

Auto

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Cars on the Brain:

Dr. Dave Checkel

Growing up in rural Alberta, Dave Checkel recalls getting along better with the local machinery than the local animals. "I'm the classic farm kid who liked vehicles," he says.

Nor is he especially fussy about what kind of vehicles he likes. Look in his back yard and you can see a van that hauls the trailer for his go-karts, along with the equipment used to service them at various tracks. You will also find a venerable Chevette, which pulls double duty as a rally racer in the summer and an ice racer in the winter. And from day to day you will find him driving an equally venerable Fiat X1/9, kept alive and well by a mechanic who races Alfa Romeos and for whom Dr. Checkel often crews.

As a member of AUTO21 and a professor at the University of Alberta, this love affair with vehicles now extends to their most sophisticated inner workings. Dr. Checkel is heading up a project on electronic controls for advanced powertrain technologies, which promise to provide internal combustion engines with greater power, better fuel efficiency, and lower exhaust emissions. More specifically, he and his colleagues are exploring innovations to enable variable valve timing (VVT) and homogeneous charge compression ignition (HCCI).

VVT poses a major research challenge, one that even a heavyweight manufacturer like Mercedes finds difficult to manage. The goal is to replace entirely



In addition to leading the *Electronic Controls for VVT and HCCI Combustion* project, Dr. Dave Checkel of the University of Alberta is also an avid go-kart racer.

the existing cam shaft operating mechanisms for engine valves with a solenoid driven system. Several advantages would then be possible.

"You can have a Miller cycle or an Atkinson cycle at any time," says Dr. Checkel, referring to combustion strokes that leave intake valves open even while the piston is rising, reducing the volume of charge to be compressed without restrictive intake throttling.

"You can run a really high expansion ratio engine, and just keep adjusting

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Board of Directors Member Profile

Anne Cool



Anne Cool

My first goal was to learn. I think it's important that time spent as a board member benefits both the organization and also the individual.

Like a true corporation, the AUTO21 Board of Directors consists of professionals from all areas of the automotive industry. Anne Cool, Vice-President of Human Resources for Algonquin Automotive has been a Board member since AUTO21's inception in 2001. She has lent her strong human resources skills to ensure the Network is current with people management trends. At the 2004 annual general meeting in June, Anne will finish her three-year term.

What is your impression of AUTO21's growth?

In the beginning, the Board focused its efforts on what was thought to be a seven-year project. This view has changed to one with a longer term and a very exciting future. The direction of the Network reflects AUTO21's maturity into an organization that is making a difference for Canada's automotive sector. We've become more focused on what is possible and realistic, and moved away from ideas that don't support its growth

or ability to help the auto industry. We focus on how we can best influence the automobile in the twenty-first century.

Did you set goals or objectives for your time on the Board?

My first goal was to learn. I think it's important that time spent as a board member benefits both the organization and also the individual. Being on the AUTO21 board provided me with an opportunity to learn more about the auto industry. Board meetings include research presentations and also tours of various facilities, both of which were great learning opportunities.

As a human resources professional, it was also important for me to provide input as required on board recruitment, and any people issues within the Network.

How do you see AUTO21 influencing Canada's auto sector?

AUTO21 is having a tremendous impact. The original ideas of the Network are happening: synergies are being recognized and developed between different areas of research. Mechanical people are working with health and safety people. Different thought processes are occurring amongst the researchers, which leads to innovation.

Industry is also aware of AUTO21's influence on skilled workforces. Students are excited about the research projects and future work in the auto industry. It's exciting and diversified, and it's happening here in Canada, not just in the United States, Europe or Asia. AUTO21 is having a direct effect on campuses across the country and this will make an impact on the industry's ability to hire the best and brightest grads for future work. ■



From the *Program Leader*

Dr. Peter Frise

The theme of this year's scientific conference is "On the Road to Commercialization," and it couldn't be more fitting. The hard work of AUTO21 researchers is paying off and projects are delivering innovative results.

Since research began in the fall of 2001, AUTO21 has filed seven patents, and one has been issued. In addition, three non-disclosure agreements have been signed, one copyright application is in progress, and many more disclosures have been filed.

Many of these innovations will be discussed in research presentations at the scientific conference. AUTO21 presenters will share the latest research on materials and manufacturing; health, safety and injury prevention; powertrains, fuels and emissions; societal issues and the automobile; design processes; and intelligent systems and sensors.

Industry speakers will also provide an update on the state of the automotive sector - an ever-changing global giant. In addition to **Ray Tanguay**, president of Toyota Motor Manufacturing Canada, and **Michael Robinson**, director of design for Centro Stile Fiat, other confirmed speakers include **Denton Dance**, director of emerging markets for J.D. Power and Associates, and a member of the **Volvo design team for "Your Concept Car,"** the unique outcome of a predominantly female design team seeking to integrate the perspectives of female drivers.

The final judging and awards ceremony for the HQP Poster Competition will be held at the opening banquet of the scientific conference on June 15th. The four finalists were selected following the initial judging at the HQP Conference held in Windsor, Ontario at the beginning of May. These four student research teams are competing for a prize purse of \$9,500. We appreciate the assistance of DaimlerChrysler Canada, the sponsor of the HQP Competition.

We hope you will join us at this year's scientific conference in Montreal from June 15 to 17. To register online, visit www.auto21.ca before June 11th, or register in person on June 15th at Le Centre Sheraton in Montreal. ■

Cars on the Brain:

Dr. Dave Checkel

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the compression ratio by when you close the intake valve," he adds, noting that the ultimate goal is HCCI, which would maximize the efficiency and emissions of the entire process. "Our aim is to achieve the most responsive engine you've ever had with the best fuel economy and capable of running on low-grade fuel."

But first you have to make it work. Dr. Bob Koch, another member of the university's mechanical engineering department and the AUTO21 team, knows how difficult that can be. He came directly from Mercedes, where he had been working on the same technology. Dr. Checkel refers to him as the "guru of valve control," whose talent and experience are equal to the task of getting this vital piece of hardware to perform in a sustainable fashion.

"You want the valves to open very quickly, but then soft land every time, for millions and millions of cycles over their lifetime," says Dr. Checkel.

Nor is he put off by the knowledge that Mercedes has not proceeded with this technology. Having recently helped a team of engineering students construct a hybrid power train for the international FutureTruck competition, this former farm kid knows what you can do with the right electronics on-board and the right people to make it work. This team was the only Canadian one in the 15-team, five-year competition.

"Our truck has six computers in all: engine control, transmission control, chassis control, and then three executive computers to control the entire vehicle, to run data acquisition for the driver, and another one to run a wireless Internet connection," he says. "And a bunch of undergrad students were able to put all that together." ■




AUTO21
 Network of Centres of Excellence
 University of Windsor
 401 Sunset Avenue, Windsor, Ontario
 N9B 3P4

(519) 253-3000, ext. 4130
info@auto21.ca
www.auto21.ca

Program Leader: Dr. Peter Frise
 Managing Director: Mr. Bill Woodward

Editor: Ms. Stephanie Campeau
 Communications Manager
 (519) 253-3000, ext. 4129



Member of the Network of Centres of Excellence in Canada
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AUTO21 Out and About

AUTO21 was busy with several trade shows this spring.

In March, AUTO21 took part in the SAE World Congress in Detroit, Michigan. In addition to a booth at the exhibition, 14 technical papers were presented by AUTO21 researchers. More than 70 network and student researchers gathered from across Canada to attend the event.



The AUTO21 exhibition booth was a hive of activity. From right to left: Dr. Ron Williams, General Motors retiree, Dr. Heather Maclean, AUTO21 project leader and University of Toronto professor, Jessie Fleming, HQP, Don Duval, HQP, Dr. Candace Wheeler, Research, Development and Planning, General Motors, and Dr. Edwin Tam, AUTO21 researcher and University of Windsor professor.



Dr. Peter Frise (left) welcomed Rocco Delvecchio, Canada's Consulate General in Detroit and Dr. Ross Paul, president of the University of Windsor and AUTO21 board member, to the AUTO21 SAE Networking Colloquium on March 9, 2004.



AUTO21 is featured in the Industry Canada "Cars on the Brain" campaign. The campaign promotes Canada's automotive intelligence. Dr. Michael Worswick, a professor at the University of Waterloo and the project leader of *Sheet and Tube Forming*, appeared in some of the Cars on the Brain materials.



Globe 2004

AUTO21 joined the Networks of Centres of Excellence of Canada and the Canadian Water Network at Globe 2004 in Vancouver, B.C. This international conference and exhibition focuses on environmental technologies and management, including the hydrogen economy and fuel cells. Prime Minister Martin attended the event to announce funding for the development of the Hydrogen Highway™ to be built between Vancouver and Whistler by 2010.

A steady stream of visitors to the NCE booth kept staff from AUTO21 and the Canadian Water Network busy.



APMA Annual Conference

AUTO21 participated at the APMA Annual Conference and Exhibition in Hamilton, Ontario. Stephanie Campeau, AUTO21 Communications Manager, greeted Jim Miller, vice-president, corporate affairs and the Chair of the AUTO21 Board of Directors and Brian Sundue, senior automotive sector development officer, Industry Canada.

Teaming Up to Reduce Road Rage

Given the convenience and efficiency that automobiles generally bring to our lives, it can be surprising how angry some drivers become. Moreover, we are witnessing examples of rudeness, impatience, and outright aggression behind the wheel far too often.

Dr. Reg Smart and Dr. Robert Mann shed light on this growing phenomenon in a seminal article on the subject of road rage for the *Canadian Medical Association Journal* two years ago. The two researchers with the Centre for Addiction and Mental Health in Toronto were impressed to find dozens of media accounts pointing to serious injuries and even deaths resulting from this phenomenon.

As part of the AUTO21 project, *Anti-Social Behaviour and the Automobile*, the researchers subsequently collected survey data which indicated that the experience of road rage is relatively common. Nearly half of Ontario drivers report being a victim of road rage in its milder forms in the previous year, while almost one in ten has over that same period been threatened with or experienced some kind of injury or

damage to their vehicles as a result of a road rage incident.

Thinking that technology had the potential to help reduce the negative behaviours associated with road rage, Dr. Smart and Dr. Mann began contacting other AUTO21 researchers with specific technical expertise. They connected with University of Calgary Geomatics Engineering professor Dr. Elizabeth Cannon, the leader of the *Construction of an Integrated Navigation Information Infrastructure* project for her expertise in sensor applications, and Hospital for Sick Children orthopaedic surgeon and leader of the *Safety Restraint of Children During Collisions* project, Dr. Andrew Howard to identify the potential physiological manifestations of road rage. Dr. Peter Frise, AUTO21 Program Leader has also contributed to a paper that the group has published.

“Because AUTO21 is structured the way it is, it allows exceptional opportunities for collegiality,” says Dr. Smart, recalling the dynamic exchanges that began when the team met to discuss the possibility of designing cars to lessen the likelihood of road rage.



“When we began to talk to engineers, it turned out that we knew more about designing cars than we thought, and the engineers knew more about preventing road rage than we thought,” he says.

The first result of this collaboration has been an academic paper outlining several different strategies for tackling the issue. These approaches feature technology that is already in use, such as forward mounted radar that warns when a driver is tailgating, cut-off mechanisms that mute a horn if it is blown too often, or global positioning systems for tracking the movements of known road ragers.

For Dr. Howard, the challenge is much the same as other preventable injuries related to automobiles, which have resulted in the use of seat belts or public education on impaired driving. But he adds that simply raising awareness about road rage is not enough – vehicles will have to be adapted to curb aggressive driving habits.

Such measures are especially important, adds Dr. Smart, because so many road rage incidents begin as minor altercations. In one recent case in Toronto, he notes, an upset driver inflicted fatal injuries on a pedestrian over a delay of no more than a few minutes. ■



Highly Qualified People

Prove Highly Talented

More than 200 student researchers (Highly Qualified People) and network researchers attended the third annual AUTO21 HQP Conference in early May.

Held in Windsor, Ontario, the three-day conference featured informative sessions, a tour of the DaimlerChrysler Windsor Assembly Plant, networking opportunities and the DaimlerChrysler HQP Poster Competition.

Guest speakers included Linda Hasenfratz, president and CEO of Linamar Corporation, Nancy Hill, of Hill and Schumacher Patent and Trademark Agents, and Dr. Douglas Barber, president and CEO of Gennum Corporation.

Approximately 53 teams from the 35 AUTO21 projects submitted posters for the competition, which has a total prize purse of \$15,000. Sixteen semi-finalist teams were selected and provided excellent oral defences to the judges. Judges had a difficult time determining the four finalist teams.

These talented teams will advance to the final round of judging to be held at the AUTO21 Scientific Conference on June 15, 2004.

The sixteen semi-finalist teams selected at the AUTO21 Posters for competition:

New Generation Steels, Queen's University
Evolution of Life Cycle Assessments, University of Toronto
Sheet and Tube Forming, University of Waterloo
Reformer Technology for Fuel Cells, Queen's University
Industrial Health and Safety in the Auto Industry, University of Windsor
Advanced Manufacturing, Assembly and Inspection University of Windsor
Polymer Composites, McGill University
Welding and Joining, University of Waterloo
Combustion Systems for Alternative Fuels, University of Windsor
Sheet and Tube Forming, University of Waterloo
Tools, Dies and Moulds, Queen's University
Industrial Health and Safety in the Auto Industry, University of Waterloo
Interior Noise Environment of Future Automobiles, Simon Fraser University
New Generation Steels, University of British Columbia
Evolution of Life Cycle Assessments, University of Windsor
Welding and Joining, University of Waterloo

DaimlerChrysler Poster Competition Finalists

New Generation Steels, Queen's University	Yancy Li Alison Mark Melinda Westphal
Interior Noise Environment of Future Automobiles, Simon Fraser University	Michael Sjoerdsma Nakul Verma
Industrial Health and Safety in the Auto Industry, University of Windsor	Tara Arnold Nadia Azar Christina Godin
Welding and Joining, University of Waterloo	Kevin Chan Karen Howard



A key component of the conference was the networking activities. The sessions allowed students to learn more about each other's research and discuss potential collaborations.



Dr. Doug Barber, president of Genum Corporation, provided delegates with insight on how Canada can achieve success through innovation.



Linda Hasenfratz, president of Linamar Corporation, provided the keynote address at the opening banquet. Dr. Peter Frise, AUTO21 Program Leader and CEO thanked her for the address on the Canadian automotive parts sector.

Networking session winners: Winners each receive a travel voucher worth up to \$2,000 for assistance to attend an academic conference of their choice.

Chemical Hydrogen Storage Process Development

Mohamed Abdul, Queen's University

Daniel Calabretta, Queen's University

Jennifer Cutting, University of British Columbia

Chih-ting Flora Lo, Queen's University

Chris Wong, Queen's University

Judges

Will Harney, Intier Automotive

Brian Jonah, Transport Canada

Tim Lougheed, Canadian Science
Writer's Association

Greig Mordue, Toyota Motor Manufacturing Canada Inc.

Stuart Shaw, DaimlerChrysler Canada

Chris Vander Doelen, The Windsor Star

Networking session judges

Dr. Mary Chipman, University of Toronto

Dr. Andrzej Sobiesiak, University of Windsor

Dr. Steve Yue, McGill University



Shawn Yates, Manager of Engineering Operations, DaimlerChrysler Canada, presented the awards for the DaimlerChrysler Poster Competition to the four teams advancing to the final round of judging in June 2004. (From right to left): Shawn Yates, Alison Marks and Yancy Li, Queen's University, and Dr. Peter Frise.

AUTO21 appreciates
the support of
DaimlerChrysler Canada
for sponsoring
the 2004 HQP
Poster Competition.

DaimlerChrysler Canada Inc.

AUTO21 2004 Scientific Conference

June 15-17, 2004

Le Centre Sheraton Montreal, Quebec



On the Road to Commercialization

There's still time to register! Visit www.auto21.ca now to reserve your space at this exciting two-day event!



Tourisme Montréal, Johanne Palasse

Downtown viewed from parc Jean-Drapeau

Terrace on Place Jacques-Cartier, Old Montréal



Tourisme Montréal, Stéphan Poulin

Confirmed speakers include:

Ray Tanguay,
President of Toyota Motor Manufacturing Canada

Michael Robinson,
Director of Design at Centre Stile Fiat

Maria Widell Christiansen
Member of Volvo's YCC design team

Denton Dance,
Director of Emerging Markets - Asia, J.D. Power

Malcolm Hing,
CanDRIVE

Jim Gouin,
Vice president and Controller of Ford Motor Company

**Tour the NRC's Industrial Materials Institute or
PMG Technologies Test Track**

