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Change of Leadership

by Heloise Abtahi



Dr. Ahmed Abdel-Rahim, associate professor in the Civil Engineering department and active researcher in NIATT since 2000, has been appointed Interim Director of the National Institute for Advanced Transportation Technology (NIATT). His research field is Transportation Engineering focusing on traffic operation and controls, transportation systems, modeling, highway design and traffic safety, and most recently has emphasized security and survivability of transportation infrastructure. He was the recipient of the College of Engineering Outstanding Faculty award in 2010 and the University of Idaho's Midcareer award in 2012.

Dr. Karen Den Braven Retiring Leaves a Legacy of Excellence in Hands-On Learning and Transportation Research

by Rob Patton

After 27 years with the University of Idaho, Karen Den Braven, professor of mechanical engineering, director of the National Institute of Advanced Transportation Technology (NIATT), and founding faculty advisor to the UI Society of Automotive Engineers (SAE) Clean Snowmobile Challenge team, is retiring. Professor and Director Emerita Den Braven is moving to South Carolina to be closer to family.

While she is leaving the challenge of developing a cleaner, quieter, more efficient snowmobile engine, Den Braven will not be putting up the "gone snowmobiling" sign quite yet. Den Braven is looking forward to tackling the new challenge of Director of Engineering Programs for the South Carolina Governor's School for Science and Mathematics (GSSM). In her new role as GSSM Director of Engineering Programs, Den Braven will work with South Carolina's young engineers (accelerated 10-12 grade students), academic partners at Clemson and University of South Carolina, the state government of South Carolina, and industry leaders in the state such as Boeing,



Den Braven pictured on snowmobile with the UI 2014 CSC team and 13 years of awards.

Indeed, at last count, Den Braven and the Clean Snowmobile Challenge team have won over 70 awards since founding the team in 2000. The Clean Snowmobile Challenge team participates in the annual SAE Clean Snowmobile Challenge hosted by Michigan Technological University's Keweenaw Research Center. Each year Den Braven works with a group of 15-20 students to reengineer a stock snowmobile to reduce emissions, noise and increase fuel efficiency.

Asked about how the snowmobile team got started Den Braven, laughs, something she does with ease and says, "In 2000 three students and I loaded up my little car and travelled to Jackson Hole, Wyoming for the inaugural clean snowmobile competition (relocated to Michigan in 2003). I had heard about the challenge and how it evolved from the controversy over allowing sports vehicles on public lands, and thought, as an expert in small engine design, there could be a great real-world opportunity for academic growth, a long-term platform for research, and also an opportunity to have a positive impact."

During that first competition Den Braven's students did not compete, instead they observed, took lots of notes and came back to Moscow to get to work. 2001 was the first year the UI team competed and, again, after competition they learned a great deal and returned to Moscow to fine-tune their engine improvements.



In 2002, Den Braven's team not only swept the competition winning "First Place," "Best Design," "Best Performance," and "Best Fuel Economy," but they also won the coveted "King of the Hill" snowmobile hill climb award. The silver and copper belt buckle trophy (pictured left) shines in Den Braven's office to this day. "Eventually this [belt buckle] will be put in a UI trophy case, but I'm going to hold onto it for a while, I'm still savoring the victory," says Den Braven.

Currently, the 2014 Clean Snowmobile Challenge team is preparing to leave for Michigan. This year's competition takes place March 3-8.

BMW, and GE among others, with the goal of positively impacting South Carolina's economic development.

"Karen Den Braven is an exemplary faculty member. First and foremost, she is passionate about students. Every year she assembles a group of students for the Clean Snowmobile Challenge team, some new and some returning, and she is able to inspire them to succeed. All you have to do is walk into the snowmobile laboratory and see the shelves of awards to know what a great job she has done," says Larry Stauffer, College of Engineering dean.

Unfortunately, the competition coincides with Den Braven's departure for South Carolina. This will be the first time in fourteen years that Den Braven will miss the snowmobile competition but she knows the UI team will be competitive and represent the university well and likely add to their trove of awards.

Mechanical engineering professor Dan Cordon, who was the snowmobile laboratory manager before earning his doctorate at UI and has been involved with the Clean Snowmobile Challenge team since the beginning, points out that Den Braven leaves some pretty big boots to fill, "I've seen Karen manage academics and the snowmobile extracurricular activity of students for 14 years and she has created one of the most cohesive groups on the campus, one that includes freshmen and graduate students with very little turnover. She understands the balance between teaching students and allowing them to fail in order for them to succeed. The team's success both in Michigan and after graduation where many students go on to work in the automotive and power sports industries is indicative of Karen's success." Cordon will be taking the reins as primary faculty advisor for the team during this year's competition and after Den Braven's departure.

Den Braven's work with engine efficiency, with over fifty publications, and her accomplishments with the Clean Snowmobile Challenge team earned her directorship of the NIATT's Center for Clean Vehicle Technology in 2005 and in 2008 she was named Director of NIATT.

Den Braven's impact on UI has been substantial. Not only has she been a mentor and advisor to hundreds of students during her career, she has been instrumental in securing over \$15 million dollars in grant awards since taking the helm of NIATT. Den Braven has managed to significantly grow UI's regional and national transportation research footprint.

As part of the regional PacTrans University Transportation Center (UTC) that includes collaborators from Oregon State University, the University of Alaska, Fairbanks, University of Washington, and Washington State University, Den Braven has led UI's research on educating teen drivers about distracted driving, the use and development of biofuels in the Northwest, and improving rural roads and designing city road systems that better incorporate vehicles, bicycles, pedestrians and other forms of transportation.

"One of Karen's invaluable qualities is that she is a great collaborator. She has worked with NIATT team members, and researchers from across the nation, to bring the U.S. Department of Transportation's highly competitive UTC program to the UI. In addition, she continues to provide excellent leadership, support to staff, and mentoring to students in a sometimes hectic and challenging environment, another example of Karen's positive effect," notes Former Director of NIATT, Michael Kyte.

Den Braven's work has brought attention to UI's distinguished transportation research and secured the leadership role of the Tier 1 UTC known as TranLIVE (Transportation for Livability by Integrating Vehicles and the Environment). TranLIVE is a national collaboration led by UI and includes researchers from Old Dominion University, Syracuse University, Texas Southern University, and Virginia Tech University, and is focused on developing technologies to reduce the environmental impact of the transportation system.

NIATT and TranLIVE colleague, civil engineering professor Ahmed Abdel-Rahim says that Karen will be sorely missed, "it has been a great pleasure working with Karen. I have definitely learned quite a bit from her wisdom, her dedication, and her guidance. As with all who have worked with her, I really appreciate her insight, her wit when things become a bit too serious, and more importantly her friendship."

Professor Abdel-Rahim's sentiments are echoed by Den Braven's own words. When asked what she most cherishes from her 27 years at UI (beyond the 2002 world champion silver belt buckle award) she says without hesitation, "the people, it has always been about the people. My role has

been to help students, to help faculty, to make other people's lives here easier. That is why I've stayed."

"It is tough to see Karen leave but given her success at the UI as professor, mentor, researcher and director. I am sure she will have equally as great an impact in South Carolina and we wish her all the best in her future endeavors," says Dean Stauffer.

Faculty at a Glance

by Heloise Abtahi

Judi Steciak, Ph.D., P.E., Professor, Mechanical Engineering



Dr. Judi Steciak has been with the University of Idaho since 1995. Prior to this, she spent a decade working on contracted research within the industry. Her interest in the Palouse region's use of agricultural residue led her to her first project with NIATT in 1998:

"One night on a flight from Boise to the main campus in Moscow, I noticed what I thought was a range fire near Lewiston. Later I learned that farmers were burning excess agricultural residue, and that this was a regular practice in northern Idaho—as well as other regions in the US and the world. I was astounded at the waste and air quality impact. Instead, renewable fuels could have been manufactured from the biomass and burned far more cleanly in an internal combustion engine."

Over the years, Dr. Steciak has also been part of a long-term and on-going collaborative effort between NIATT and SmartPlugs, a small company founded in Coeur D'Alene, to explore the "technical and entrepreneurial challenges of catalytically igniting very lean alternative fuel mixtures in retrofit commercial and research engines." She has also worked to encourage high school students (especially underrepresented demographic groups in engineering) to consider STEM careers by regularly attending science camps and career days. Her group has worked with many undergraduates, senior design teams, and MS students over the years. Dr. Steciak says that she has "always been impressed by the work ethic, ingenuity, and can-do attitude of University of Idaho students." She applauds NIATT's internships for having helped a great deal with getting undergraduate students involved in transportation-related research. Many of these interns have continued on to obtain graduate degrees from UI after working with Dr. Steciak. Dr. Steciak will be retiring in May. For additional information on Dr. Steciak you can view her profile at: <http://www.uidaho.edu/engr/me/faculty/judisteciak>.

Michael Dixon, Ph.D., P.E., Associate Professor, Civil Engineering



Dr. Michael Dixon has been with University of Idaho and NIATT since 2000. He received his B.S. and M.S. from Brigham Young University and his Ph.D. from Texas A&M University. Some of his research interests include measuring transportation system performance, traffic sensing technology, intelligent transportation systems, and transportation system modeling. Dr. Dixon played a role in reviewing and revising the 2010 Highway Capacity Manual, and is currently working on several projects, including an evaluation of the safety impacts of Idashield signs at Idaho railroad crossings and an investigation of how to improve the safety of signalized intersections during inclement weather.

Dr. Dixon has spent a great deal of time working with undergraduate and graduate students on NIATT projects. He says that one of the most rewarding aspects of this process is being able to see students' "imagination come alive with what they can do in transportation engineering." In the past, graduate students who have been heavily involved with projects have served as contributors

to final reports. Dr. Dixon always invites students to consider the practical applications of their research and to become truly involved with a project as opposed to seeing it from a distance. Dr. Dixon will be receiving a promotion to Professor with the start of the new academic year. For additional information on Dr. Dixon, you can view his profile at: <http://www.uidaho.edu/engr/ce/faculty/dixon>.

2013-14 Coral Sales/Douglas P. Daniels Scholarship Award Winners

by Rob Patton

Two University of Idaho civil engineering students and TranLIVE interns, Mitch Skiles and Riannon Heighes were each awarded a \$1,000 scholarship from the Coral Sales Company in recognition of their outstanding accomplishments and leadership in the field transportation engineering. Coral Sales supplies materials to the transportation industry throughout the Pacific Northwest.



Mitch Skiles, Senior civil engineering major, spent time as a TranLIVE intern. Mitch recently worked with U-Idaho civil engineering professor Michael Lowry to test and deploy an eco-routing mobile app in participant experiments. In essence the mobile app did two things: tracked participant movement over time, and identified the proximity of other blue tooth devices, logging any interactions with those devices and the participant over time and distance. Mitch employed computer programming experience to assist with app development and to create data visualizations. He also worked with Professor Lowry to find meaning in data collected for basic research purposes to be used in future experiments. Mitch says that the experience really helped him understand "what's useful and not useful" with data.



Riannon Heighes, Senior civil engineering major, is planning to use her education and research experience to make an impact. This past summer as part of her TranLIVE internship Riannon worked with UI professor Ahmed Abdel-Rahim to gain first-hand experience with fuel emissions research. Riannon collected over 100 miles of emissions data for Dr. Abdel-Rahim using a 5 gas analyzer plugged into the tailpipe of her 1997 Lexus ES300. Riannon is also the project lead for U-Idaho Engineers Without Borders. As part of a five year commitment, she is planning a trip to Chiwirapi, Bolivia this June to begin construction of a village water well. While there she and her team will conduct assessment for future irrigation projects.

2013 Students of the Year



Christopher "Kip" Davidson was first exposed to traffic signal systems during his senior year of pursuing a B.S. in Civil Engineering at the University of Idaho. He has been fascinated with the dynamic topic ever since.

After assisting in research efforts for NIATT during his undergraduate career, Kip felt at home in continuing his transportation engineering education as a graduate student under the supervision of Dr. Ahmed Abdel-Rahim. During this time, he had the exciting opportunity of investigating eco-friendly traffic signal timing plans for fully-actuated isolated

intersections and fixed-time arterial corridors. The outcome of this research is rewarding both on a local and global perspective. Reducing the amount of tailpipe emissions and fuel consumed as a result of traffic signal control is a substantial step in the fight against pollution and global warming.

Kip's time at NIATT has supplied him with pertinent tools, such as transportation simulation experience, and the knowledge to effectively solve real-world problems. Upon obtaining his M.S.C.E. with an emphasis in transportation engineering in December of 2013, he joined the team at Horrocks Engineers, headquartered near Salt Lake City, Utah, working on various transportation related projects.

Kip represented UI in the TranLIVE UTC Student-of-the-Year selection process. William "Andy" Edwardes from Virginia Tech was selected as the 2013 TranLIVE Student-of-the-Year.



Pactrans Director Yin Hai Wang, Andrew Hooper, and NIATT Director Karen Den Braven at CUTC Awards Banquet in Washington, D.C.

Andrew "Drew" Hooper, UI mechanical engineering graduate, was selected Student-of-the-Year for the PacTrans regional UTC, which is based at the University of Washington. He was selected as the most exceptional student studying transportation in the five northwest universities that comprise the PacTrans research group. Drew graduated Fall 2013 with a MS in Mechanical Engineering from the UI. He is now a project engineer with Polaris.

His expertise is in the area of clean and efficient direct-injected two-stroke engine development. He was instrumental in the achievements of the UI Clean Snowmobile Team in the SAE Clean Snowmobile Challenge in 2013, which won overall Third Place, and a record of 10 other trophies and awards. The UI snowmobile had the same pollution emissions as the cleanest four-stroke machines, while being equally fuel efficient and 200-

300 pounds lighter. With Polaris, Drew is now working on the next generation of clean two-stroke engines.

Drew is author or co-author on two papers that have been submitted to the Society of Automotive Engineers for publication as technical papers and presentation at the international Small Engines Technology Conference, the premier global venue for work in small engines. One of the papers received the Best Technical Paper Award at the Clean Snowmobile Challenge in 2013.

Drew also was a member of the senior design team which designed and now has a patent on a synchronous charge trapping (SCT) two-stroke engine. The SCT valve is unique in that it operates at any engine speed, and may be able to replace the heavy, bulky, large tuned pipe which is placed in the exhaust of a typical two-stroke engine. These rotary exhaust valves operate at the speed of the engine and greatly reduce emissions from the engine by improving scavenging. This saves weight and space, and reduces costs. His thesis examined the pollution emissions produced by the engine and is entitled "COMPARISON OF SYNCHRONOUS CHARGE TRAPPING AND VARIABLE EXHAUST VALVES IN A TWO-STROKE ENGINE."

During his graduate career, Drew also had an internship with Bombardier Recreational products, makers of Evinrude and Ski-Doo, and learned how to control combustion in two-stroke engines.

SAE Clean Snowmobile Challenge 2014—University of Idaho Team Takes 3rd Place

by Heloise Abtahi

The University of Idaho Clean Snowmobile team has had another exceptional year at the 2014 Society of Automotive Engineers (SAE) Clean Snowmobile Challenge, taking 3rd place overall along with “Best Design,” “Best Handling,” “Best Performance,” and “Best Ride” awards. The team also tied for top speed in the acceleration event, reaching 73 mph in just 500 feet.



Chase Smith during the competition (photo courtesy of KRC/MTU).

UI's team came away from the event in Houghton, MI with four awards in addition to placing 3rd. Additionally, they came away with the second highest emissions score in the event, a feat they accomplished using a conventional “dirty” two-stroke engine. They were able to cold-start their sled (which doesn't even have a battery) in a single pull. These significant accomplishments demonstrate the amazing skill and aptitude of this year's young team. Dan Cordon, faculty advisor for the snowmobile team, noted the particular prestige of the team winning the “Best Design” award, which is based on their SAE technical paper, their presentation and

conversations at their static display. “If you have any questions about how difficult it is to win “Best Design” at an SAE competition, I can assure you that this is a big deal.”

The “Best Handling” award also carried an extra significance to it. This award is given by a panel of judges who ride all the competition sleds and pick out the one that they believe has the best dynamic behavior. Every industry judge who rode the sled indicated that it was the only one that they would consider purchasing.

After such amazing accomplishments at the competition this year, the 2014 Clean Snowmobile team has done both NIATT and University of Idaho proud. Dr. Cordon says of their work, “I have never seen a student competition team work together (and through significant struggles) like this one.” Well done, team of 2014!

A special thank you goes out to Dr. Karen Den Braven for her many years of dedication with advising the team until retirement, Russ Porter for the countless hours he assisted the team in the machine shop, and Dr. Dan Cordon for stepping in as faculty advisor for the team this year as well as his many years mentoring the team.



The 2014 team: (from left to right) Chase Smith, Tony Keys, Trevor Lutz, Meghann Hester, Mark Woodland, Joey Gibson, Tygh Weyand, Dillon Quenzer, Alex Wright, Justin Ruehl (on snowmobile), Dillon Savage, Parker Hill, Crystal Green, Marc Compton, and Amos Bartlow (photo courtesy of KRC/MTU). Not pictured Chris Fraser.

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