Auto INNOVATIONS
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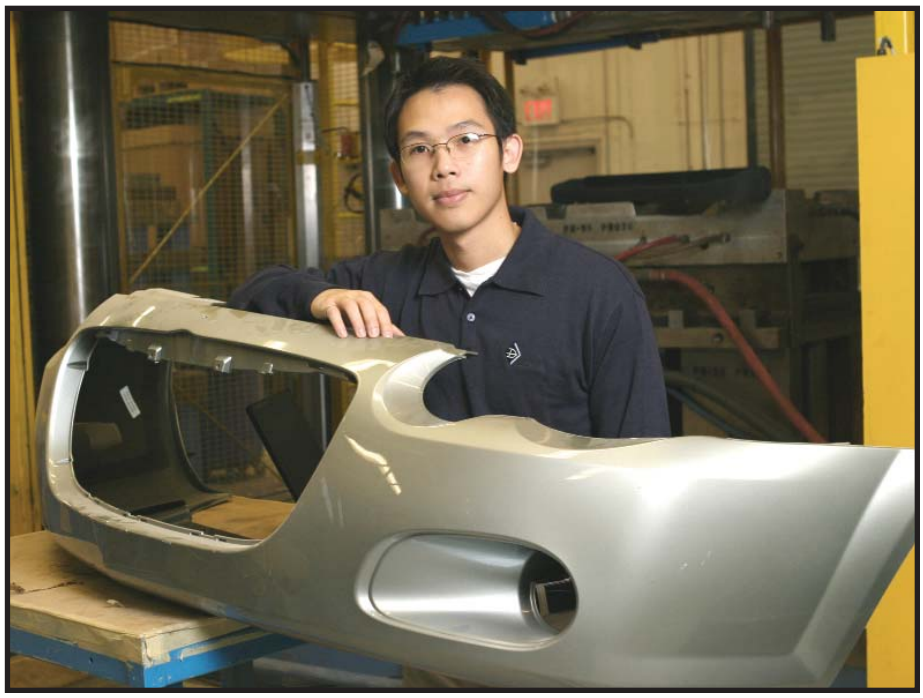
Research rubs young engineer the right way

Some of the hardest working parts on a vehicle are also the hardest to make. Components such as air-intake manifolds have unusual shapes and hollow interiors, making them expensive to cast as single pieces. And casting them in sections poses another challenge, namely how to join those sections to one another as securely as possible.

Jeff Mah knows how. Now working in product and process development with auto parts manufacturer Decoma International in Concord, Ontario, he has spent several years exploring the potential of vibration welding. This technique brings two pieces together under pressure and vibrates them quickly enough to reach the melting point of the material.



Jeff Mah is using the skills he developed as a student researcher with the AUTO21 Network in his current role at Decoma International.

As significant as such contributions might be, he is equally pleased with the opportunity to put into practice some of the ideas that fascinated him as a student.

"The methodology is very simple and fast," he says. "It's over within five to 10 seconds"

Mah's investigation of vibration welding was an integral part of his Master's degree research with AUTO21 researcher Dr. Phil Bates, a professor cross-appointed between Queen's University and the Royal Military College. As a researcher on the *Polymer Composites* project, AUTO21 funds this work, which is also supported by Siemens VDO and DuPont Canada.

By correlating the performance of finished parts that had been welded in this way with the laboratory results based on the welding of much simpler plaques made of the same material, Mah and Dr. Bates demonstrated a much simpler and cost-effective way of testing new composite materials.

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Pondering Public Policy

Automobile manufacturing represents the centrepiece of Canada's industrial economy, so dominant that it is tempting to think of it as inevitable. Dr. Dimitry Anastakis knows better.

Photo courtesy of Trent University

Dr. Dimitry Anastakis took part in the AUTO21 Network as a student researcher. He is now an assistant professor at Trent University.

"Canadians take it for granted that we have an immense auto industry, and it's important to recognize that it's been here for a long time because we've made public policy moves to ensure that it stays," he says.

Dr. Anastakis, an assistant professor in Trent University's Department of History and a member of the Frost Centre for Canadian Studies, stresses that he is among a handful of people studying public policy and the auto industry, which includes complex trade regimes such as the Canada-U.S. Auto Pact and the North American Free Trade Agreement. His interest in the subject blossomed as he was pursuing his doctorate at York University, where he wrote a thesis on the evolution of the Auto Pact in the decades after World War II.

"Canadians take it for granted that we have an immense auto industry, and it's important to recognize that it's been here for a long time because we've made public policy moves to ensure that it stays," he says.

Soon after completing his Ph.D., he began working for the automotive section of Ontario's Ministry of Economic Development and Trade. He then discovered a post-doctoral position sponsored by AUTO21 that allowed him to work directly with Dr. Maureen Molot, another keen observer of how Canada's auto industry has been nurtured and sustained. Dr. Molot leads the AUTO21 project *Public Policy and the Automobile in Canada*, and is a member of Carleton University's Paterson School of Business.

"There should be more people doing this," says Dr. Anastakis, noting the widespread interest in automobile design and use. "It's really important to frame and provide context for public policy issues and debates."

He adds that the industry has changed dramatically over the course of its history. Although a great deal of public attention remains focused on traditional assembly line manufacture, even more activity has been spread across an increasingly complex network of supply chains, making it all the more important for policymakers to understand the needs of these diversified enterprises.

Through his position with Dr. Molot's research team, Dr. Anastakis was able to contribute to AUTO21 as a student researcher, who are also known as highly qualified people (HQP). Above all, he praises AUTO21 for providing him and others with an opportunity to explore this subject in some depth. Other countries seeking to foster their own expertise in automotive technology have established similar research networks, notes Dr. Anastakis, but only Canada's has included activities around a social science theme.

"It's not just about building a better car and building a better car industry, it's about the car industry in our society," he says. "It reflects a particularly Canadian view toward the auto industry."■

Dr. Anastakis praises AUTO21 for providing him and others with an opportunity to explore this subject in some depth. That includes a grant that helped with his book, ***Auto Pact: Creating a Borderless North American Auto Industry, 1960-1971,*** to be published by the University of Toronto Press in 2005.

From the *Program Leader*

Dr. Peter Frise

What could be a better way to start 2005 than to look at some of the successes of graduated AUTO21 student researchers, or highly qualified people (HQP)? This issue of Auto Innovations focuses on three former student researchers from the themes, Health Safety and Injury Prevention, Societal Issues and the Automobile and Materials and Manufacturing. While all work in different areas of the automotive sector, each is using the skills developed through AUTO21 to further their careers and benefit their employers. We'll continue to showcase HQP in future newsletters as well.

Electronic components and systems comprise approximately 15 per cent of vehicle cost. That percentage is expected to more than double over the next decade as consumers and regulators demand more advanced performance in safety, engine and chassis management than traditional mechanical systems can offer.

Canada holds a wealth of expertise in electronics and information technologies and is well poised to take advantage of this growing area. AUTO21 researchers in the Intelligent Systems and Sensors theme are exploring how to integrate leading-edge electronic components into vehicle design. In October 2004, several AUTO21 researchers and representatives attended the Convergence conference in Detroit, Michigan, a biennial event organized by the Society of Automotive Engineers. Convergence is an excellent opportunity to learn more about the current and future trends, products and services in automotive electronics and information technology systems.

In partnership with the Canadian Consulate General in Detroit, AUTO21 hosted a networking dinner for the researchers and automotive industry research and development executives. The evening was well attended and will help to foster future collaborations between Canada's electrical and information technology researchers and the auto sector.

As part of its federal funding process, AUTO21 recently underwent a thorough scientific review by a panel of international experts. We appreciate the hard work of those involved with the rigorous scientific review process. AUTO21 is pleased to fund the most innovative automotive research in Canada, and also to provide a national forum for academic researchers and the automotive sector to partner in this work.

To advance this important research, AUTO21 will announce the funding of additional projects in March 2005. These projects result from the 2004 call for proposals. Visit www.auto21.ca for information at that time. ■

Peter R. Frise

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Mah presented a paper on their findings at a Society of Automotive Engineers conference, which subsequently came to the attention of a manager at Decoma, who eventually hired him in 2002.

"I'm involved with plastics joining at Decoma and I can draw a lot from what I learned during my Master's degree with AUTO21's help," says Mah. And he continues to stay in touch with Dr. Bates, already having completed one industrial project with him involving vibration welding. Mah now is involved with two more projects with Dr. Bates, one of which will aim to involve AUTO21 and Decoma as an industrial partner.

Mah's graduate experience likewise helped to move him quickly through the hierarchy of skills in Decoma's Sigma Six manufacturing quality program. He recently acquired a Black Belt, the stage at which Six Sigma expertise begins to nurture improvements that can save companies hundreds of thousands of dollars a year.

As significant as such contributions might be, he is equally pleased with the opportunity to put into practice some of the ideas that fascinated him as a student.

"We're at the forefront of technology, where you get exposed to the latest new developments in plastics technology, " he says. "It's a great learning environment and fosters innovative thinking." ■

Network News

AUTO21 Fuel Cell Research Gets Boost

Dr. Brant Peppley, leader of the AUTO21 project *Reformer Technology for Fuel Cells,* was recently appointed the Associate NSERC Industrial Research Chair in Fuel Processing for Fuel Cells at the Royal Military College. This program is supported by NSERC with an annual contribution of $200,000 plus additional funding from the Hydrogenics Corporation and Fuel Cell Technologies Ltd. A small-scale diesel reformer has been built and tested at Royal Military College for remote power applications, and will contribute to Dr. Peppley's AUTO21 fuel processing investigations.


Dr. Brant Peppley

Dr. Peppley was also the recent reci_pient of a $4.2 million CFI/OIT infrastructure grant for fuel cell research. The project is a multi-institutional program involving Royal Military College, Queen's University, Waterloo University and several AUTO21 researchers located at those institutions. Approximately $1.2 million will be used by Royal Military College to purchase specialized test equipment for studying chemical reactions and catalytic processes that occur during fuel processing, which will benefit the AUTO21 work conducted by Dr. Peppley. Other equipment will assist the work of fellow AUTO21 researchers **Dr. Phil Bates** of Royal Military College, and **Dr. Boyd Davis**, AUTO21 project leader for *Chemical Hydrogen Storage Process Development,* and **Dr. Patrick Oosthuizen** of Queen's University. A portion of the grant will be used to purchase fuel cell research equipment for **Dr. Xianguo Li** of the University of Waterloo, who leads the AUTO21 project *PEM Fuel Cells and Related Technologies.*


Dr. Ibrahim Dincer

Another AUTO21 researcher contribu_ting to the *PEM Fuel Cells and Related Technologies* project was recently awarded one of Ontario's highest research honours, the Premier's Research Excellence Award for his efforts to improve fuel cell vehicles. **Dr. Ibrahim Dincer**, a professor at the University of Ontario Institute of Technology, will receive $100,000 in research funding from the province of Ontario plus $50,000 in matching funds from the university. The award was developed in 1988 to promote innovation and to help Ontario's best researchers attract graduate students, post-doctoral fellows and research associates to their research teams.

Forging Links with the Japanese Automotive Research Institute

Several AUTO21 researchers visited the Japanese Automotive Research Institute (JARI) in Tokyo last November. The group included **Dr. Peter Frise**, AUTO21 program leader and CEO, **Dr. Denis Gingras** of Université de Sherbrooke, coordinator of the *Intelligent Systems and Sensors* theme, **Dr. Anne Snowdon** of the University of Windsor, project leader of *Vehicle Safety for Vulnerable Populations* and coordinator of the *Health, Safety and Injury Prevention* theme, **Dr. Jan Miller Polgar** of the University of Western Ontario, project leader of *Vehicle Safety for Vulnerable Populations* and *Safe Transportation for Seniors*, **Dr. Michel Bédard** of Lakehead University, project leader of *Safe Transportation for Seniors*, **Dr. Paul Hagler** of the University of Alberta and researcher on the *Safe Transportation for Seniors* project.

While in Japan, the group met with academic, government and industry representatives to find ways of making vehicle safety materials developed for Canadian children and parents applicable to another culture, and other potential collaborations.

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AUTO21 and partners support the Networks of Centres of Excellence of Canada program

The AUTO21 Network of Centres of Excellence participated in a magazine supplement promoting the NCE program. The eight-page supplement appeared in the *"Leaders and Dreamers"* commemorative issue of Maclean's magazine, which was available on newsstands until January 17, 2005. The supplement featured nine NCEs from across Canada.

The AUTO21 advertisement was made possible with support from DaimlerChrysler Canada, Ford Motor Company of Canada, General Motors of Canada, Honda Canada, Toyota Motor Manufacturing Inc. and the University of Windsor.

A French version of the eight-page supplement appeared in the November 1, 2004 issue of L'Actualité magazine.

HQP Represent Network at Annual General Meeting

In December, several Ottawa-area HQP who contribute to AUTO21 projects represented the Network at the Networks of Centres of Excellence of Canada Annual General Meeting. The student researchers joined other student researchers from the 20 NCEs across Canada for a breakfast and session titled *"Innovative Knowledge Transfer Approaches – Meeting of the NCE Students with Young Innovators."*

The NCE AGM also provided an opportunity to share information on the different Networks to Members of Parliament at a breakfast on Parliament Hill. ■

Getting Back to Basics – Helping Autoworkers Stay Healthy on the Line

The people who eventually build the 2006 editions of the Cadillac de Ville and Buick LeSabre may never meet her, but they can thank Christa Lauder if they find their day-to-day activities a little easier on the back.

As a student researcher, Christa Lauder contributed to the *Industrial Health and Safety in the Auto Industry* project. Since graduation, she has worked for General Motors Corporation applying the skills she learned through AUTO21.

"I make sure that the design is good for the operator to install," says Lauder, a Future Program Ergonomist at the General Motors Vehicle Engineering Center in Warren, Michigan. She acknowledges that many of those operators may not even know that she exists, but her efforts will nevertheless contribute to making the lifting, lugging, and loading associated with vehicle assembly as efficient and painless as possible.

The field is a familiar one for her, since it mirrors research she conducted as part of her Master's degree in Human Performance at the University of Windsor. Her thesis advisor was AUTO21 researcher Dr. David Andrews, a member of the university's Faculty of Human Kinetics and part of the AUTO21 team dedicated to industrial health and safety in the automotive industry.

When Lauder met Dr. Andrews, he had already spent several years considering the kind of dynamic loading that was being placed on the spines of individuals who work in various branches of automobile manufacture.

After closely examining how such individuals operated in various workplace situations, he began developing precise models to assess this loading, and what might be done to reduce it. He and Lauder then turned their attention to a much broader assessment of how the spine might be affected by all aspects of an individual's lifestyle.

"You do spinal loading all day, not just at work," says Lauder, who based her thesis on information gathered by monitoring people as they went about their business at home. Following them around with a video camera and even wiring them up with electrodes, she was then able to compare people's non-working behaviour with established occupational health and safety guidelines.

"We got a really good idea of what people do, then we went to quantify the loading on the spine," she says, describing how she was able to take advantage of the detailed model created by Dr. Andrews.

She adds that working within AUTO21 provided an unrivaled opportunity to meet other researchers with an interest in the highly specialized area of automobile manufacturing ergonomics. Now, after almost two years of working in one of the world's leading research centres for all aspects of vehicle design and construction, she is beginning to see even more possibilities for her skills.

"I had a lot to learn at first, and I'm still learning, but now that I'm getting a little more comfortable with the process, you start to see where you might be able to branch out." ■

AUTO21 Increases Presence at SAE 2005 World Congress

In April 2005, more than 35,000 people will travel from around the world to attend the Society of Automotive Engineers World Congress in Detroit, Michigan. For the fourth year in a row, AUTO21 will have a presence on the exhibit floor within the Canadian Pavilion and in the technical paper sessions.

With each passing year, AUTO21's participation at Congress has increased. In its first year, AUTO21 was represented by administrative centre staff and two researchers. In 2004, a dozen AUTO21 researchers presented technical papers and shared their knowledge at the Network's booth. A delegation of more than 60 AUTO21 researchers and student researchers attended to learn more about recent advances in all aspects of automotive engineering and related issues.

For the 2005 Congress, more than 30 technical papers focusing on AUTO21's innovative research will be presented by researchers from all six of the Network's research themes. We expect the Network delegation attending the event to rival last year's numbers. To help its researchers and students attend this key automotive event, AUTO21 is offering travel assistance.

"The SAE World Congress provides an opportunity for AUTO21 to share its research expertise with international automotive representatives and allows AUTO21 delegates to learn more about all aspects of the auto sector and to ensure the Network's research agenda is current," said Dr. Peter Frise, AUTO21 program leader and CEO. "We are excited to attend the 2005 World Congress and look forward to being part of the Canadian Pavilion hosted by the Canadian Consulate General in partnership with Industry Canada. It's a great venue to showcase the important automotive research conducted in Canada to the rest of the world."

The World Congress will take place from April 11th to 14th. For more information, visit www.sae.org. ■

Several AUTO21 researchers shared their knowledge at the Network booth at the 2004 World Congress, including Dr. Francois Michaud, leader of the *Collaborative Driving Systems* project and Dr. Murray Thomson, a researcher on the *Combustion Systems for Alternative Fuels* and *Lean Burn Combustion for Reducing Emissions* projects.

AUTO21 2005 Scientific Conference

Mark Your Calendars

June 20-22, 2005
Sheraton Centre Toronto

AUTO21 is pleased to announce the date and location of its 2005 Scientific Conference. Join researchers, government and industry representatives for research updates, industry speakers, panel presentations, poster competitions and networking opportunities.

Check **www.auto21.ca** for registration and program information.

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