research faculty,
- (2) Highlight focus areas of region X UTCs,
- (3) Learn about national research priorities from FHWA, FTA, and RITA, and
- (4) Identify and discuss possible mechanisms in which these research needs and capabilities can be connected.

Also see [http://www.webs1.uidaho.edu/mkyte/region10-June\\_2006/home01.htm](http://www.webs1.uidaho.edu/mkyte/region10-June_2006/home01.htm)

## TRAINING IDAHO PROFESSIONALS

The Idaho T2 Center provides affordable training across the state of Idaho that is available to all local, state, federal and private organizations. The training covers all aspects of the road building industry. In 2005, the T2 Center held 98 workshop/classes covering 23 transportation topics for a total of 840 hours of instruction for 1611 attendees. A majority of the classes were conducted by Director Doug Moore or Bruce Drewes, the T2 Training and Research Manager. However, other classes were conducted by experts from the Asphalt Institute, the Portland Concrete Association, Caterpillar Corporation, winter de-icing experts, and others who come to Idaho to enhance the knowledge of the staff.

The T2 center has two professional recognition programs: the Road Scholar and the Road Master. The Road Scholar Program helps transportation personnel across the state gain basic engineering/technical knowledge. With severely limited budgets, training and knowledge continue to be the best way to improve efficiency, adopt innovative ways to improve, and provide continued service to customers of the local agencies.

Both programs also provide an opportunity to recognize and applaud local professionals. Graduates are recognized in ceremonies where they receive certificates, and local newspapers are apprised of the awards. Thirty-one Road Scholar Certificates have been awarded since the T2 Center initiated the program.

## PLANS FOR THE FUTURE

Sixty percent of Idaho's fatalities occur on local roads. The T2 Center staff plans to do their part in combating these statistics by developing a highway safety audit program for local jurisdiction. Highway safety audits, safety circuit rider for Idaho. At least one ITD district has started a program of identifying hazards along their roadways, documenting them with pictures and data, and looking for possible solutions



Idaho has 308 local transportation agencies that are responsible for maintaining 32,000 miles of roads. That's why the Idaho T2 center exists—to serve these people who design and maintain these areas and miles of roads.

Douglas Moore  
*Director*  
*Idaho Technology Transfer (T2)*  
*Center*



## T2 RESEARCH

A Winter Maintenance Project sponsored by the American Trucking Association is due to be completed this fall under the direction of David Alexander and two students from UI's mechanical engineering department. One of the students will be receiving a Master's Degree based on the study.

The T2 Center received grants from FHWA and DEQ to conduct an Environmental Best Management Practices Project. Graduate student Stacy Smith organized numerous meetings of individuals representing both state of Idaho and federal regulatory and land management agencies. At these meetings, specific environmental problems and issues associated with rural road maintenance were identified and successful methods of minimizing them were discussed. A focus group made up of road foremen and highway supervisors from around the state was also formed to discuss relevant practices for the maintenance needs of rural Idaho roadways. Smith completed the T2's *Best Management Practices Manual* in 2005.

With completion of the manual is completed, the next step is to disseminate the information. Beginning in 2007, Director Doug Moore will travel throughout Idaho training district road supervisors on the use of the handbook. The training program will help maintenance personnel to comply with environmental laws and to maintain rural roadways so that they are safe, scenic, and effective transportation routes.



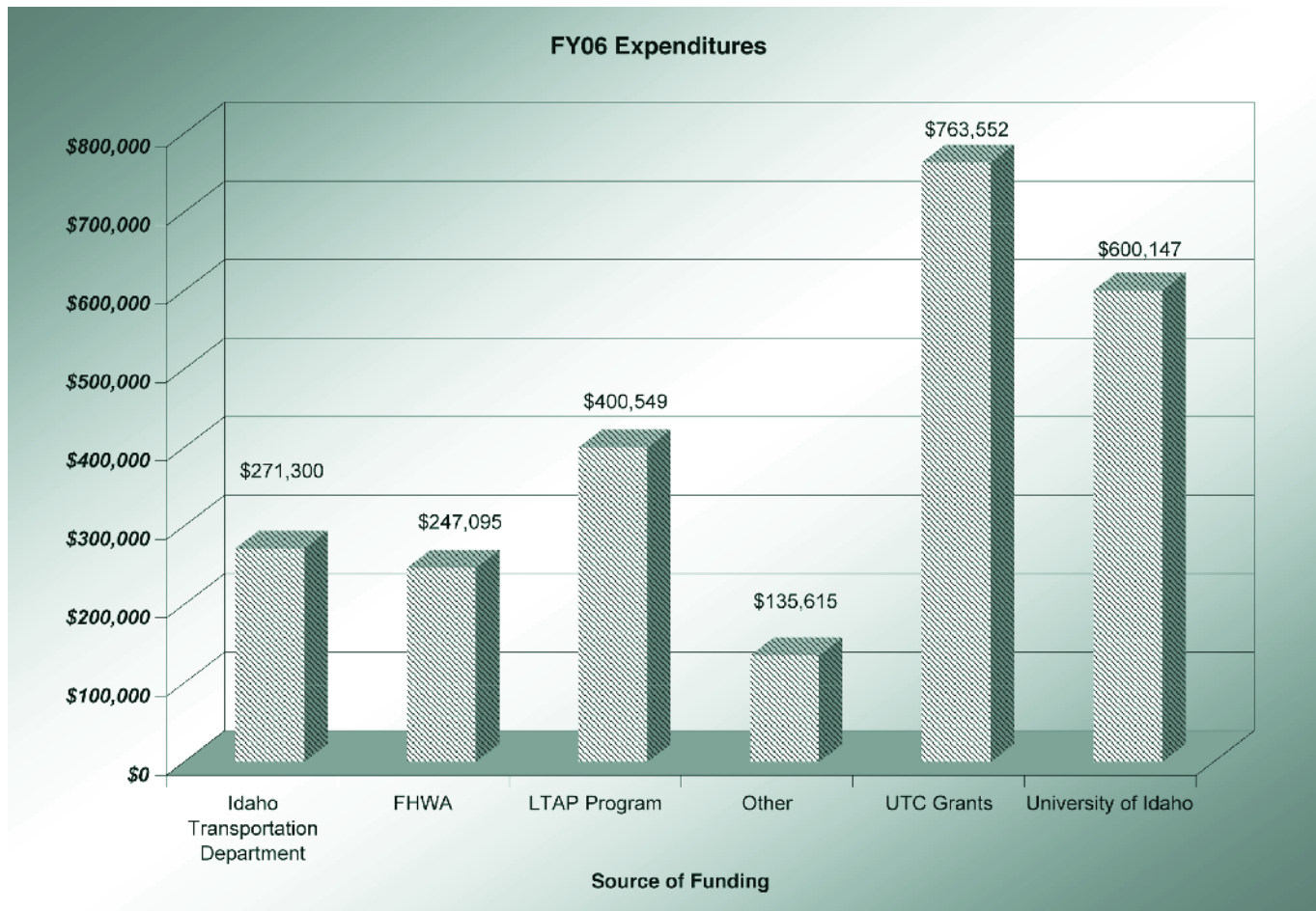
Bruce Drewes, working with the Safety Office of FHWA, developed a project to add safety data to the Transportation Asset Management System (TAMS). The new grant allows the T2 Center, in conjunction with Utah LTAP, to place a module into TAMS that can be used to locate and record accidents on the road systems using GIS. The accident data can then be more accurately depicted and road geometrics, signage and road conditions can be analyzed.

Bruce is serving as president of the National LTAP association for 2006. He is very active on the national scene working with the National Local Technical Assistance Program Association (NLTAPA), as well as with FHWA, NACE, AASHTO, and our other T2 partners.



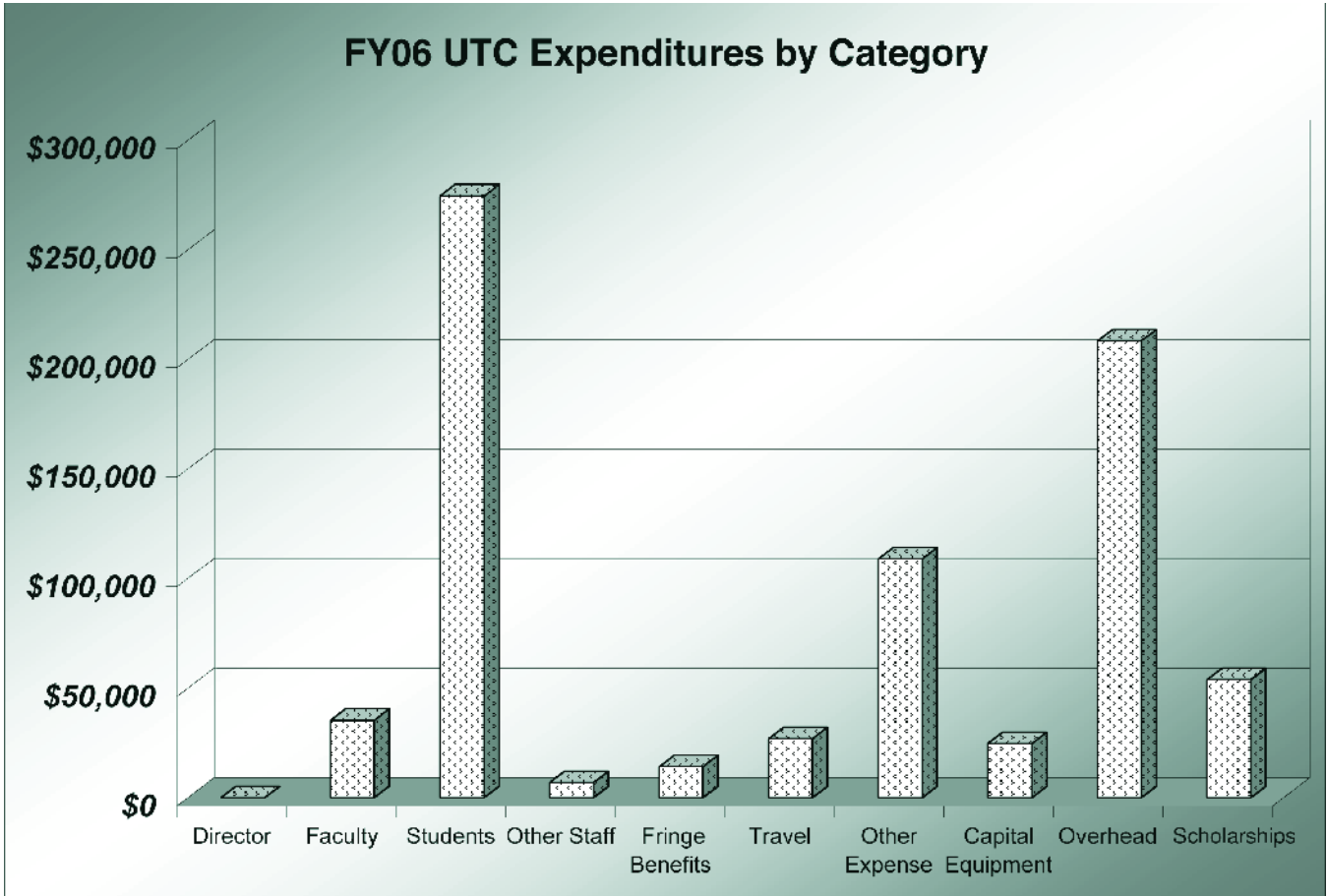
# SECTION 6: FUNDING SOURCES AND EXPENDITURES

## EXPENDITURES BY SOURCE



Over eight years, we have matched \$6,295,300 of UTC funds with \$7,186,742, better than the 1:1 required.

More than 50 percent of UTC funds used in FY06 have been used to support graduate and undergraduate students.



## CONGRATULATIONS TO THESE NIATT STUDENTS AND FACULTY WHO HAVE RECEIVED SPECIAL HONORS OVER THE PAST THREE YEARS:

### College of Engineering Awards:

Ahmed Abdel-Rahim, Assistant Professor, Civil Engineering: 2006, Outstanding Young Faculty Award

Joe Thompson, Research Support Scientist: 2006, Outstanding Staff Award

Dennis Ownby, BSCE 06, Outstanding Senior, Civil Engineering

Tyson Rallens, BSCS 06, Outstanding Senior, Computer Engineering

Michael Maughan, BSME 06, Outstanding Senior, Mechanical Engineering

### Engineering Expo Awards:



#### **Award for Excellence and Idaho Research Foundation Innovation Award at the 2006 Engineering Expo:**

Senior Design Team supporting the UTC-funded project "Full-Scale Implementation of Plug-and-Play Smart Traffic Signal Pedestrian Wait/Walk Display with Pedestrian Button," undergraduate students: Steve Allen; Michael Busby; Dustin DeVoe; Tyson Rallens; Advisors: Richard Wall and Brian Johnson and graduate student Sanjeev Giri.



#### **Award for Excellence at the 2005 Engineering Expo:**

The Clean Snowmobile Team



#### **Most Innovative Project at the 2004 Engineering Expo:**

FutureTruck capacitors.

# NIATT

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