



# NEWSLETTER / COMMUNIQUÉ

Number 71

Spring / Summer 2013

**A newsletter for the information of the Academy, and a record for other engineering academies and organizations**

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## President's Message

The following is the President's Report to the 2013 Annual Meeting. It was submitted by Richard J. Marceau, FCAE on June 21, 2013 in Montreal, Quebec.

In June of 2012, upon my election as President of the Canadian Academy of Engineering, I indicated that my efforts over the coming year would be focused primarily on the creation of local Sections of the Academy. I pointed out that this effort continued our Past President Kim Sturgess' leadership in this area, and was based on a framework for creating local sections approved last year by the Board of the Academy. This initiative addresses the need to extend the Academy's footprint throughout Canada by nurturing and intensifying local activities. Over time, it is hoped that this will enhance public awareness of the Academy, raise its profile, facilitate recruitment of high-quality Academy candidates from industry and academia, and strengthen its ability to pursue its mission! I also personally believe that this will transform the Academy into a more dynamic and energetic organization!



As a result of many local efforts, I am happy to say that we have made significant headway on this project. On March 11 of this year, the first Academy section was officially launched in Montreal, and it is no exaggeration to say that the success of this year's Annual Meeting is a direct result of this important local initiative! Significant interest has arisen in other parts of

*(Continued on page 15)*

## The CAE Focuses on the Future of Manufacturing in Canada



by Pierre Lortie, FCAE, CAE President-Elect

*"We should all be concerned about the future because we will have to spend the rest of our lives there."*<sup>1</sup>

The 2013 Annual Meeting provided the opportunity to examine in a comprehensive manner the challenges that confront Canada's manufacturing sector, the risks and opportunities stemming from the deployment of new digital and disruptive technologies and the rebalancing of labour costs at the global level, and the paths public policies and firm practices must adopt to reap the full advantages of the new paradigm that will shape manufacturing in the future. This discussion with and between CAE Fellows benefitted from the participation of business economists, industry leaders and representatives from foreign national academies of engineering.

At the outset, it is essential to understand that a competitive manufacturing sector is not about "the making of goods or wares by manual labour or by machinery." Leading manufacturing encompasses the whole gamut of activities from understanding customer needs and requirements, engineering, design, innovation, production and, increasingly, services.

*(Continued on page 17)*

## New Fellows 2013



Back row (standing) from left to right: Walter F. Petryschuk, Pierre François Tremblay, Dougal McCreath, Tongwen Chen, Hausi A. Muller, Paul Blanchard, Panos Nasiopoulos, Savvas G. Hatzikiriakos, Paul Fortier, Maher Nessim, Simon Foo, Alberto Leon-Garcia, Claudio Canizares, Jean-Luc Fihey, David Naylor, Mohini Sain, Mark Kortschot, Bruce Vincent Burlton

Front row (seated) from left to right: Bill Buckley, John Douglas Pearson, Amir Shalaby, Ramamritham Sridhar, R. Doug Hooton, Andrew K.S. Jardine, Andreas Mandelis, Leah Lawrence, Tarek Sayed, Slobodan P. Simonovic, Chris Twigg-Molecey, Suong Van Hoa, Christopher Tattersall, Dharma Wijewickreme, Gordon A. Fenton, Sophie D'Amours

New Fellows not in attendance: Paul Amyotte, Lee Barbour, Yu-Ling Cheng, Thomas Darcie, Rafik Goubran, Larry Kostiuik, Ged McLean, Catherine Rosenberg, Maja Veljkovic, Lorraine Whale, J. D. Wilcox, Yiyan Wu

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## Annual Meeting

The CAE's 2013 Annual Meeting was held at the Delta Centre-Ville, Montreal, June 20-21. The symposium theme was "The Future of Manufacturing in Canada". Thanks to the planning committee (Chair Pierre Lortie, Jacques Lyrette, André Bazergui and Ron Crotogino), the



Old friends catching up - Ian Jordaan, FCAE with new Fellow Maher Nessim, FCAE

meeting was very ambitious in scope compared to previous years, with 30 panellists and Chairs and four parallel sessions in the afternoon. We were able to attract some very highly knowledgeable speakers, ranging from C-level executives from Canadian manufactures, respected academics and representatives of the US, Swiss, Australian and Danish engineering academies. We also held a tour to the manufacturing facility of CAE Ltd, the world leader in simulation technology best known for its full flight simulators. Elsewhere in this newsletter, you can read President-Elect Pierre Lortie's summary of the symposium.



New Fellow Sophie D'Amours, FCAE with Montreal Section Chair André Bazergui, FCAE

Thirty-five of the 47 new Fellows were present at the Induction Dinner. After dinner, the Fellows and guests enjoyed a thought-provoking presentation by Frank Graves, President of EKOS Research, one of Canada's leading public opinion firms. Frank presented some current polling data on Canadians' thoughts on the trustworthiness of engineers vs. other professions, their faith in the use of evidence in public policy and their predictions for the economic future of the country.



Dinner Speaker Frank Graves

At the Annual General Meeting, a relatively minor by-law change was approved. A full description of the proceeding is described in the draft minutes, which are available to members in the members' section of the website. President Richard Marceau announced that the 2014 annual meeting will be held in St. John's, Newfoundland, the first time that the CAE has held its annual meeting in Atlantic Canada. The dates will be announced soon.



Victor Leung, FCAE with new Fellow Panos Nasiopoulos, FCAE and Joanna Nasiopoulos

## Montreal Section Meeting

André Bazergui, President of the new Montreal Section of the CAE reports that the Section had a very successful meeting on March 11, 2013 at École Polytechnique.

CAE President Richard Marceau, and FCAEs Christophe Guy, Yves Beauchamp and Robin Drew worked closely with André for the creation of the Montreal Section. At the meeting Yves Beauchamp, Lorne Trottier, Ron Crotogino and Toby Gilsig were elected officers of the Section.

The gathering of 50 Fellows were provided with an excellent and very inspiring presentation of the Trottier Energy Futures Project by Lorne Trottier and Ralph Torrie.



Fellows Yves Beauchamp, André Bazergui, Richard Marceau and Christophe Guy at the official signing creating the Montreal Section of the CAE

**We wish to thank and recognize the generous support of our Annual Meeting sponsors:**

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**The Canadian Academy of Engineering also acknowledges with appreciation the financial support of McMaster University**

# President Marceau Appears Before Committee

On 7 February 2013, CAE President Richard Marceau appeared before the House of Commons Standing Committee on Industry, Science and Technology. The Committee was examining the state of engineering in Canada.

## **Presentation:**

### Introduction

I would like to begin by thanking the Standing Committee of the House of Commons on Industry, Science and Technology for the opportunity to speak on behalf of the Canadian Academy of Engineering on the state of engineering in Canada today. The Canadian Academy of Engineering is the national institution through which Canada's most distinguished and experienced engineers provide strategic advice on matters of critical importance to the nation. Though a number of issues would merit your close consideration today, our brief introductory remarks will focus on three key ideas:

- The high quality but insufficient number of Canadian engineers
- The urgent need for adequate succession planning of Canada's next generation of engineers, and
- The importance of engineering input in Canada's economy and in creating policy

### Education

On the first point, Canada has the enviable reputation of having one of the finest engineering education systems in the world. It is characterized by a unique combination of Provincial jurisdiction over the institutions which provide the education, provincial jurisdiction of the engineering profession itself, and compliance to high standards of excellence set by a national organization, the Canadian Engineering Accreditation Board. For engineering graduates to be admitted to the profession without taking exams, all engineering programs, regardless of province or size, must meet the same high standards of excellence set by this Board. As a result, Canadian engineers are recognized internationally for their excellence in many fields:

- Aerospace
  - Automotive parts
  - Electric power transmission and distribution
  - Hydroelectric power generation
  - Nuclear power generation
  - Information and Communications
  - Resource extraction
  - Satellites
  - Simulation and virtual environments
  - Transportation
- .... to name only a few.

Unfortunately, Canada has one of the lowest number of engineers per capita among OECD nations, a fact which creates uncertainty around Canada's capacity to:

- maintain its present infrastructure,
- build new infrastructure,
- meet the needs of growing and emerging industries,
- develop new applications and products, and
- stimulate innovation and entrepreneurship.

### Succession Planning

Let us now turn to the issue of succession planning. Canada is faced with a generational problem:

At least 1/4 of all Canadian engineers could retire within the next ten years, at a time when an expansion of the engineering pool is essential, and Canada is challenged to maintain its present supply! Historically, the gap between supply and demand has been filled by immigration. Unfortunately, this is no longer an option: China and India now wish to keep their engineers for their own nation-building needs! Those still open to immigration are now aggressively courted by Scandinavia, Europe, and even Japan, countries which traditionally have not had to do so! The same is true for the university professors who will educate engineers: Canada will need to step up efforts to graduate professors from among its own young people rather than rely on immigration! Canada significantly needs to stimulate its ability to graduate far more engineers at the bachelor, master and doctoral levels, especially women engineers.

*(Continued on page 16)*

## Trottier Energy Futures Project

Since the beginning of this year, the Trottier Energy Futures project has published two reports, Low-Carbon Energy Futures: A Review of National Scenarios ([www.trottierenergyfutures.ca/low-carbon-energy-futures-a-review-of-national-scenarios/](http://www.trottierenergyfutures.ca/low-carbon-energy-futures-a-review-of-national-scenarios/)) and An Inventory of Low-Carbon Energy for Canada ([www.trottierenergyfutures.ca/an-inventory-of-low-carbon-energy-for-canada-2](http://www.trottierenergyfutures.ca/an-inventory-of-low-carbon-energy-for-canada-2)). TEFP project staff and consultant Robert Evans, FCAE, have also completed two internal reports calibrating and verifying the CanESS energy simulation model that has been used for some preliminary modeling. All of these reports have been subject to extensive review by a number of CAE Fellows with expertise in the appropriate subject areas.

Planning for the next stage of the project is currently ongoing.

## Bayer Award

We are pleased to report that the Trottier Energy Futures Project was recently cited by Bayer Canada as part of Bayer's 150th anniversary saluting Canadian innovators who embody Bayer's philosophy: Science for a Better Life, under the renewable energy category.

The award was given at a special ceremony on Tuesday, May 28 in Toronto. Michael Charles represented the Academy.



Michael E. Charles, FCAE, Lorne Trottier, FCAE and Ralph Torrie accept the Bayer Award for the TEFP

## Calgary Section Meetings

Under the interim leadership of Ross Douglas and Kim Sturgess, Fellows from southern Alberta have met three times to discuss the possibility of forming a Section. Each meeting has had around 12 members attend. Amongst the topics discussed by the group include concrete steps to increase the number of Fellowship nominees from industry, improving the impact of CAE studies, having the CAE take on a major leadership role with CELF and creating a Task Force that would examine flooding issues in Alberta.

## Task Force on Engineering in Canada's Northern Oceans

At the 9 April Board meeting, a new Task Force on Engineering in Canada's Northern Oceans was approved. It will be led by Ian Jordaan, Ken Croasdale, Bob Frederking and Peter Noble. They mean to study the development and transportation of resources, accounting for sovereignty, understanding & protecting the environment, and human safety. The study aims to recognize the potential effects of climate change on developments and engineering design, and identify technology gaps and objectives to address them.

## Several CAE Fellows Honoured by the Engineering Institute of Canada

Among the 2013 senior award recipients are the following Fellows of the Canadian Academy of Engineering:

Andrew Goldenberg – recipient of the Sir John Kennedy Medal, the senior award of the Institute for outstanding service rendered to the engineering profession or noteworthy contributions to the science of engineering.

Peter K. Kaiser – recipient of the Julian C. Smith Medal for achievement in the development of Canada.

Chul B. Park – recipient of the K.Y. Lo Medal for significant engineering contributions at the international level.

Ian D. Moore – recipient of the John B. Stirling Medal for leadership and distinguished service at the national level within the Institute and/or its Member Societies.

Colin E. Smith – recipient of the Canadian Pacific Railway Medal, for many years of service of members of the societies of the Institute at the regional, branch or section levels.

Among the newly elected Fellows of the EIC are the following Fellows of the Canadian Academy of Engineering: Brahim Benmokrane, Azzedine Boukerche, Zhizhang (David) Chen, Robin Drew, Shamim Ahmed Sheikh, Weihua Zhuang.

## Deceased Fellows

The Canadian Academy of Engineering offers its condolences on the death of the following Fellows. If you are aware of the passing of a Fellow not listed, please contact Valérie Broadfoot at [vbroadfoot@cae-acg.ca](mailto:vbroadfoot@cae-acg.ca).

**Robert T. Tamblin**, elected in 1990, passed away on October 4, 2012. He was a graduate of the University of Toronto in 1942 in engineering. He served in the Canadian army during WW II as a second lieutenant with postings in England and Holland. As a mechanical consulting engineer, he had a long career in the design of building systems. He fostered several major innovations and became the "father" of energy management in Canadian buildings. His engineering work continued into his eighties. His engineering legacy will live on through his innovations and his mentoring efforts with others.

**H. Brian White**, elected in 1997, passed away on December 8, 2012 a few months after his 90th birthday. There can be no doubt that Brian left his broad and indelible signature on the entire world's transmission line engineering industry. Brian's relentless curiosity for how and why things happen coupled with numerous early career opportunities and his formidable intellect allowed the development within him of a very clear and rare understanding of the how transmission lines work structurally and how he and those who learned from him could improve them. He will be missed for his friendship, energy and passion. His value to the industry is a seed well planted.

## Energy Pathways Task Force Update

The CAE Energy Pathways Task Force held a successful conference 'Bitumen - Adding Value: Canada's National Opportunity' in Sarnia on May 21/22. The conference was headlined by three key-note speakers:

Honourable Frank McKenna complimented the CAE in getting behind the idea of mega projects across the country which would enable Canada to lead the world if it got energy projects off the launch pad. In supporting increased east-west pipeline capacity, he stated that we need a national energy infrastructure from coast to coast that makes all Canadians feel like they are part of the solution. Without value-added pipelines and infrastructure, the value destruction will be an economic fiscal catastrophe of between \$20B to \$30B in 2013 alone.

Senator Elaine McCoy summarized the Senate report "Now or Never" and pointed out that Canada has yet to transform itself into a Global Trader in energy. 'We are a country built on conversation and action; you are doing that now.' Canada has an opportunity to go global and she asked whether we want to do it, and if we do, how do we do it? Senator McCoy later read the communique from the conference into the Senate record.

Jim Stanford, Canadian Autoworkers Economist, noted that Canada's economic history can be traced 'from beavers to bitumen.' Canada has a long history of exploiting staples, or natural resource-based products, for export. 'We've sold staples in unprocessed or barely-processed forms to more advanced trading partners and in turn we've imported manufactured goods'. Since 2000, the level of shipment of unprocessed or barely processed resources has increased.

The following Communique was issued at the conclusion of the conference.

1. Lack of access to international pricing for Canada's oil products represents a value destruction of \$20 to \$30 billion per year.
2. An expanded pan-Canadian pipeline network is key to accessing both domestic and growing global markets.
3. Canada should launch national-scale energy projects as the foundation of its energy strategy and its pathway to sustainable wealth creation and jobs.
4. The Ontario and Alberta governments commit to dramatically enhance their value-added collaboration to improve energy supply chain opportunities, to enhance transportation networks and to develop new energy efficient and environmentally advanced technology.
5. A Sarnia/Lambton bitumen upgrading project to produce refinery ready crudes was identified as a high priority national-scale project, with a call for action, with strong support by a committed region.
6. Delegates urged Canada to shift to a more diversified value-added economy, away from its historic staple-based economy.
7. An Alberta Government/Industry study is being launched to identify pathways to increase the competitiveness of oil sand products in North American and International markets.
8. New technology is key for the long term sustainable development of Canada's natural resources. (The COSIA initiative was identified as an example of the commitment of oil companies to collaborate and share advances in improving environmental performance).

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## Fellows in the News



Pierre-Claude Aïtcin has won the 2013 Grand Prix d'excellence, the highest distinction given by the Ordre des ingénieurs du Québec to its members. The winning engineer serves as a model for the profession and is known and recognized for his or her visionary qualities, ability to innovate and social commitment.

Yusuf Altintas was recently conferred the prestigious title of 'Doctor Honoris Causa' by Budapest University of Technology and Economics.

Christina Amon, dean of the Faculty of Applied Science and Engineering, University of Toronto, was named one of the Top 25 Women of Influence in the Women of Influence Winter 2012 issue.

Paul Amyotte was named President-Elect of Engineers Canada for the 2013-2014 term at Engineers Canada's AGM in Yellowknife on June 7, 2013.

John Bandler, Professor Emeritus, McMaster University and President, Bandler Corporation, has been honored by the IEEE Microwave Theory and Techniques Society with its 2013 Microwave Career Award. He is the first Canadian to win the award.



Richard J. Bathurst has begun his 2013-2014 term as President of the Canadian Geotechnical Society. He was also awarded the 2014 Giroud Lecture by the International Geosynthetics Society. Professor Bathurst also recently received the ASTM 2013 Hogentogler Award.

Clement W. Bowman received an honorary degree from the University of Ontario Institute of Technology on June 6, 2013.

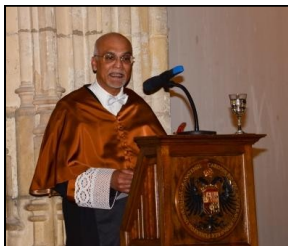
M. G. (Ron) Britton published an article on the differences between information and knowledge in the Spring issue of APEGM's magazine, The Keystone Professional.

Angus Bruneau, along with his wife Jean, has donated \$1-million to Memorial University to create a choral centre at the school of music. Mr. Bruneau founded the university's engineering program, created a unique co-operative education program, opened the Centre for Cold Ocean Resources Engineering and served in various roles at MUN for 12 years.

Peter Buckland's design firm, Buckland and Taylor Ltd. (B&T) took home the award for Design and Contract Preparation - Structures for its work on the Hagwilget Suspension Bridge Rehabilitation project near New Hazelton, BC. In addition, the B&T designed John James Audubon Bridge in Louisiana has won ENR's Best of the Best of 2012.

Elizabeth Cannon, President of the University of Calgary, received an honorary doctorate from the University of Ottawa on June 7. In addition to her efforts to promote leadership and the importance of post-secondary education as University of Calgary president, Cannon has also been selected for her expertise in geomatics engineering and GPS research.

Pat Daniel was recently honoured with two awards from two universities — the Canadian Business Leader Award from the University of Alberta School of Business and the Canadian Engineering Leader Award from the University of Calgary.



M. Jamal Deen has received the highest degree and honour, Doctor Honoris Causa, from the University of Granada. Dr. Deen was also one of five foreigners elected Foreign Fellow of the National Academy of Sciences, India in October 2012. In May 2013, Deen was presented with the McNaughton Gold Medal by the IEEE and the McMaster Engineering Research Award. He was also honoured as the 2013 Winegard Lecturer at the University of Guelph and the University of the West Indies presented him with a Vice Chancellor's Award.

John R. Grace, Canada Research Chair in Clean Energy Processes in the Department of Chemical and Biological Engineering at UBC, was appointed as an Officer to the Order of Canada on June 28, 2013. He was cited for "his contributions as a chemical engineer, notably to the development of cleaner technology for industrial processes and energy production."

*(Continued on page 9)*



## Fellows in the News (cont'd)

*(Continued from page 8)*

Peter Halsall has been appointed president and chief executive officer of the Canadian Urban Institute, a Toronto-based not for profit organization that supports the development of sustainable urban regions across Canada and internationally with applied policy research, civic engagement projects, and incubation of innovative technologies that reduce a city's environmental footprint.

Tom Jenkins, the executive chairman and chief strategy officer at OpenText Corporation, received an honorary doctor of laws degree and addressed convocation during the University of Waterloo's spring convocation ceremonies on June 12.

Catherine Karakatsanis was among three female engineers honoured with the Ontario Women's Directorate awards by their MPPs, in recognition for their exceptional community leadership to improve the lives of women and girls in Ontario.

Chandra Kudsia received an honorary Doctor of Science degree from McMaster University on June 10, 2013. McMaster alumnus Kudsia is a world leader in engineering technologies for satellite communication and aeronautics.

Mohamed Lachemi assumed his new position as the Provost and Vice-President, Academic of Ryerson University, on May 1, 2013. The provost serves as Ryerson's chief academic officer and is responsible for strategic direction and leadership of all aspects of academic policy and planning, and leads the university's budget process.



Branko Ladanyi, Professor Emeritus of École Polytechnique de Montréal, was awarded an honorary degree from Laval University in August 2012. This prestigious honor was conferred in the framework of the fifteenth International Conference on Cold Regions Engineering in the presence of Denis Brière, President of the Laval University.

Pierre Lassonde was recently inducted into the Canadian Mining Hall of Fame in recognition of his exemplary career as a professional engineer, astute investor, innovative financier, entrepreneurial company builder, dedicated philanthropist, and senior statesman of Canada's mining and investment industries.

Richard Marceau assumed the position of vice-president (research) at Memorial University of Newfoundland on June 1, 2013. Dr. Marceau comes to Memorial from the University of Ontario Institute of Technology (UOIT), where he served as provost and vice-president (academic).

Jacob Masliyah received an Honorary Doctor of Science degree from the University of Alberta on June 6. He was cited for his groundbreaking contributions to the creation of operations and processes that are more energy- and water-efficient, thereby making extraction from the Alberta oilsands more commercially viable and environmentally sound.

John Nenniger, CEO of N-Solv, with Murray Smith, VP of Business Development, was invited to testify on Canadian energy innovation before the U.S. House of Representatives' Subcommittee on Energy and Power at a March 2013 hearing entitled "The American Energy Initiative". They addressed the topic of oilsands technology and economic growth. Among others, they were accompanied by CAE Fellow Eddy Isaacs of Alberta Innovates.



Eric Newell has become the second person to receive the Award for Excellence in Aboriginal Relations from the Canadian Council for Aboriginal Business. During his time as CEO of Syncrude Canada Ltd. he founded a hugely successful and progressive Aboriginal relations program.

Professor Chul B. Park has been elected as a Fellow of the Engineering Division of the Korean Academy of Science and Technology. Professor Park is being honoured for his work on effective manufacturing techniques for plastics.

Doug Perovic has been elected a Fellow of the American Association for the Advancement of Science. The AAAS is the largest international organization dedicated to advancing science or its applications on a global basis.

*(Continued on page 10)*

## Fellows in the News (cont'd 2)

*(Continued from page 9)*

David Plant of McGill University is one of the six recipients of the Killam Research Fellowships for 2013. The goal of Plant's project is to build tomorrow's internet, by improving the fiber optics networks that are its backbone. His research will concentrate on fiber optic transmission and what are called silicon-photonics transceiver arrays.

Gamal Refai-Ahmed is being awarded the ASME K-16 Clock Award for his excellence and leadership in the field of the science and engineering of heat transfer in electronics. The presentation will take place at the ASME 2013 International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems in Burlingame, California.

R. Kerry Rowe has been elected a fellow of the Royal Society in the United Kingdom. Dr. Rowe is one of only four Canadians, and the world's only civil engineer, elected to the prestigious institution in 2013. Dr. Rowe was described by the Royal Society as one of the most distinguished civil engineers of his generation.

Adel Sedra received an Honorary Doctor of Science degree from the University of Victoria on Thursday, June 13, 2013. His citation noted that he is a gifted scholar, teacher, university administrator, and advocate for engineering research and education. He co-authored *Microelectronic Circuits*, the best-selling engineering textbook in history, with more than a million copies in print in more than 10 languages.



Molly Shoichet and her team members were one of University of Toronto's ten 'Inventors of the Year' celebrated on May 15, 2013. The Inventor of the Year Award recognizes inventions that have the potential to improve our quality of life. Professor Shoichet's team develops materials for drug delivery and regeneration.

Mamdouh Shoukri, President of York University, has been appointed to the Order of Ontario, the province's most prestigious honour for individual excellence and achievement. Shoukri is being recognized for his visionary leadership, first at McMaster University in Hamilton and now at York, where he has spearheaded the university's international expansion, environmental sustainability and development of engineering and life sciences research and education.



Michèle Thibodeau-DeGuire has been appointed Chair of the Board of Directors of the Corporation de l'École Polytechnique de Montréal for a five-year mandate, thus becoming the Corporation's senior officer. Until just recently, Ms. Thibodeau-DeGuire served as President and Executive Director of Centraide of Greater Montréal.

Lorne Trottier's family foundation is making a donation of \$10 million to create the Trottier Energy Institute at Polytechnique Montréal. The institute's mission is to "promote the search for solutions to help secure the future of energy in Québec, Canada and the world." The Trottier Energy Institute will be based at Polytechnique Montréal and will bring together some 60 professors and researchers from the three Campus Montréal institutions (HEC Montréal, Polytechnique Montréal and Université de Montréal). Mr. Trottier also received an honorary degree from the University of Ontario Institute of Technology on June 7, 2013

Robert Walker received an honorary Doctor of Science degree from McMaster University on June 10, 2013. Walker is the president and chief executive officer of Atomic Energy Canada Limited.

David P. Wilkinson, of the Department of Chemical & Biological Engineering at UBC, is the recipient of the 2013 Lifetime Achievement Award from the Canadian Hydrogen and Fuel Cell Association. The award recognizes Dr. Wilkinson's life-long personal involvement in fuel cell technology which includes closing significant technology gaps, providing a basis for future generations of fuel cells, integrating fuel cell technology with clean energy approaches, and simplifying the overall fuel cell system and energy pathways.

H. Neil Windsor has won PEGNL's Award of Merit for 2013. The Award for Merit is the highest award presented by PEGNL and bestows distinction on outstanding engineers and geoscientists to recognize their exceptional achievements in either of engineering and geoscience.

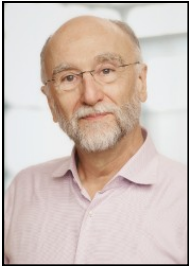
## Two Fellows Receive NSERC Synergy Awards for Innovation

Since their inception in 1995, the NSER Synergy Awards for Innovation have honoured the most outstanding achievements of university-industry collaboration in the natural sciences and engineering. Two CAE Fellows received these awards recently:



Yusuf Altintas – Award category: Large Companies (A partnership with a single company of more than 500 employees)

“In an industry as competitive as aircraft manufacturing—where margins are tight and precision is a must—Pratt & Whitney Canada deeply values its longstanding research partnership with The University of British Columbia’s Yusuf Altintas, winner of an NSERC Synergy Award for Innovation. The professor of mechanical engineering has worked with the company over the past several decades to develop mathematical models that simulate parts machining, which remove much of the financial risk of physical trials.”



Arthur Pelton – Award category: Leo Derikx Award (An established innovative model of long-standing university-industry partnership in pre-competitive R&D that has improved the general well-being of an industry)

“Having the right tool for the right job is, of course, vital to any industry. But what is even more valuable is having a great tool for getting the job done in many industries. The recipients of the NSERC 2012 Leo Derikx Award—Arthur Pelton, Patrice Chartrand and Christopher Bale of the Chemical Engineering Department at the École polytechnique de Montréal, and In-Ho Jung of the Department of Mining and Materials Engineering at McGill University—have created diverse chemistry simulation software called FactSage. It allows users to perform complex chemical equilibrium calculations using a vast, critically evaluated database, saving time and costs associated with physical experimentation.”

## Three Fellows Elected to the Royal Society of Canada

The following three CAE Fellows were elected to the Royal Society of Canada in September 2012:

Claudio Cañizares has done pioneering work in the field of voltage stability analysis of power systems, which has helped electric utilities worldwide, understand and prevent voltage collapse. He is currently working on various aspects of power system analysis, control and optimization in the context of Smart Grids, renewable resources, energy systems and competitive electricity markets. He is considered one of the top power engineering researchers in Canada.

Elizabeth Edwards has achieved international recognition for her pioneering research on how biological processes affect pollutants in the environment. Her research was largely responsible for disproving the belief that monoaromatic hydrocarbons such as benzene could not be biologically degraded under anaerobic conditions. She also developed a microbial culture called KB-1, dominated by unusual organohalide-respiring bacteria, that is an effective low-cost solution for cleaning up industrial sites contaminated by chlorinated solvents.

Jonathan Rose is a world leader in the area of Field-Programmable Gate Arrays, which are pre-fabricated digital chips that can be programmed to become any digital circuit. These devices form the backbone of the Internet, cellular networks and many other systems that required digital hardware. Rose and his students have done pioneering work on the global structure of these devices, and the software algorithms and tools needed in their use.

## CAE Fellows Honoured by the Canadian Society for Civil Engineering

Several CAE Fellows were honoured by the Canadian Society for Civil Engineering (CSCE) during its annual conference in Montreal from May 29-June 1, 2013, when Greg Lawrence, Tarek Sayed and Dharma Wijewickreme were inducted as Fellows of the CSCE. Doubly honoured at the conference was Dharma Wijewickreme, who received the CSCE’s Horst Leipholz Medal for his outstanding contributions to engineering mechanics research and practice in Canada.

## Four CAE Members Elected Fellows of Engineers Canada

The following four Fellows have received their Engineers Canada Fellowship designation:

Yusuf Altintas, Ken Putt, Doug Dale and Leah Lawrence

## Two Fellows Receive 2013 Engineers Canada Awards

Presented annually since 1972 to recognize outstanding Canadian engineers, teams of engineers, engineering projects and engineering students, the Engineers Canada Awards highlight engineering excellence, as well as the contributions of Canadian engineers to their profession, their community, and to the safety and well-being of Canadians.

Elizabeth Cannon - Gold Medal Award which bestows distinction on outstanding engineers and recognizes exceptional achievements in their chosen fields.

M.G. (Ron) Britton - Meritorious Service Award for Professional Service which recognizes outstanding service and dedication to the Canadian engineering profession through Canadian professional, consulting or technical associations and societies, and to enhance the role of the associations and societies in the career of the professional engineer)

## Engineers Canada Hosts Dinner for Medal Recipients



Michael A. Ball, FCAE

Seven members of the CAE are among the thirty-seven recipients of the Queen Elizabeth II Diamond Jubilee Medal awarded by Engineers Canada and its constituent associations. The commemorative medal was created to mark the 2012 celebrations of the 60th anniversary of Her Majesty Queen Elizabeth II's accession to the Throne as Queen of Canada. The medal serves to honour both Her Majesty for her service to Canada, and to honour significant contributions and achievements by Canadians.

"Sixty thousand deserving Canadians have been recognized during this past year of celebration," said Engineers Canada's president, Catherine Karakatsanis, FEC, FCAE, P.Eng., "Our 37 recipients very much deserve to be part of this distinguished group, having contributed and dedicated service to their peers, to their community and to the country through their work in engineering."

The CAE Fellows so honoured are Michael A. Ball, Darrel J. Danyluk, Pierre Lassonde, Roger Nicolet, P. Kim Sturgess, Pieter Van Vliet, H. Neil Windsor.

## Ordre des ingénieurs du Québec 2013 Hommage Awards

The Ordre des ingénieurs du Québec announced the names of the four recipients of the 2013 Hommage awards in recognition of their outstanding contributions. The objective of these awards is to recognize exemplary displays of excellence and contributions to the engineering profession. The awards were presented in various categories at the OIQ's Gala de l'excellence, an annual event that was held recently in Montreal.

Among the recipients were two Fellows of the CAE:

Charles Terreault - award for outstanding social commitment by an engineer

Yves Beauchamp - award for members in research or education

## News from CAETS

The CAE is an active member of the Energy Committee of the International Council of Academies of Engineering and Technological Sciences (CAETS). The Working Group, of which Bob Evans is a member, has written a comprehensive [report on low carbon electricity generation](#).

Bob Evans also represented the CAE at the 2013 CAETS meeting, which was held in Budapest, June 26-28. At the meeting, he presented a report that Fellows Dan Meneley and Terry Rogers wrote on the state of the nuclear industry in Canada. He participated in follow-on discussions with our colleagues at the Indian National Academy of Engineering about the joint India-Canada Clean Coal Conference which was held in Delhi in December 2012.

CAETS has published a booklet which provides a brief description and short history of CAETS's activities since its inception: CAETS – The First 35 Years 1978-2013. The booklet can be viewed on the [CAETS website](#).

## Council of Canadian Academies Update

The first half of 2013 saw the release of two new Council assessments: [Water and Agriculture in Canada: Towards Sustainable Management of Water Resources](#), published in February, and [Innovation Impacts: Measurement and Assessment](#), published in April. Looking to the end of 2013, the Council expects to release final reports on subjects such as the state of industrial R&D in Canada (chaired by CAE Fellow Kathleen Sendall), Canadian ocean science, and the medical and physiological impacts of conducted energy weapons.

At the end of the 2012/13 fiscal year, the Council had 11 active panels at work, and efforts were under way to set up an additional four. The Council is pleased to have such a diverse set of questions for assessment, which include therapeutic products for children, the impacts of shale gas extraction, Canada's industry competitiveness in terms of energy use, potential new and innovative uses for green ICTs, and STEM skills for the future. To see our full range of assessments, visit [www.scienceadvice.ca/en.aspx](http://www.scienceadvice.ca/en.aspx).

To conduct assessments, the Council draws upon the expertise that exists within the Canadian Academy of Engineering and its other Member Academies. Experts also come from around the world, many of whom are internationally recognized leaders in their fields. Thanks to the efforts of our expert volunteer community, the Council can continue to provide science advice in the public interest.

To keep up to date on our regular activities, follow us on Facebook, on Twitter @scienceadvice, or sign up to our mailing list by visiting our homepage, [www.scienceadvice.ca](http://www.scienceadvice.ca).

## PAGSE Annual Activity Report 2012-13

The Partnership Group for Science and Engineering (PAGSE; [www.pagse.org](http://www.pagse.org)) is a cooperative association of 26 national organizations in Science and Engineering that represent approximately 50,000 individual members from industry, academia, and government sectors. They work collectively to represent the Canadian science and engineering community to the Government of Canada, and to advance research and innovation for the benefit of Canadians.

On July 1 2012, Martha Guy, Society of Canadian Limnologists, assumed the Chair of PAGSE. PAGSE welcomed a new society as a member this year, the Canadian Rivers Institute. Work continued through the Bacon & Egg Heads breakfasts between Parliamentarians and guest speakers drawn from the engineering and science communities. *SciencePages* also continued. is an initiative undertaken PAGSE in co-operation with the Science Media Centre of Canada (SMCC) and provided free of charge to all people interested in scientific topics, including Parliamentarians. Issues on Genomics (November 2012), Wetlands (February 2013), Cyber security (March 2013), and the Arctic (April 2013) were launched at corresponding Bacon & Eggheads Breakfasts. Plans are underway for the release of several more issues of *SciencePages* in 2013.

## News from Engineers Canada

As the national organization of Canada's engineering regulatory bodies, Engineers Canada works closely with its 12 constituent associations to deliver national programs that contribute to their work, and that have a positive impact on the profession and its public profile. Nationwide, there are over 260,000 members of the engineering profession, but together, we are one profession.

Engineers Canada selected its new executive at its Annual General Meeting in Yellowknife, Northwest Territories, held on June 4–8. Engineers Canada is pleased to welcome W. James Beckett, FEC, P.Eng., as its president for the 2013–2014 term. Mr. Beckett will lead the Board and work with the constituent associations to build a stronger engineering profession and to increase Canadian's awareness of the contributions of engineers to society.

He will be joined by the following members of the Executive Committee: Past-President Catherine Karakatsanis, FEC, FCAE, P.Eng. (PEO); President-Elect Paul Amyotte, FEC, P.Eng. (Engineers Nova Scotia); Zaki Ghavitian, FIC, ing., M.ing. (OIQ); Rick Kullman, FEC, P.Eng. (APEGGS); Darryl Benson, FEC, P.Eng. (PEGNL); and Engineers Canada's Chief Executive Officer Kim Allen, FEC, P.Eng.

In an effort to improve licensure processes for the associations, Engineers Canada is moving forward with the development of the online competency-based assessment tool. The first step in this work is extensive consultation with the constituent associations to understand their needs and challenges in relation to an online work experience assessment tool. The project has created a system of more consistent assessment of engineering experience leading to enhanced access to engineering expertise, abilities and experience for the Canadian public. To read the final Competency-Based Assessment Project report, visit:

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## Energy Pathways Task Force Update (cont'd)

(Continued from page 7)

The Energy Pathways Task Force, currently comprised of more than 30 members, has recently developed its 2013/2014 energy program, based on pursuing and measuring progress in the nine big projects recommended as Canada's energy infrastructure plan for the first half of this century. The results of this work will be documented in its next book 'Canada: Becoming a Sustainable Energy Superpower' to be released at the time of the Academy's 2014 Annual General Meeting. The book will cover the following topics:

### Section 1 – Canada 2050 – The Rainbow Transition

The nine new energy projects proposed in the CAE Book 'Winning as a Sustainable Energy Superpower' would increase the amount of value-added energy-related products that Canada could export, and decrease the carbon content of its energy production significantly. They would give meaning to the phrase 'sustainable superpower' and demonstrate that Canada can maintain a significant superpower status for the foreseeable future. A scenario which includes the implementation of all nine new big projects is described in this section.

### Section 2 – Canada 2050 – Adding Value: From Beavers to Bitumen

Canada's progress in discarding its reputation as a hewer of wood and drawer of water has been intermittent at best. Recent evidence shows that our value-added record has worsened since the turn of the century. Upgrading bitumen from the oils sands to fuel and chemical products, one of the nine proposed new big projects, is a case study of the value-added dilemma. The findings from the recent bitumen upgrading conference are presented in this section, and a plan of action described.

### Section 3 – Canada 2050 – Imagining Deeper into Canada's Energy Future

The Academy is continuing its work on the other eight new big energy projects, adding specificity in particular to the role of electricity (the hydroelectric and nuclear potential) and expanding on renewable sources including district heating systems. Chapters include;

- Canadian Electrical Corridor – (A national grid with regional hubs for north-south trade)
- Muskrat Falls Hydroelectric Project and Transmission
- MacKenzie River Hydroelectric Feasibility Study
- Nuclear Generating Farm Big Project
- District Energy/Geothermal Big Project

Members who are interested in contributing to the above work should contact Richard Marceau ([rmarceau@mun.ca](mailto:rmarceau@mun.ca)) or Clem Bowman ([bowman@progrid.ca](mailto:bowman@progrid.ca)), co-editors of the new volume.

## News from Engineers Canada (cont'd)

(Continued from page 13)

[http://www.engineerscanada.ca/e/pj\\_competency.cfm](http://www.engineerscanada.ca/e/pj_competency.cfm)

Engineers Canada has been working to make access to the profession easier for international engineering graduates. As part of that work, Engineers Canada is proud to have launched the *Roadmap to Engineering in Canada*, [newcomers.engineerscanada.ca](http://newcomers.engineerscanada.ca), an online resource for international engineering graduates to learn about how to become a licensed engineer in Canada. It builds on changes to Canada's immigration system to help international engineering graduates begin their career in Canada more quickly and efficiently.

In terms of the future of the profession, Engineers Canada released the *Engineering Labour Market in Canada: Projections to 2020* report in January. It shows, among other things, that Canada is facing a short supply of engineers with more than 10 years of specialized experience. For more information about the findings of the report, visit: [http://www.engineerscanada.ca/e/pj\\_lms.cfm](http://www.engineerscanada.ca/e/pj_lms.cfm)

Work on the Canadian Framework for Licensure continues. Its purpose is to look for the best way forward for the engineering profession. Engineers Canada and our constituent associations are consulting with a wide variety of stakeholders to get their input as we develop the model regulatory policies and practices that make up the Framework. Information about the initiative is available on our website at [http://www.engineerscanada.ca/e/pj\\_cfl.cfm](http://www.engineerscanada.ca/e/pj_cfl.cfm). Please feel free to look at any of the draft elements and provide your feedback to [stephanie.price@engineerscanada.ca](mailto:stephanie.price@engineerscanada.ca)

We are proud to report that we awarded our inaugural Award of Journalism Excellence in Engineering in Yellowknife at our Engineers Canada Awards Gala in June. Tyler Irving, a writer for *Canadian Chemical News* (*L'Actualité chimique canadienne*), received

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## President's Message (cont'd)

*(Continued from page 1)*

Canada, and discussions have advanced under Dr. Mohamed Lachemi's leadership in Toronto; that of our Executive Director, Dr. Kevin Goheen, in Ottawa; that of our immediate Past President Kim Sturgess and former President Dr. Axel Meisen in Alberta; and that of Dr. John McLaughlin in Atlantic Canada. It is my fondest hope that, in the coming year, these initiatives will be as successful in other parts of Canada as they have been in Montreal.

The past year has also seen significant activity on many other fronts. The Council of Canadian Academies, an entity created some eight years ago by Canada's three national academies - the Royal Society of Canada, the Canadian Academy of Health Sciences, and our own Canadian Academy of Engineering – led by its chief executive officer Dr. Elizabeth Dowdeswell, has actively pursued its advocacy activities in favour of the renewal of its federal government funding. In the past year, these activities have included extensive talks with the three Academies for their renewed support. The key issue, still to be resolved, revolves around the issue of whether or not the Council should contribute financially to its three founding and constituent Academies. Presently, Council funding is directed exclusively to the task of managing the processes of answering questions submitted to the Council by federal ministries for the purpose of providing input to the construction of policy. In this task, the role of the three Academies is to provide the intellectual capital underpinning this important work. In the past, the government has not recognized the need to support costs borne by the three national Academies within the Council's processes. The purpose of ongoing negotiations, led by our representatives on the Council Board, Axel Meisen and Kim Sturgess, with significant support and advice from former CAE president John Leggat, aims to obtain such recognition while working to renew the Council's funding.

Another important initiative involving your Academy this year has been the Trottier Energy Futures Project, a project undertaken over three years ago in partnership with the David Suzuki Foundation and the Trottier Family Foundation under the initiative of Academy Fellow Lorne Trottier. The purpose of this study is to determine how Canada could reduce its carbon emissions by 80% of 1990 levels, and do so by the year 2050. In the past year, the project team has prepared a number of reports, a few of which have successfully been made available publicly. Approximately a dozen Fellows have been involved in reviewing these reports to ensure their scientific and technical accuracy, and I am deeply grateful for their rigor and selfless volunteer commitment. Due to its complexity, the project duration has exceeded the terms of the original agreement with our partners, and the Academy is presently engaged in talks regarding the continuation of its participation.

Your Academy also continues to engage in public dialogue on relevant topics of national importance through conferences, presentations and appearances before government committees. Last May 20 and 21, a highly successful conference was held in Sarnia under Academy auspices entitled "Bitumen – Adding Value: Canada's National Opportunity". This conference was organized as a direct result of the Academy's successful publication of June 2012 entitled "Canada: Winning as a Sustainable Energy Superpower" which proposed nine big energy projects for strengthening Canada's economy, enhancing its production of value-added energy products while reducing its carbon footprint. Keynote speakers at the conference included Frank MacKenna, Deputy Chair TD Bank Group, and Jim Stanford, chief economist, Canadian Auto Workers who, despite significantly different professional backgrounds, fully agreed on the need for far more value-added industrial activity in Canada in addition to its resource-based industry. This year's Annual Meeting, under the visionary leadership of our president-elect, Pierre Lortie, addresses the extremely important and timely topic of Canada's future in manufacturing, again reinforcing this message, highlighting yet again the role of manufacturing and value-added transformation in a sustainable economy. Over the past year, as co-editor of the "superpower book" along with Fellow Clem Bowman, I was invited to present the Academy's views on energy at the Canadian District Energy Association's Annual Meeting last June, at the Toronto Forum for Global Cities last October, at the University of New Brunswick's Deneen/Andrews lecture series in February, before the Professional Engineers of Ontario in March, at the Council for Clean and Reliable Electricity's Annual Energy Leaders Roundtable in April, and at the 2013 Ontario Power Conference, also last April. In February, I was invited to speak on behalf of the Academy before the Standing Committee of the House of Commons on Industry, Science and Technology, this time on "the state of engineering in Canada".

Over the past year, our Academy has also significantly increased its international visibility. Dr. Bob Evans, as CAE representative on the Working Group on Energy of the International Council of Academies of Engineering and Technological Sciences, more generally referred to by its acronym of "CAETS", has been an important contributor to a soon-to-be-published report on Low Emission Electricity Generation. Former president Dr. Ravi Ravindran took the lead in a joint CAE/Indian National Academy of Engineering workshop on clean coal technology which took place in New Delhi in December 2012. Fellows Dr. Dan Meneley and Dr. Terry Rogers reported on the state the Canadian nuclear industry at the 2013 CAETS meeting in Budapest. It is worthy to note that four CAETS sister academies have sent speakers to our annual meeting this year: Australia, Denmark, Switzerland and the United States.

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## President Marceau Appears Before Committee (cont'd)

*(Continued from page 5)*

### Impact

Let us now briefly address the third issue, that of the impact of engineers on Canada. Canada's industry competes in a world economy, and access to engineering talent is a key competitive advantage underlying Canada's capacity not only to maintain but grow its wealth-generating environment, either through US style innovation, or Canada's historically successful "Big Project Innovation Strategy"!

Also, for nations to be competitive, they need enlightened policy. In a world dominated by rapidly changing technology trends, understanding the deeper meaning of such trends is key to a nation's competitive position. The need for engineering input in formulating national policy has never been more important.

### Conclusion

In conclusion, access to a pool of engineers of adequate breadth and quantity is key to the sustainable social and economic development of any nation. The Canadian Academy of Engineering recommends that the federal government provide leadership in creating a joint federal-provincial partnership for greatly accelerating our nation's capacity to develop human capital in all fields of engineering. The Academy also recommends that representatives from industry, universities and the profession be called upon to provide advice on how best to achieve the needed gains in graduation rates at the bachelor, master and doctoral levels.

Again, thank you for your kind attention and the opportunity to appear before you today.

## President's Message (cont'd 2)

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In addition to all of this, thanks to the commitment and initiative of its Executive Director, Dr. Kevin Goheen, the Academy has streamlined many aspects of its operations, and improved its internal and external communications. In particular, through his efforts, the Academy has significantly upgraded its web site, improved its internal communications with its Fellows through LinkedIn, and established an Academy presence on Twitter and Facebook. Under Dr. Peter Frise's leadership, the Academy's Fellowship Committee recommended 48 candidates for election to Fellowship this year. All in all, I think you will agree that the Academy has surged forward in the past year!

Turning now briefly to the next year, with your support, that of the Academy membership, along with that of the Executive and the Board, I am hoping to bring the duration of the mandate of our Academy's presidents in line with our two sister academies, where presidents serve for two years rather than one. Such a change will ensure greater continuity of our partnerships – such as with our sister academies and the Canadian Council of Academies – and of long term projects and initiatives – such as the Trottier Energy Futures Project. I also believe that, over time, it will enable the Academy leadership to take on more ambitious projects. In partnership with the Executive Director and Fellows everywhere, I also intend to continue my efforts to stimulate the establishment of sections of the Academy where the appropriate critical mass of Fellows exists. The Board and I will also continue to participate, along with our two sister Academies, in the renewal of the Council of Canadian Academies, and to consider further participation in the Trottier Energy Futures Project. Finally, the Board has approved two Academy initiatives which will be making significant progress over the next year, the first, a task force led by Fellows Ian Jordaan and Ken Croasdale on the important topic of Engineering in Canada's Northern Oceans, the second, a follow up initiative of the Academy Energy Pathways Task Force's 2012 "superpower book", led by Fellow Clem Bowman and myself. As a final note, subject to Board approval, I am hoping to bring the Academy's 2014 Annual Meeting to St John's Newfoundland in an effort to extend the footprint of the Academy's Annual Meetings throughout Canada!

As you can see, the next year is shaping up to be yet another busy one, with many irons in the fire! However, the successes of the past year - and the foundation of our future successes - would not be possible without the unflagging support of our Fellows to the Academy's Board, to me personally, and to our collective efforts. I am deeply grateful and honoured by our Fellows' willingness to move the Academy forward in the directions that we have chosen to undertake over the past year. Rest assured that I will continue to do everything in my power to be worthy of your confidence and support.

Richard J. Marceau, FCAE, P.Eng., Ph.D.



## The CAE Focuses on the Future of Manufacturing in Canada (cont'd)

*(Continued from page 1)*

"Making Value" rather than "making things" is how Lawrence Burns, the representative of the US National Academy of Engineering, defined the task. In a nutshell, the success of modern manufacturing is predicated on brain, not sweat.

Canada is a small market accounting for about 0.5% of world population and 2.4% of world GDP. Hence, to grow, Canadian manufacturing must be competitive at the North American and global levels. We had the examples of Canadian firms such as CAE Inc., Bombardier, Pratt & Whitney Canada and others who have captured and hold global market shares in excess of 50% in their industry. The question is then to identify the environmental factors - the ecosystem – that will support and facilitate the emergence of many other Canadian manufacturing leaders at the global level and make Canada a privileged location for manufacturing activities.

### INVESTMENT IN MACHINERY AND EQUIPMENT



Symposium panellists Benoit Grenier, Jamieson Steeve and Pierre Cl roux with Session 1 Chair Richard J. Marceau, FCAE

Jamieson Steeve, President of the Institute of Competitiveness and Prosperity, reported that the main conclusion that arises from their studies is that "Canada's prosperity gap is a productivity gap, and the productivity gap is an innovation gap."

Innovation and productivity are highly dependent on the level of investment in machinery and equipment. Such investment is a key factor because new equipment and systems embody technological advances and provide powerful means to enhance efficiency and implement new approaches and best practices. It constitutes one of the most powerful technology transfer mechanism.

On this dimension, Canadian corporations fall short. Panelists pointed out that this shortfall translates, amongst other things, in the under-utilization of advanced transformative manufacturing technologies. It is no

coincidence that Canada has fallen from the 9<sup>th</sup> rank on the Global Competitiveness Index in 2009 to the 14<sup>th</sup> position in 2012.

The global economy is expected to grow faster in the next twenty years than in the last two decades. Pierre Cl roux, Chief Economist at BDC, explained that between 2009 and 2020 an additional 1.4 billion "middle class" consumers will join the market, a development that will significantly increase demand for manufactured goods. Canadian manufacturing should be well positioned to capture a not inconsequential portion of this expanding demand, but its success will have to be earned.

Manufacturing is faced with an inordinate number of disruptive technologies. Individually, each technology promises incremental improvements over today's manufacturing systems; collectively, their implementation will structurally transform manufacturing. Examples of disruptive technologies include nano-technologies, bio manufacturing and a substantial array of digital technologies: Cloud computing, mobility internet, Internet of Things, additive manufacturing (3 D-Printing), low-cost sensors and actuators for process control and optimization, virtual/math-based design, "Big Data", predictive analytics and several others. As adoption of these digital tools increases, so too will their speed and computing power. Moore's Law tells us that processor chips double in speed every eighteen months. That means a computer in 2025 will be 256 times faster than it is in 2013. Another predictive law, this one concerning photonics, tells us that the amount of data from fiber-optic cables, the fastest form of connectivity, doubles roughly every nine months. Even if these laws have natural limits, the promise of this exponential growth unleashes enormous possibilities.

Simon Olivier, Vice-President at GE Canada, reported that the daily amount of data transmitted through the extensive use of sensors on manufacturing equipment within a single GE plant exceeded the total annual data processed worldwide through Twitter. Here again, Lawrence Burns made a forceful argument that if these technologies deployed as an integrated system focused on providing compelling customer experience, the technologies would yield "compelling, low-cost and hugely differentiated products and services commanding premium prices and yielding superior returns." The demise of Kodak - which no one would have predicted the demise in the 1960s and 1970s - serves as an eloquent counterfactual and strong warning about the seriousness of the challenge and the urgent need to adapt.

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# The CAE Focuses on the Future of Manufacturing in Canada (cont'd 2)

(Continued from page 17)

Most of the disruptive technologies arise from the intensive use of IT, an area where investment by Canadian business is significantly lower than the levels observed in other advanced economies, particularly compared to the United States. This is a serious matter because the ultimate value of IT investments stems from accumulated experience in their use and experimentation.

The rapid spread and pervasive impact of these new technologies also interpellate our education establishments with regard to the content of their curricular. Knowledge is an increasing returns phenomenon. Technology has a cumulative, accelerating quality to it. The more stuff we know, the greater the base of existing knowledge, and the greater the payoff from the next discovery or innovation.



Lunch speaker Simon Olivier

## INNOVATION



Roger Miller, FCAE

Measured in terms of input, Canadian policies in support of R&D conform to "best practices" and compare favorably within OECD countries. The issue is that the output does not match the effort. As an innovative country, Canada has lost ground in the last five years. Measured by the Global Innovation Index, Canada has slipped from the 8<sup>th</sup> position in 2007 to 12<sup>th</sup> rank in 2012. Noteworthy is the fact that Northern European countries are predominant within the top 10 innovators.

Business leaders are generally concerned about their company's innovation performance. Indeed, 72% of senior executives consider innovation a top-three strategic priority; however, 42% are unsatisfied with their innovation system. Industrial companies are faced with accelerating product lifecycle, increasing pressure to reduce new product development lead time while global competition is putting heavy pressure on margins. Rémi Cornubert, a senior partner at Oliver Wyman in Paris succinctly stated the corporate challenge: "more complexity, less time, less money....but need to generate more profits." Successful and sustainable innovativeness, added Cornubert, is not the product of a "random walk" but the result of a managed process.

The interplay between advanced manufacturing and innovation is complex and adopts many forms calling for specific competencies. Dr. Roger Miller presented a typology of innovation which captures the strategies likely to succeed depending on the characteristics of the industry and the maturity of markets.

### The Six Games of Innovation

	<b>Autonomous products</b>	<b>Platform-based products</b>	<b>Closed systems</b>
Innovations in emerging markets	Eureka!	Battles of Architecture	System Breakthroughs
Innovations within mature markets	New and Improved	Mass Customization	Pushing the Envelope

Source: Roger Miller & Marcel Côté, *Innovation Reinvented*, University of Toronto Press, 2012

Industry and academic participants emphasized the fact that electronics and software are gaining in importance due to higher connectivity needs for all types of devices, be it for industrial, institutional or consumer products. Moreover, rising environmental pressure puts new constraints on product design. To properly address this new reality, innovation needs to be conducted through design in a collaborative, multidisciplinary and broad-minded approach grounded on in-depth market knowledge.

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## The CAE Focuses on the Future of Manufacturing in Canada (cont'd 3)

(Continued from page 18)

It was generally recognized that successful innovations are driven by competition in the quest to respond to customer needs. Four major dimensions were highlighted:

- Scale is a key factor. It was reported that 67% of Canadian manufacturers face competition in their primary market from global firms. Hence, the crucial importance of trade agreements with our principal trading partners (i.e., NAFTA, the EU, Japan, South Korea, TTP) to provide unhindered access to equivalent size markets.
- Leading and large industrial groups are "locomotives" around which various firms should coalesce to form globally competitive "teams." Drawing on his international experience, Rémi Cornubert suggested that "governments and businesses must foster the emergence of strategic ecosystems, combining several sectors to create new products, services and businesses." Professors Hans-Rudolph Helfer and John Johansen of the Swiss and Danish Academies of Engineering, respectively, testified that, indeed, such "strategic ecosystems" were one of the main factors contributing to the ranking of their countries in the top 10 innovators.
- Collaborative R&D between universities, research establishments and industry, is an essential ingredient. To ensure manufacturing companies of all sizes are able to participate in the transformations brought about by the rapid adoption of the new disruptive advanced manufacturing technologies, Canada needs a national network of manufacturing innovation institutes as public-private partnerships to accelerate the diffusion of these technologies across the country and foster the development of competitive ecosystems in advanced manufacturing technologies.
- The correct education is a mandatory condition. The time may have come to dramatically rethink the overall education system with a greater focus on science, technology, engineering and mathematics. Educational establishments, particularly universities, should also play a proactive role in bridging the gap between education and work by forming closer relations with local manufacturing companies, and embracing apprenticeships.

### HUMAN RESOURCES

Advanced manufacturing is dependent on highly qualified personnel ranging from skilled trades people to engineers and other professionals. There was a consensus that the quality of Canadian engineers matched that of other advanced economies. Simon Olivier comforted the positive assessment of the quality of our engineering faculties with the example of the GE aerospace plant in Bromont which over the years consistently ranked as one of the most innovative and productive in their global network.

The question remains: will Canada have sufficient human capital to drive innovation and growth at a globally competitive pace? Looking forward, the picture is worrisome. Benoit Grenier, Vice-President at Mercer, reported that their research reveals that 71% of Canadian manufacturers indicate that highly skilled talent is in short supply. The talent shortages are experienced by all sizes of companies, in all regions of the country and carry significant economic consequences, including constraining business growth.

In short, Canada's labour market imbalance is one of the largest threats to our economy.

First, the issue is not one of quality but of quantity of well-trained engineers. The demographics mean that Canada must produce significantly more engineers to meet the growing demand **and** replace the 95,000 Canadian experienced engineers that are expected to retire in the next seven years. Queried about the reliability of this forecast, it was pointed out that although predicting the future is a risky endeavour, in the case of demographics, the numbers were already "baked in."



Session 2 Chair Élie Saheb, FCAE (centre) with panellists Hans-Rudolph Helfer, Lawrence D. Burns, Bruce Grey and John Johansen

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## The CAE Focuses on the Future of Manufacturing in Canada (cont'd 4)

*(Continued from page 19)*

Second, Canadians have a bias against trade jobs. Even though 40% of new jobs in the next 20 years in Canada are forecast to be skilled trades or technology, Benoit Grenier presented survey results that showed that 60% of Canadian youth reported that their parents have not encouraged them to consider a career in the trades and that they were not informed about the breath of high-paying career opportunities in these occupations.

Third, to compound the problem, our education systems are not well organized to provide effective tradecraft training. In the past, a significant portion of our requirements for skilled employees were filled by immigration; this source is unlikely to be sufficient in the future because of the worldwide demand for this category of personnel, hence, the need to do much better at home.

The demographic shift, a deepening shortfall of skilled workers and the growing mismatch between the skills needed and those available have combined into an undeniable talent crisis that could jeopardize the future of manufacturing in Canada. There was consensus that bridging the gap by bringing together the key stakeholders – Canadian manufacturing companies, Canadian policymakers and education institutions – into a concerted approach should become a national priority.

### CONCLUSION

Manufacturing is a vital sector of the Canadian economy. It accounts for 13% of our GDP, 63% of Canadian exports, 80% of private sector R&D, 85% of all new patents and 30% of tax revenues. However, it will grow and prosper only if it is successful in offsetting its higher structural costs by offering differentiated and unique solutions to the markets and achieving high productivity in all aspects, from R&D to after-sale services. This requires Canadian business to:

- Develop long-term relationships with customers and acquire in-depth understanding of their evolving needs and expectations;
- Achieve alignment between corporate strategy, innovation strategy and capital and human resource allocation;
- Excel in the efficient management of manufacturing processes, technologies, product development and time to market.

New skillsets to absorb knowledge will not suffice to ensure success. We also need a new mindset that supports constructive relationships within workplaces, research organisations and government agencies – and across all three. This is about relationships, not rules.

The example of Switzerland, which remains in first place since 2009 in the Global Competitiveness Index, demonstrates the critical importance of a supportive ecosystem. Professor Helfer stressed some of the key attributes that allowed Swiss manufacturing to prosper despite a very high cost base: deep collaboration between the manufacturing actors in the value chain within Switzerland, world-class scientific research institutions, strong collaboration between academic and business sectors, high company spending on R&D, on-the-job training opportunities and high productivity.

Many insightful and practical suggestions were made throughout the Symposium to strengthen the Canadian ecosystem in support of advanced manufacturing, notably to achieve a better alignment between schooling, training and the workforce. The conversation of the future of manufacturing also stressed the ubiquity of digital technologies in all aspects of life and the need to anticipate and take into account its profound impact on social norms and behavior. The Symposium produced much food for thoughts that will underpin the "White Paper" on the future of manufacturing the Academy plans to publish later this year.

<sup>1</sup> Charles F. Kettering, American inventor and businessman

## News from Engineers Canada (cont'd 2)

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the award for his article on the use of microbial biotechnology to create 'forest biorefineries.' The objective of the award is to encourage quality articles and reports on engineering that increase the public's respect and awareness of the profession.

Explore [www.engineerscanada.ca](http://www.engineerscanada.ca) to get more information on these and other Engineers Canada activities or sign up for our weekly newsletter at [www.engineerscanada.ca/e/pu\\_newsletter.cfm](http://www.engineerscanada.ca/e/pu_newsletter.cfm).

# Executive Director's Report



Fellows should now have experienced some of the changes that the Board and the staff have been implementing at the CAE since I joined 18 months ago. Those 100+ Fellows who have accepted my invitation to join our LinkedIn group will now be receiving news from us a few times each week, and if you follow us on Facebook [www.facebook.com/CanadianAcademyOfEngineering](http://www.facebook.com/CanadianAcademyOfEngineering) or Twitter <https://twitter.com/TheCdnAcadofEng>, you will see even more frequent news items about our activities and those of your colleagues. You can now pay for your membership with credit cards and soon you will see us rolling out a new website with a modern look and modern capabilities including ecommerce, and paperless Fellowship nomination and voting. We have also updated many of our internal processes, such as our banking, telecommunications and insurance.

With those infrastructure changes in place, we can now focus on advancing our mission, which has two parts:

- 1. Honouring the best Canadian engineers.** In recent years, various CAE committees have noted the trend to more favour academic appointments over those engineers who work in the private sector, or in government. The root causes of this have been debated endlessly, but the ratio will not become more balanced unless we receive nominations from those two sectors. Our office maintains a database of eminent Canadian engineers who are not Fellows. Some of the omissions I find quite shocking. I would encourage you to ask me for this list and begin working on nominations, which we should receive by the middle of October. This allows me the time to comment on your first draft and for you to make any recommended revisions. Please note that the Board has recently approved a new Nomination form, so please ensure that you are using the most recent version.
- 2. Public policy debates.** Other than a few notable exceptions i.e. the work of the Energy Pathways Task Force, our CAETS' projects, Richard Marceau's presentation to the Commons Committee on 7 February 2013 and a good beginning with the results of the Future of Manufacturing symposium, in my opinion, the CAE has very little impact in public policy. There are some good initiatives, such as the new Northern Oceans Task Force, and some proposals from a couple of the Sections for studies which then can be disseminated to the public, policy makers in all levels of government and politicians. However, I think we can do a great deal more. I was approached by Fellows at the Annual Meeting with idea of studies on infrastructure renewal, and cyber security. These are great ideas and I would be pleased to help Fellows with good ideas such as these to help you execute on them. Another initiative which we have recently undertaken is to cooperate with the Science Media Centre of Canada ([www.sciencemediacentre.ca/smc/](http://www.sciencemediacentre.ca/smc/)), a non-profit non-partisan organization partially funded by Engineers Canada. The goal of the SMCC is to educate media about science and engineering issues in order to provide better media coverage to the public. Through the cooperation of some of your colleagues, we have already provided important facts about nuclear liability, chemical weapons and flooding to the mainstream Canadian media. If you are interested in participating in this program, please let me know.

In closing, I will reiterate my standing invitation to any Fellow to visit us if they find themselves in Ottawa. My best opportunity to meet Fellows is at our Annual Meeting, but I find that we are so busy that unfortunately I only have a few moments to talk with anyone. I am always happy to meet with people with good ideas and an interest in advancing our mission.

Best wishes for a great summer.

Kevin Goheen, P.Eng., Ph.D.

## Annual Meeting 2014

Plans are being made for the 2014 AGM, Induction of New Fellows and Symposium. The event will take place in mid- to late-June in St. John's, Newfoundland and Labrador.

Further details will be available on our website soon.

We hope to see you there!

