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Call for Help

Even while cell phone technology was still in its infancy, when the earliest handheld units were as large and clunky as World War II-era walkie talkies, researchers suspected this development might spell trouble behind the wheel. Some of the pioneering work in this field was conducted in the 1990s by Dr. Donald Redelmeier, a senior scientist with Toronto's Sunnybrook Health Sciences Centre.

He surveyed 699 drivers and tracked more than 26,000 calls they made on cell phones while driving over a 14-month period, then correlated this information with accidents to arrive at an assessment for the risk of collisions. His findings, published in the *New England Journal of Medicine* in 1997, offered the sobering conclusion that this risk quadruples when drivers were calling on the road.

Dr. Mark Asbridge, an associate professor at Dalhousie University's department of community health and epidemiology, displays a tinge of envy over the methods this research employed. Using the cell phone numbers of study participants, Redelmeier was able to obtain the call records and the details of which calls were made on the road. Such records are now much more strictly guarded by wireless service companies, which would make it all but impossible to conduct a similar project now.

Nevertheless, Dr. Asbridge is interested in knowing how the risk of collision has evolved with the dramatic proliferation of cell phones over the intervening 20 years. Deprived of the rich resource of phone records, he and his colleagues turned to insurance statistics on how many accidents take place while a cell phone is being used. Drawing on data from the Insurance Corporation of British Columbia Traffic Accident System, he was able to compare 312 crashes where drivers were identified as using a phone with 936 similar crashes where no phone was mentioned.

The results, which appeared last year in the International Journal of Epidemiology, concluded that that drivers were 70 per cent more likely to be culpable of causing a crash when they used a cell phone. The work, which is part of AUTO21's *Convergent Evidence from Naturalistic, Simulation and Epidemiological Data (CENSED)* Network, points to some of the key features associated with driver distraction.

"One of the things that came out of our data was that cell phone distraction appeared to be age-related," Dr. Asbridge said. "Risk for drivers was higher for older drivers using a cell phone than for younger drivers. One of the arguments is that we're getting into a transitional generation of drivers, with those who grew up using handhelds being savvy users."

Such observations are backed up by CENSED's experimental investigations, which are being led by Dr. Jeff Caird at the University of Calgary, where individuals are studied under simulated conditions. However, learning more about how drivers handle phones under "naturalistic", real-world conditions poses a significant research challenge.

"Our data can't really give us a prevalence of this behaviour," he explains, noting that the role of a cell phone can be easily omitted in accident reports, especially if drivers deny they were using one. "If the police don't see a cell phone around or the person doesn't mention it, they won't bother."

"One of the arguments is that we're getting into a transitional generation of drivers, with those who grew up using handhelds being savvy users."

Dr. Asbridge adds that it might be possible to correlate traffic camera images of drivers using phones with subsequent accidents, or perhaps even come up with a way of collecting anonymized data from phones in use on the road. He emphasizes the importance of seeking as much information as possible, since the ultimate goal is to establish a fundamental cultural shift in attitude toward cell phone use amongst drivers.

"What makes it more interesting now is that we have policies," he explains. "There were no policies around cell phone use when Redelmeier was studying it and now there are a number of provinces that have bans. We need to move along much further in the research if you ever want to justify something from a policy standpoint."

Cover Photo: Dr. Manjusri Misra, an associate professor at the University of Guelph, contributes to AUTO21's Hybrid Biocomposites for Automotive Applications project.



Helping Canada Grow its Bio-economy

Today's automobiles have an average of 400 pounds of plastic on board. Plastics improve fuel economy by reducing weight, but are made from petroleum, a non-renewable fossil fuel.

"At least 100 pounds of that can easily be replaced by bio-based material, especially in interior parts of the car," said Dr. Amar Mohanty, the Premier's Research Chair of Biomaterials and Transportation and director of the Bioproducts Discovery and Development Centre (BDDC) in Guelph.

biomass into include console boxes, parcel trays, visors, glove boxes, door trimming and handles.

"Currently, there are bio-based products in some car parts, but they are not widely used," Dr. Mohanty said. "Current technology is motivating auto companies to make these materials more prominent and they are moving in a very dynamic way to include these eco-friendly materials into their auto parts using mostly natural fibre composites."

Approximately two acres of value-added output of perennial grasses can produce 40,000 pounds of automotive application based biomaterial.

Dr. Mohanty leads a team of AUTO21 researchers, which has successfully run trials to substitute a percentage of petroleum-based materials with bio-based hybrid composites in automotive interior parts. Not only does the eco-friendly, bio-based material reduce greenhouse gas emissions, its less dense structure can make vehicles lighter.

In the past five years, Dr. Mohanty said they've increased bio-based content in automotive parts up to 34 per cent and shed five per cent in weight while maintaining material integrity and performance at a competitive cost. The leap in percentage of biomass was achieved by using perennial grasses and biocarbon. Some of the items researchers have successfully introduced

AUTO21 research has led to three patent-pending biocomposite technologies for injection moulding, including simultaneously improving both heat resistance and impact strength of polylactic acid, a bio-plastic obtained from renewable sources that was previously not viable for vehicle use due to its brittleness and weak heat resistance. However, Dr. Mohanty said the main challenge for researchers does not lie only on price-performance of materials.

"One of the most significant challenges is supply chain," he said. "We as the researchers could possibly make a competitive formulation that meets performance criteria — but the question is, is there a supply chain of millions and millions of pounds of biomass?"

Dr. Manjusri Misra, an associate professor at the University of Guelph and BDDC researcher, said approximately 2,000 acres of Ontario land currently grows perennial grasses.

"One acre can produce five to 10 tonnes of perennial grass," she said.

Approximately two acres of value-added output of perennial grasses can produce 40,000 pounds of automotive application based biomaterial. This is sufficient to make enough car parts for around 400 cars — assuming 100 pounds of biomaterials is being substituted per car, Dr. Misra added. BDDC researchers mostly rely on non-food resourced bio-based materials and often use agriculture residues, which are leftover materials — wheat straw, soy stalk, soy hull, etc. — after a crop has been harvested. Once a vehicle reaches the end of its life cycle, the bio-based materials could potentially be recycled.

The automotive sector is one of the major sectors driving the demand for bio-based materials to meet sustainability challenges. In addition to reducing the use of petro-based materials, bio-based materials can provide a new revenue stream to farmers, extend the value chain of crops and create jobs.

"The automotive industry is always keen in becoming more environmentally focused and utilizing more eco-friendly materials, but companies do not want to pay more money," Dr. Mohanty said. "Automotive parts must be the same weight or lighter, cost competitive and greener while maintaining or improving performance. That's what these bio-based materials can offer."

Dr. Mohanty and Dr. Misra contribute to AUTO21's *Hybrid Biocomposites for Automotive Applications* project with industry partners Volkswagen and Competitive Green Technologies.

Left: Dr. Manjusri Misra, an associate professor at the University of Guelph, contributes to AUTO21's Hybrid Biocomposites for Automotive Applications project.

AUTO21 Initiative Wins National Innovation Award

A partnership between AUTO21 researchers and the City of Waterloo that has reduced vehicle emissions has been recognized with a national award for innovation. The City of Waterloo was presented with a Canadian Association of Municipal Administrators (CAMA) award in recognition of an eco-drive initiative that reduced carbon offsets from fleet vehicles. The 2014 CAMA Willis Award for Innovation was presented May 28, 2014 at the CAMA Annual Conference in Niagara Falls, Ont.

In July 2012, the City of Waterloo joined the AUTO21 *Eco-Drive Training Project*, which is led by Dr. Andrew Jardine, a professor at the University of Toronto. Dr. Jardine and researchers from the University of Toronto helped Waterloo fleet drivers implement eco-friendly driving techniques through classroom training and simulators. This included various techniques, such as managing acceleration and reducing the need to make frequent stops. The ultimate goal for this project is to reduce fuel and carbon emissions from fleet vehicles by 10 to 20 per cent. With carbon concentrations being higher than ever, the need for reduced vehicle emissions is becoming increasingly important.

"This success will raise awareness about fuel-efficient driving behaviour and encourage other municipalities to train their fleet drivers in eco-driving,"

"This success will raise awareness about fuel-efficient driving behaviour and encourage other municipalities to train their fleet drivers in eco-driving," said Dr. Jardine. "We look forward to successful knowledge transfer of our eco-driving project success to other organizations, such as trucking fleets and mobile mining equipment — not just municipalities."

Dr. Jardine said the majority of participants found the driver training sessions interesting and told him they would implement the techniques not only in their city-owned truck, but also in their own vehicles.

"I think that is a very nice outcome," he said.

The Canadian Association of Municipal Administrators awards are given out annually to municipalities across Canada. The CAMA Willis Award for Innovation is given to municipalities in recognition of innovative initiatives, programs, services and projects they have taken on.

Co-investigator Dr. Birsen Donmez and researchers Dr. Winnie Chen and Dr. Turuna Seecharan contribute to the Eco-drive Project.

"I am very fortunate to have been able to collaborate with a group of researchers who had a passion for real-world research and subsequently, to see the recognition received through our collaboration with the City of Waterloo," said Dr. Jardine.



(L-R) Glen Davies, 2014 CAMA Awards of Excellence chair and city manager, City of Regina, Bruce Malcolm, president of Ravenhill Group Inc., Cameron Rapp, commissioner/deputy CAO, City of Waterloo, Keshwer Patel, commissioner, CFO and treasurer, City of Waterloo, Karen Moyer, fleet manager, City of Waterloo, Sunda Siva, director of facilities and fleet, City of Waterloo, Professor Andrew Jardine, University of Toronto and Jean Savard, CAMA president.

Open House Welcomes Industry

Connections between academia and industry were forged during the second annual Industry Open House, hosted by McMaster University.

The school opened its doors to industry March 26, 2014, giving attendees a chance to peek at tooling development and process optimization research. Projects being conducted in the materials and manufacturing research labs, the McMaster Automotive Resource Centre and CANMET Materials were on display, including research by AUTO21 researcher Dr. Stephen Veldhuis.

Dr. Veldhuis is working on an advanced tribology project, which oversees the interaction between manufacturing tools and work pieces. The research being conducted examines how a tool interacts with work piece material. AUTO21 researchers are trying to maximize the life of the tool and increase the productivity and quality of the production.

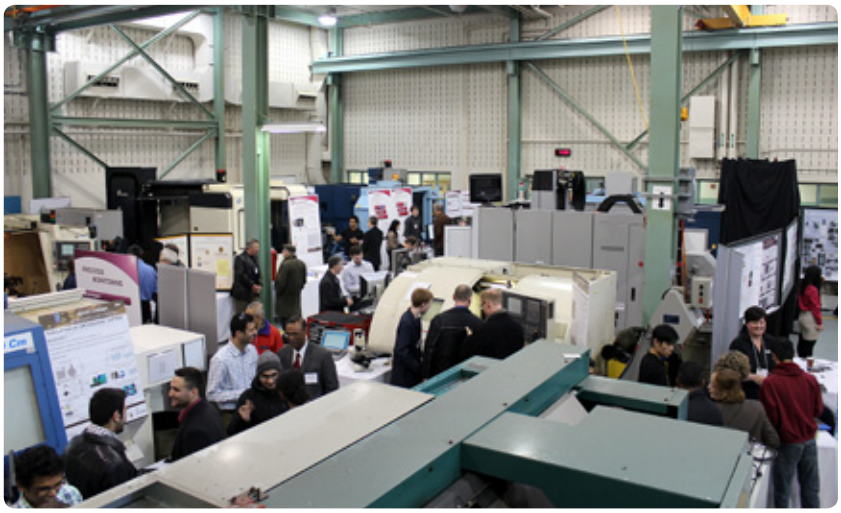
Veldhuis, the event organizer, said the open house provides researchers a great opportunity to highlight project results and provides industry members with an opportunity to see the projects being conducted by researchers and students at McMaster.

Many automotive and aerospace company representatives from small and medium enterprises, as well as large market organizations took part in the one-day event.

"We typically get people from original equipment manufacturers, auto parts suppliers and some of the smaller to medium-sized enterprises as well," said Dr. Veldhuis. "The event is really about giving the companies we work with an opportunity to see our facility. There are always new contacts that are made and we're following up and linking to other projects now."



Mohammed Tauhiduzzaman (left) talks with Alex Yip (centre) and Rahman Mizanur (right) at the McMaster Industry Open House.



Machining System Lab at the McMaster Manufacturing Research Institute.



AUTO21 Recognized for 14 years of Success

The AUTO21 Network was recognized for its 14-year contribution to improving the safety and sustainability of automobiles. AUTO21 scientific director and CEO Dr. Peter Frise received a certificate from Dr. Alain Beaudet, president of the Canadian Institutes of Health Research, at the Networks of Centres of Excellence (NCE) Annual Best Practices meeting in Ottawa on April 23, 2014. Two other NCEs with terms coming to a close in 2015 were also recognized: the Canadian Water Network and the Stem Cell Network.

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Students Showcase Canadian Automotive Research Success

Automakers increasingly rely on innovations to help meet stringent fuel standards, decrease vehicle weight and increase vehicle connectivity. Canadian university graduate students with the AUTO21 Network of Centres of Excellence are helping automakers achieve these goals and enhancing the automotive community through automotive research and development.

A University of Guelph team was nationally recognized May 28 at the 2014 AUTO21 Conference in Niagara Falls, Ont. for its research on hybrid bio-based composite materials and its use in automotive interior parts. The team was awarded first place in the AUTO21 Highly Qualified People (HQP) Poster Competition, taking home a $4,500 prize.

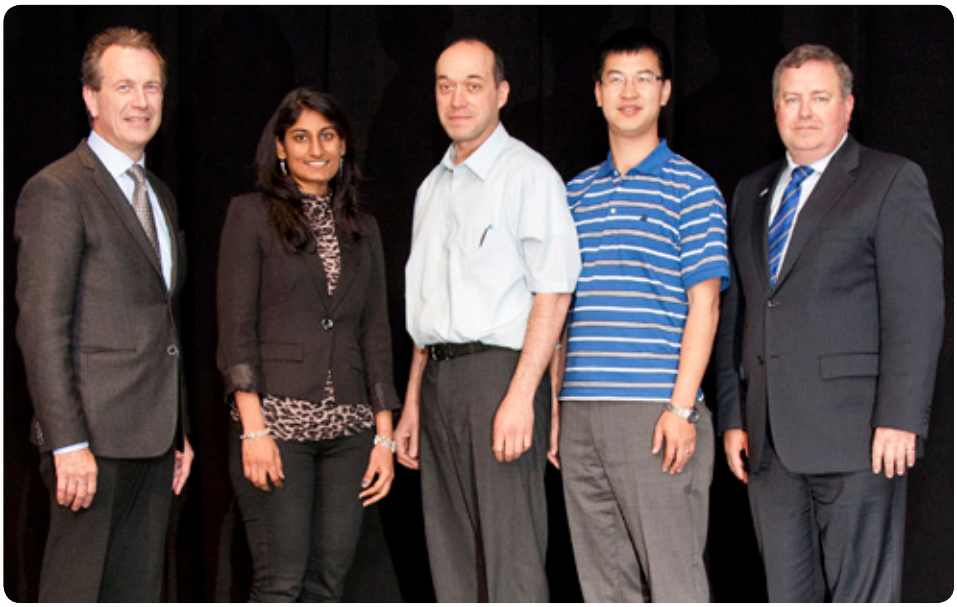
The trio of graduate students also claimed first place in the AUTO21-Stackpole International HQP Video Competition for creating a three-minute video that shows how their research benefits Canada.

"The automotive industry benefits from bio-based materials by being able to reduce weight and use renewable resource based materials rather than petroleum based materials," said Vidhya Nagarajan, a member of the first place team. "It also adds value to locally grown biomass by incorporating biomaterials into automotive parts, which are produced at a high volume."

The University of Guelph team contributes to the *Hybrid Biocomposites for Automotive Applications project*, which is led by Dr. Amar Mohanty, University of Guelph, and Dr. Mohini Sain, University of Toronto. Team members include Kunyu Zhang, Nagarajan and Arturo Rodriguez-Uribe.

"To compete in the global marketplace, Canada needs to develop products in addition to manufacturing," said Dr. Peter Frise, AUTO21 scientific director and CEO. "It's extremely important that graduate student ideas are deployed and become useful in the world. I think it's really an essential part of development of the country because they are the future of a critical sector in the Canadian economy."

The competition offers HQP a chance to showcase their research success and is open to students within the AUTO21 Network of Centres of Excellence program. Nearly 50 teams presented leading-edge technologies in this year's event. The annual HQP Poster Competition boasts a total prize purse of approximately $15,000. Judges include senior industry, government and R&D experts.



(L-R) Rick Legate, chair of the AUTO21 board of directors, Vidhya Nagarajan, Dr. Arturo Rodriguez-Uribe, Dr. Kunyu Zhang and Peter Frise, AUTO21 scientific director and CEO, are photographed at the 2014 AUTO21 Annual Conference in Niagara Falls.