THE CANADIAN ACADEMY OF ENGINEERING
Leadership in Engineering Advice for Canada

L'ACADÉMIE CANADIENNE DU GÉNIE
Chef de file en matière d'expertise-conseil en génie pour le Canada

NEWSLETTER / COMMUNIQUÉ

Number 70 Winter 2013

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

Inside this issue:

President's Message

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

Colleagues and friends,

You will recall in our last Newsletter that my top priority as president of your Academy this year was to undertake the implementation, on behalf of the Board of Directors, of local sections of the Academy across Canada, where the number of Fellows warrants such an initiative. As we enter into the New Year, I am pleased to inform that we have made rapid progress, and I would like to share some of this exciting news with you!

In Toronto, a group of Academy members, under the leadership of Fellow Mohamed Lachemi, Dean of the Faculty of Engineering and Architectural Science at Ryerson University, have begun the work of setting up a Section. In Ottawa, on November 13, 2012, Kevin Goheen, Executive Director of the Academy, invited a group of 10 Academy members to meet for lunch to discuss the opportunity of setting up a Section there. In Calgary, Ross D. S. Douglas and Past President Kim Sturgess held a meeting on December 5, 2012 to discuss creating a Section. Also in Alberta, Past President Axel Meisen is leading an initiative to explore the opportunity of creating a formal Academy presence in Edmonton.

In Montreal, on December 3, 2012, Fellow Yves Beauchamp, Head of the École de Technologie Supérieure, held a meeting to discuss the opportunity of setting up a Section. Invitations were sent out to over one hundred members, and nearly fifty members responded by participating, including Fellow Jean-Paul Gourdeau, a founding Fellow (1987) and the Academy's seventh president (1994), and Fellow John Dinsmore who joined the Academy in its second year of existence (1988)! Attendees came from as far away as Sherbrooke, Quebec, 140 km from Montreal (Fellow Louis Cloutier)!

Fellow Robin Drew, Dean of the Faculty of Engineering at Concordia University, was master of ceremonies, and Fellow André Bazergui, former Head of École Polytechnique de Montréal, spoke eloquently of the need to actively engage its Fellows, to expand the Academy's visibility,

(Continued on page 2)

We've Moved! – In Cyberspace

The New Year brings a new domain name to the Canadian Academy of Engineering. Please update your records!

Website: www.cae-acg.ca

E-mail:

Kevin Goheen – Executive Director: kgoheen@cae-acg.ca
Valérie Broadfoot – Office Manager: vbroadfoot@cae-acg.ca
Richard J. Marceau – President: president@cae-acg.ca
General: info@cae-acg.ca

President's Message (cont'd)

(Continued from page 1)
and to seize the opportunity to increase its impact on the community. The enthusiasm for creating a Section in Montreal was palpable, and motions were duly proposed and voted on to elect an interim Chair of the Montreal Section (André Bazergui) and an interim Vice-Chair (Yves Beauchamp) tasked to finalize the terms of an official agreement creating a formal Section of the Canadian Academy of Engineering in Montreal. The evening ended with an invitation by Fellow Christophe Guy, Head of École Polytechnique de Montréal, to attend a signing ceremony in March 2013 at his university, formally creating the Montreal Section of the Academy. As the evening was wrapping up, a number of Fellows were suggesting ideas of potential initiatives that could be taken on by the future Section.

As can be seen, the Academy is moving forward! There is a sense that the Academy is becoming a dynamic organization, and our Fellows are anxious to be involved, and to actively contribute to the Academy's fundamental tenet of providing "Leadership in Engineering Advice for Canada".

If you wish to assist in the creation of one of the above sections, please do not hesitate to connect the following:

Toronto: Mohamed Lachemi (mlachemi@ryerson.ca)
Alberta: Kim Sturgess (kim.sturgess@albertawatersmart.com), Axel Meisen (axel@meisen.ca)
Ottawa: Kevin Goheen (kgoheen@cae-acg.ca)
Montreal: André Bazergui (andre.bazergui@gmail.com), Yves Beauchamp (yves.beauchamp@etsmtl.ca)

We are still looking for Fellows to lead the creation of Academy Sections in areas where a critical mass of Fellows would allow such an initiative. If you would like to discuss such an opportunity, please do not hesitate to connect with me at richard.marceau@uoit.ca.

I look forward to hearing from you.

Richard Marceau
Provost and VP Academic, UOIT
President, The Canadian Academy of Engineering

THE CANADIAN ACADEMY OF ENGINEERING
Leadership in Engineering Advice for Canada

L'ACADÉMIE CANADIENNE DU GÉNIE
Chef de file en matière d'expertise-conseil en génie pour le Canada

Contact Information

1402 - 180 Elgin Street, Ottawa, Ontario, K2P 2K3, Canada
Telephone: (613) 235-9056 — Fax: (613) 235-6861
info@cae-acg.ca — www.cae-acg.ca
Facebook — LinkedIn

President: Richard J. Marceau
president@cae-acg.ca
(905) 721-3147

Executive Director: Kevin Goheen
kgoheen@cae-acg.ca
(613) 235-9056 x 223

Office Manager: Valérie Broadfoot
vbroadfoot@cae-acg.ca
(613) 235-9056 x 222

Board of Directors 2012/2013

Fellows in the News

Garry Lindberg received an Honorary Doctor of Science degree from the University of Alberta on June 7, 2012. A former vice-president of the Canadian Space Agency, Lindberg played an integral role as project manager for the Canadarm, or Space Shuttle Attached Remote Manipulator System. Named one of the top 25 engineering wonders of Canadian science, the Canadarm was a success that enabled Canada to become a leader in robotics innovation. Lindberg also oversaw the creation of the Canadian Astronaut Program and played a key role in establishing the Canadian Space Agency in 1989.

Michel Rigaud, Emeritus Professor, Department of Mechanical Engineering, at École Polytechnique, Université de Montréal, has received the 2012 Arcelor-Mittal Dofasco Award from the Metallurgy and Materials Society of the Canadian Institute of Mining and Metallurgy, during the 51st Conference of Metallurgists meeting, October 2nd 2012, in Niagara Falls, Ontario. This award recognizes those who have distinguished themselves through highly significant contributions to the advancement of materials engineering in Canada.

Kathy Sendall recently received an Engineers Canada Fellowship. Ms. Sendall was President of the CAE in 2005.

Thierry Vandal, Hydro Quebec's CEO, was awarded the 2012 Canadian Energy Person of the Year award by the Energy Council of Canada. This award recognizes and pays tribute to leaders in Canada who have made significant impacts at both the national and international levels with respect to energy. Since joining Hydro-Québec over 15 years ago, Thierry Vandal focused his attention on maintaining and improving the legacy that the company will leave to future generations in Québec and North America. Developing renewable energy and maintaining competitive rates for the company's customers are also top priorities.

H. Neil Windsor was recently named a fellow of the Canadian Society for Civil Engineering, for his impressive career achievements, including a 21-year political career in the Newfoundland House of Assembly and 15 years as the CEO of APEGA.

Kimberly Woodhouse, member of the CAE Board of Directors, has been appointed as a member of the Natural Sciences and Engineering Research Council of Canada (NSERC). Dr. Woodhouse is Dean of the Faculty of Engineering and Applied Science and Professor with the Department of Chemical Engineering, both at Queen's University. She is also the Director of Product Development for Elastin Specialties Inc. In addition to NSERC, Dr. Woodhouse sits on several boards and committees of Queen's University and on the Editorial Board for the Journal of Biomedical Engineering: Polymer Edition. She also serves as Vice-Chair on the Canadian Engineering Accreditation Review Panel. Dr. Woodhouse is a Fellow of BioMaterials Science and Engineering, as well as the recipient of Engineers Canada's Medal for Distinction in Engineering Education and the Premier's Research Excellence Award.

2013 Annual Meeting - Mark Your Calendars!

We are pleased to announce that our next Annual Meeting will take place on June 20 & 21, 2013 in Montreal, Quebec. The two-day event will start on Thursday, June 20 with our symposium on the theme: 'The Future of Manufacturing in Canada: The Way Forward'. Later that day, we will be hosting a reception and dinner, which will include the induction of new Fellows. Activities on Friday, June 21 comprise the continuation and wrap-up of the symposium, followed by our AGM and lunch. At this time, we are planning to offer an optional tour of a near-by manufacturing facility on Friday afternoon – stay tuned!

An Historical Update (2002 – 2012) of the CAE

by Michael E. Charles, FCAE

The Canadian Academy of Engineering was founded in 1987. In the last Newsletter, #69, Drew Wilson outlined the rather tortuous birth of the Academy within the somewhat complex milieu in Canada at the time. The late Gordon Slemon wrote an historical account covering the first fifteen years through to 2002 focused on the growth of the membership, projects undertaken within a limited resource base, and the international context. It is available to members on the Academy's website.

With the celebration of the Academy's 25th Anniversary at the Annual Meeting in Ottawa in June 2012, it is timely to provide an historical update covering the last ten years or so for the benefit of all Fellows, but especially for those admitted to the Academy recently. It is useful in looking ahead to identify trends over the last ten years flowing from where we have been and which influence where we may want to go.

Demographics

We can start with the demographics of the fellowship. Back in 1994, with a total membership of 193, 59% of Fellows were based in industry (including consulting), 25% in engineering schools and 16% in government and associations. Since then, we have seen a dramatic shift in these proportions, particularly over the last ten years. By 2002 with 297 members (including both active and emeritus categories), the proportions were respectively 55%, 37% and 8%, by 2007 among 384 members they were 48%, 44% and 8%, and in 2012 with 546 members they had become 40%, 54% and 6%. While the number of members based in industry has grown from 113 in 1994 to 221 in 2012, the number of members from engineering schools has grown more rapidly from 49 to 293 so that the majority of the membership has shifted dramatically from industry to the university sector.

What accounts for this shift? First, it should be noted that membership in our Academy is by way of nomination to the Fellowship Committee which meets annually. The Committee reviews all nominations individually in detail and recommends a list of potential new Fellows for approval by the membership at large. The Committee has no quotas other than that now the total number recommended in any one year cannot exceed 50. So the shift in membership is driven by a shift in nominations.

Canada is fortunate to have many strong engineering schools, all of which have grown significantly over the past 10-15 years, particularly into areas such as information technology, energy and environment, bioengineering, including biomedical engineering, and nanotechnology. As a consequence of federal and provincial funding, our engineering schools have been able to attract outstanding new faculty from around the world. Over the past three years, the Times of London international ranking of engineering schools included four Canadian schools (Toronto, UBC, McGill and Waterloo) in the top 50, an acknowledgment of this outstanding pool of talent which is now reflected in the nominations. Canadian engineering schools have strong design programs, and research which has led to many commercial applications.

Prompted in part by the shifting balance in membership, Axel Meisen, as then Past President, was asked to Chair an Ad Hoc Committee on Membership Balance. It reported in 2011 and encouraged proactive nomination of engineers practicing in industry and of women practicing engineering. (By 2012, the number of women within the fellowship had grown to 30, but still less than 6% of the membership.) It also proposed several additional membership categories including international membership, corporate membership, and associate membership for non-engineers. The Board has yet to act on these proposals. In the context of overall balance, the emphasis has been on encouraging nominations of individuals practicing in industry, rather than putting a limit of some kind on the number of members from engineering schools.

Annual Meetings

The main "coming together" event for our Academy is the Annual Meeting. The primary responsibility for organizing these has rested with the President-Elect, backed up by a committee and the Executive Director and Office Manager in Ottawa. Locations over 2001-2012 have included Montreal (2), Ottawa (3), Toronto (3), Calgary (3) and Vancouver (1). Prior to 2001, all meetings had cycled between Montreal, Ottawa and Toronto. Annual Meetings have three components: induction of new Fellows, the AGM, and a technical program. Starting in 2010, the inductions have taken place at a gala dinner and the technical programs have become more substantial in terms of time and content. Typically, Annual Meetings attract about one hundred Fellows.

Technical themes have included energy and climate change (Calgary, 2001), fool-proof buildings (Ottawa, 2002), engineering innovation (Montreal, 2003), expanding the boundaries of engineering (Toronto, 2004), water for life (Calgary, 2005), the automotive industry in Canada (Ottawa, 2006), engineering and public policy (Toronto, 2007), imagination in engineering (Montreal, 2008), natural resources – management and sustainability (Calgary, 2009 with CAETS), low emission electricity generation, distribution and use in transportation (Toronto, 2010), Canada as a sustainable energy superpower – realizing the vision (Vancouver, 2011), and Canada in aviation and space: past, present and future (Ottawa, 2012). It is clear that themes have attempted to focus on current issues and opportunities.

(Continued on page 7)

INAE – CAE Clean Coal Technologies Workshop

Canadian delegation: Ravi Ravindran, Sushanta Mitra, Prabir Basu, Sudhir Bhattacharjee, Rajender Gupta

The Canadian Academy of Engineering (CAE) and the Indian National Academy of Engineering (INAE) organized a Joint Conference on Clean Coal Technologies in New Delhi on December 4, 2012. This was in due recognition of the fact that Canada and India are endowed with a variety of energy sources, and coal is a dominant source for power generation in both countries. The CAE delegation was led by Past President Prof. Ravi Ravindran. The INAE delegation leader was Vice President (Academic, Professional and International Affairs) Prof. K.V. Raghavan. The conference was chaired by INAE President Dr. Baldev Raj. The Canadian High Commission was represented by First Secretary Ms. Ivy Lerner-Frank, who gave an update on many Canada-India initiatives, and promised support for this conference and possible joint endeavours. The CAE team consisted of Prof. Rajender Gupta (Coal Utilization and its Impact on Clean Coal Technologies), Prof. Prabir Basu (Fluidized Bed Combustion and Biomass Cofiring), Prof. Sushanta Mitra (Bioconversion) and Prof. Subhir Bhattacharya (Water Intensity of Coal Based Power and Water Footprint). The Indian Team covered topics including Coal Beneficiation, Coal Research in India, Liquefaction, and Precumbustion and Postcombustion Carbon Dioxide Capture.

There was a consensus on the need for reducing GHG emissions and Coal Upgrading to reduce emissions and increasing efficiency. Potential inter-academy initiatives include collaborative research partnerships with possible focus on characterization of coals in different regions of Canada and India, development of water intensity and water footprint data for clean coal technologies, bioconversion options for coal processing and future joint CAE-INAE conferences (annual or biennial). It was an excellent inter-academy conference with high quality presentations, stimulating discussion and potential for further interaction with attendant benefits to Canada and India.

Trottier Project Advances on Several Fronts

PROJET TROTTIER POUR L'AVENIR ÉNERGÉTIQUE
TROTTIER ENERGY FUTURES PROJECT

The Trottier Energy Futures Project (TEFP) closed out 2012 with activity on several major fronts, including a webinar on energy futures modeling, a workshop on the sustainable supply of bioenergy feedstocks, two publications set for release early 2013, and—most important of all—a comprehensive scenario that points the way to a low-carbon energy future for Canada.

The project, a partnership between the Canadian Academy of Engineering and the David Suzuki Foundation, is made possible through a generous contribution from the **Trottier Family Foundation** of Montreal. **Dr. Lorne Trottier** and other CAE Fellows are playing an active role in the project, contributing their expertise to some of the key challenges along the road to reducing Canada's energy-related greenhouse gas (GHG) emissions.

- On December 11 and 14, TEFP Managing Director **Ralph Torrie** joined **Michael Hoffman** and **Bert McInnis** of *whatIf? Technologies* to present a webinar on the Canadian Energy System Simulator (CanESS), the quantitative model that serves as the backbone for the TEFP's research and analysis. The sessions generated valuable discussion with participating CAE Fellows and Suzuki Foundation staff.
- On December 6, CAE Fellows **Jean Paris** and **Grant Allen** participated in a facilitated dialogue on the sustainable volume of bioenergy feedstocks that will be available to Canada in 2050. Participants considered the significant increase in biofuels production that would be required in a low-carbon energy scenario and discussed the factors that would either limit or boost feedstock availability.
- Early in 2013, the project will release its first two research papers, *Low-Carbon Energy Futures: A Review of National Scenarios*, and *An Inventory of Low-Carbon Energy for Canada.* Each paper received in-depth review comments from several CAE Fellows.
- Energy Policy Analyst **Tyler Bryant** completed a 140-page reference document that lays out the assumptions and steps built into the TEFP seed scenario—the project's first comprehensive look at how Canada could achieve an 80% reduction in its energy-related GHG emissions by 2050. The report is not intended for publication, but will available as a central reference for project staff and partners.

CAE Fellows who would like further information on the Trottier Project are encouraged to contact **Ralph Torrie**, rtorrie@trottierenergyfutures.ca, or TEFP Deputy Director **Mitchell Beer**, mbeer@trottierenergyfutures.ca.

Deceased Fellows

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

Henri Audet, elected in 1991, deceased November 3, 2012.
D. J. Laurie Kennedy, elected in 1995, deceased July 1, 2012.
Ralph N. McManus, elected in 1989, deceased March 14, 2012.
O. John C. Runnalls, elected in 1995, deceased October 14, 2012.

In Memoriam

Henri Audet, a pioneer of the Canadian cable television industry, has died at the age of 94. Trained as an engineer, Henri Audet left a job at the CBC to start up a television station in Trois-Riviéres, Que. in 1957. He built Cogeco into a major Canadian cable and media player. Cogeco Cable is now Canada's fourth largest cable television distributor.

D. J. Laurie Kennedy, Professor Emeritus, Faculty of Civil Engineering, University of Alberta., passed away on July 1, 2012. All who met or knew him will miss his laughter, jokes and passion for life. He was a phenomenal man with a big heart as well as a distinguished structural engineer admired by his peers. He had an exceptional life from February 28, 1929 to July 1, 2012.

Ralph Norman McManus passed away on March 14, 2012, at age 93 years. Ralph's spirit lives on in many landmark Alberta works. He served as the structural engineer for both the Groat and James MacDonald bridges in Edmonton; the Chin Reservoir crossing in southern Alberta; and his favorite project of all – the Dunvegan suspension bridge across the mighty Peace River.

O. John C. Runnalls passed away peacefully on October 14, 2012 in his 88th year. He began his career in 1951 in Chalk River with Atomic Energy of Canada Ltd. and held various senior research and development positions over a 20-year period. From 1971-1979 John was the Senior Advisor of Uranium and Nuclear Energy for the Department of Energy, Mines and Resources in Ottawa and was Executive Vice-President of Uranium Canada Ltd. from 1974-1979. In 1979 John was appointed the 1st incumbent of a new Chair in Energy Studies with the Faculty of Applied Science and Engineering at the University of Toronto and in 1983 became Chairman of the Centre for Nuclear Engineering.

Several CAE Fellows Receive 2012 Ontario Professional Engineers Awards

Award winners include the following four CAE Fellows:

- **Bert Wasmund**, *The Gold Medal*

The premier award of the profession is the Gold Medal, which is awarded only when there is an outstanding candidate. It is given to an association member who is recognized widely as a distinguished practitioner of the profession and has rendered outstanding public service in other fields on a federal or provincial basis. The recipient should be recognized by the public as a professional engineer and a dedicated public servant, who has made significant sacrifices of time and effort to benefit society.

- **John Bianchini**, *The Engineering Medal – Management*
- **Catherine Karakatsanis**, *The Engineering Medal – Management*

The Engineering Medal is given to association members who have contributed substantially to advancing the engineering profession in any of its branches. Recipients' achievements are significantly above the normally high standards of the profession. The Engineering Medal – Management is awarded for managing and directing engineering projects or enterprises, where innovative management practice has contributed significantly to the overall excellence of the engineering achievement.

- **C. Ravi Ravindran**, *The Engineering Medal - Research and Development*

The Engineering Medal is given to association members who have contributed substantially to advancing the engineering profession in any of its branches. Recipients' achievements are significantly above the normally high standards of the profession. The Engineering Medal - Research and Development is awarded for using new knowledge in developing useful, novel applications, or advancing engineering knowledge or applied science, or discovering or extending any of the engineering or natural sciences.

An Historical Update (2002 – 2012) of the CAE (cont'd)

(Continued from page 4)

Projects and Publications of the Academy

All publications are available on our website. Our Academy published a series of brief topical opinion pieces entitled "Engineering Issues" over the period 1991 to 2003. Within the timeframe of the current review, "Security and the Engineering Profession in Canada" was addressed by Arthur Heidebrecht in #9 in 2002 and "Energy and Climate Change" was addressed by Jozinus Ploeg in #10 in 2003. Since then, opinion pieces have appeared in the expanded Academy Newsletter. Substantial reports, typically based on workshops around important topics, have appeared, on average, about one per year since 2002. The project led by John McLaughlin in 2005 on "Major Directions for the Future of Engineering", which produced an insightful, high-level document, deserves special mention. This, in part, laid the foundation for ongoing strategic planning. And then, over the period 2006 to the present, we have the series of reports on energy issues generated under the leadership of Clem Bowman and Richard Marceau based on a number of workshops involving many members of the Academy and extensive consultation outside the Academy. The Energy Pathways Task Force issued its Phase I report in 2007. It outlined "national technology projects" on gasification of fossil fuels and biomass, carbon dioxide capture, and upgrades to electrical infrastructure, proposed a network for bioconversion demonstration processes, identified energy opportunities and recommended that Canada should stay connected to fusion energy developments. The follow-on Canada Power Grid Task Force developed the case for expanded electricity grid connections in order to meet the nation's long-term needs. In its 2010 report it emphasized improved access for wind and solar energy sources, and enhanced capacity for energy storage. And it spoke of the importance of east-west, in addition to north-south, connectivity.

Arising out of the work of these task forces the notion of Canada as an energy superpower emerged, with the potential engineering projects deemed necessary likened to the major infrastructure projects which have built and sustained Canada since its very beginning. All this is set out in the book "Canada: Winning as a Sustainable Energy Superpower" authored by Clem Bowman and Richard Marceau published in 2012.

In 2008, the David Suzuki Foundation (DSF) approached our Academy informally with the suggestion of a joint project to be substantially funded by the Trottier Family Foundation and focused on reducing Canada's greenhouse gas emissions. (Lorne Trottier is a Fellow of our Academy.) Lengthy discussions within the Academy, and negotiations with the DSF resulted in a formal agreement signed in 2010 by Axel Meisen as President to establish the Trottier Energy Futures Project (TEFP). Michael Charles as the incoming President served on the inaugural Board. This ongoing project has a goal of identifying the path to reduce Canada's emissions by 80% by 2050. Also in 2010, our Academy submitted a brief to the Federal Expert Panel on Research and Development in Business. In this document, Michael Charles stressed the importance of the process of engineering in the context of increasing Canada's capacity for innovation and that technological design should be regarded as part of business focused R&D.

Strategic Planning

Several initiatives on strategic planning have taken place. As President, the late Morrel Bachynski led the process that produced "The CAE 5-Year Plan: The Will to Invent Our Future" presented to the 2004 AGM. Comprehensive and ambitious, it is a compelling document and still relevant. Subsequently, Moyra McDill produced "A Critical Look at the CAE – Where Do We Stand?" in 2007 by comparing us with the international array of similar academies. Recognizing that while a number of successes arose out of the 2004 plan there were many shortcomings in its implementation, John Leggat as President led a consultative process to revisit strategic planning and presented a redeveloped document to the 2009 AGM built around insight, inspiration and influence. While perhaps less ambitious than the 2004 document, it still set out a challenging action plan which itself was revisited by Kim Sturgess as President in 2012 when a more limited number of action items were targeted.

Council of Canadian Academies (CCA)

Early in the decade, our Academy along with the Royal Society of Canada and the nascent Canadian Academy of Health Sciences sought recognition and funding from the Government of Canada in support of their respective missions, all of which include offering advice on matters of national importance. Rather than provide funding directly to the academies, the decision was made to create and fund a new organization – the Council of Canadian Academies – as a kind of umbrella body whose mission is to undertake assessments on matters presented to it by departments of government. In carrying out such assessments, the CCA calls upon expertise resident in the three academies. While the Council undertakes important work, it cannot support the basic operations of the academies. However, the Council has in recent years supported the induction of new Fellows into our Academy as a sponsor of our annual meetings. Former CAE Presidents who have served, or are serving on the CCA Board include John Leggat, Ron Nolan, John McLaughlin, Axel Meisen, Kim Sturgess and Kathleen Sendall. In addition, Tom Brzustowski has served as Chair of the Scientific Advisory Committee. Operational in 2006, the CCA has a ten-year mandate.

(Continued on page 11)

Engineers Canada News

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. It renewed its governance model and mandate and updated its bylaws to reflect these changes.

Engineers Canada welcomed Kim Allen, FEC, P.Eng., as chief executive officer in September 2012. Mr. Allen is a dynamic leader committed to finding creative solutions and implementing winning strategies. He brings to his new role the experience of being chief executive officer and registrar of Professional Engineers Ontario for nearly a decade. One of his top priorities will be to enhance collaboration between Engineers Canada and its 12 constituent associations, governments and other organizations.

The organization is continually working towards assisting the constituent associations in improving licensure processes for international engineering graduates in Canada. By the end of 2012, Engineers Canada will have evaluated the results of pilot projects for the *Competency-Based Assessment System for Engineering Work Experience* project, and will provide a final report with recommendations for the constituent associations on implementation. The project has developed competencies, an assessment system and all necessary training tools, form and guides to assess the engineering work experience of applicants for licensure. This will create a more consistent assessment of engineering experience leading to enhanced access to engineering expertise, abilities and experience for the Canadian public.

The end of January 2013 is the anticipated launch of the *International Engineering Graduate Roadmap*, a website to help international graduates navigate through the process of becoming licensed in Canada and to direct them to the appropriate engineering regulator. This will enhance the quality and accessibility of information already in place to help international engineering graduates with employment and integration into the Canadian engineering workforce.

Finally, the *Canadian Framework for Licensure* is an initiative to develop foundational documents which can be used as model regulatory policies and practices by the constituent associations. Developed through a comprehensive analysis and national consultation process, these documents outline the elements of a framework for regulation of the engineering profession. The *Framework* currently has over 30 elements in various stages of development.

In other news, with the idea of underlining the importance of engineering in mind, Engineers Canada has created the Award of Journalism Excellence in Engineering. 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. Engineers Canada accepted nominations until January 14, 2013.

Explore 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 and click on Current Issue.

Council of Canadian Academies Update

The second half of 2012 has been particularly busy for the Council, with the release of no fewer than four reports since June. *Informing Research Choices: Indicators and Judgment* was the first of the four reports, it was released in July. It was followed days later by the Council's workshop report, *40 Priority Research Questions for Ocean Science in Canada*. In September the Council launched *The State of Science and Technology in Canada, 2012*. In late November the Council released its report on Women in University Research entitled *Strengthening Canada's Research Capacity: The Gender Dimension.*

Looking forward to 2013 the Council has a wide range of assessments underway and is working at full capacity. We expect to release final reports on subjects such as Water and Agriculture, Industrial Research and Development, Measuring Innovation and Oceans Capacity throughout the next year. To see the full range of assessments, visit http://www.scienceadvice.ca/en.aspx. To keep up to date on our regular activities you can follow us on Twitter @scienceadvice or sign up to our mailing list by visiting the home page of our website, listed above.

The Council of Canadian Academies is pleased to have four Fellows of the Canadian Academy of Engineering working on four assessments at the present time: Kathleen Sendall, who is the chair of the Expert Panel on the State of Industrial Research and Development; Claude Lajeunesse, who is also serving on that panel; Robert L. Evans, who is serving on the Expert Panel on Canadian Industry's Competitiveness in Terms of Energy Use; and Hadi Mahabadi who is serving on two panels, Expert Panel on the State of Industrial Research and Development, and the Expert Panel on Socio-Economic Impacts of Innovation Investments. CAE Fellow P. Kim Sturgess has also recently joined the Council's Board of Governors. Congratulations Kim!

CAETS Update

by Kevin Goheen, CAE Executive Director

The CAE is a member of CAETS (International Council of Academies of Engineering and Technological Sciences, Inc.), an independent non-political, non-governmental international organization of engineering and technological sciences academies, one member academy per country, with the objectives, amongst others, to advise governments and international organizations on technical and policy issues related to its areas of expertise and contribute to the strengthening of engineering and technological activities to promote sustainable economic growth and social welfare throughout the world.

A small CAE delegation attended the 2012 CAETS meeting, held in August 2012 in Zurich. There was a one day technical symposium on urban transportation, and the meeting resulted in a communiqué which we have sent to Canadian government officials and political leaders. This was followed by a one day business meeting and technical tours of some Swiss Federal Railway system facilities.

Bob Evans, FCAE, has been a contributor to a CAETS study being led by the Australian Academy of Technological Sciences and Engineering (ATSE) on Analysis of Strategies to Accelerate the Deployment of Low Emission Energies for Electric Power Generation in Response to Climate Change. Building on a preliminary study, the aim of this enhanced study is to identify those technologies that can most efficiently and effectively reduce carbon emissions for stationary power generation in both technical and financial terms. Bob and I attended a half day working group session just prior to the conference to review progress with our counterparts from South Africa, the UK, the USA, Korea Japan and Germany. We are now all finalizing our sections and reviewing others and the final report should be issued this spring.

For the June 2013 meeting, hosted by the Hungarian Academy of Engineering in Budapest, the CAE is contributing a paper on the state of nuclear energy development and deployment in Canada. I would like to thank CAE Fellows Terry Rogers and Dan Meneley for taking the lead in writing our submission.

New Publication

by Tom Brzustowski, FCAE

Why we need more INNOVATION IN CANADA and what we must do to get it — Published by Invenire Books

I wrote this book to help make discussions of innovation in Canada more systematic and more productive. It's a "big picture" book written for many audiences, from engineers to policy makers. Each of these audiences has its own knowledge base on innovation that is undoubtedly more extensive and deeper than I could present, but I believe that each group will find it useful to see where it fits in the big picture of innovation, and what the other groups contribute. The premise of this book is that Canada has a prosperity problem because we don't create enough wealth. We have many well-documented needs that we can't afford to fund properly, whether with public funds, private funds, or some combination of the two. Health care and education are the most obvious, but there are many others ranging over a very broad span of issues, from eliminating childhood poverty to updating and upgrading much of our physical infrastructure. Business as usual is not a solution; it got us where we are. We now need to create more value in new ways - that's innovation. But beyond innovation to solve our current problems, we must learn how to innovate in new ways to deal with whatever future pressures and opportunities arise from global demographics and climate change.

INNOVATION IN CANADA demystifies innovation and presents its many aspects in one big picture. The book proposes innovation in both goods and services as the means for increasing the value of what the Canadian economy produces, and sets an aggressive target for increasing GDP growth in this way. This will raise our prosperity and show up as improved productivity. As an engineer, I tried to write concisely in plain language, stressing precise definitions of key terms, and using diagrams – some of them elaborate – to help convey some key ideas. More importantly, I tried to bring more balance to the current public discourse on innovation which seems to associate it mainly with science and research. I repeatedly pointed to engineering and design as essential too.

When industrial innovation is usefully thought of as invention followed by successful commercialization, the essential roles of entrepreneurship, commerce and competition become evident. The old adage about invention just doesn't go far enough. It should be: *Necessity may be the mother of invention, but competition is the father of innovation.* We have to recognize that there are important differences between innovation in established firms and innovation in new ventures, whose time scales are shorter and whose needs are more urgent. Likewise there are important differences between research-based innovation (new use of new knowledge) and design-based innovation (new use of prior knowledge).

New ventures engaged in research-based innovation are a particularly interesting group of companies. They spend more on R&D than they earn in sales revenues, sometimes very much more. Most of them are SME's, but not all. And many of them will

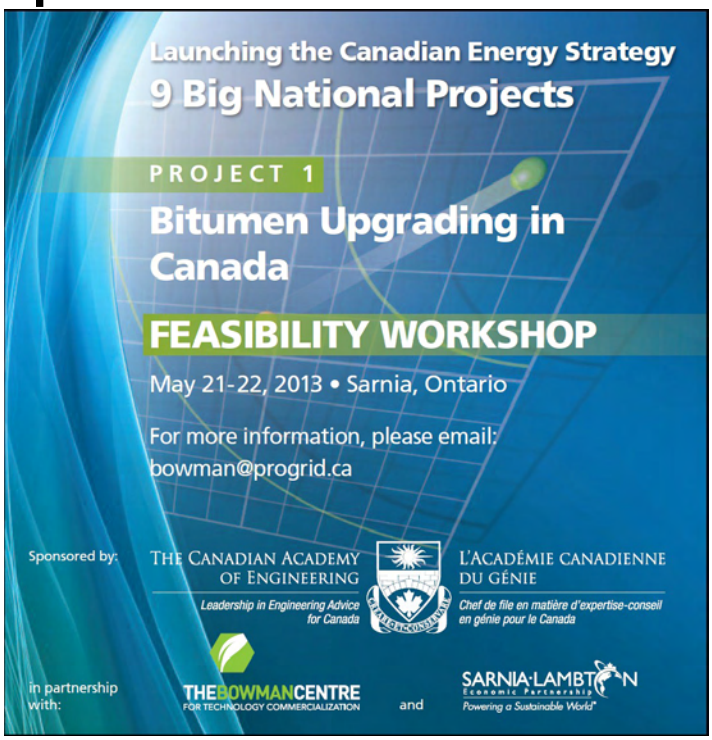
(Continued on page 10)

Energy Pathways Task Force Update

by Clem Bowman, FCAE and Richard Marceau, FCAE

Eight months have passed since the Energy Pathways Task Force released the Academy's Superpower book: "Canada: Winning as a Sustainable Energy Superpower". The Canadian Academy of Engineering has committed to continue its energy work and to monitor the progress that Canada is making in capturing its energy endowment**.**

Copies of the two-volume book have been distributed by Academy President Richard Marceau to a wide range of critical stakeholders in the public and private sectors, including the provincial Premiers and the Prime Minister. The written responses have been positive with no disagreement, and in some cases strong support for our proposed nine "big energy projects". We have proposed these projects as the foundation for Canada's energy innovation strategy for the first half of the 21st century.



On November 29, Walter Petryschuk from Sarnia, one of our "Superpower" book authors, presented in Calgary, on behalf of the Academy, the case for a project for upgrading oil sands bitumen to value added products in Eastern Canada. To read more about this, visit: http://www.theobserver.ca/2012/12/02/economy-sarnia-putting-out-the-welcome-mat. Industry has been outspoken in supporting the need to pipeline new bitumen production to Texas for upgrading, which while economic from an individual company perspective, misses out on important future wealth generation for Canada, with corresponding job growth. This has galvanized the Alberta members of the Energy Pathways Task Force to seek and obtain Alberta Government funding for a $300k feasibility study on the long term incentives for upgrading bitumen in Canada, with a specific focus on Sarnia/Lambton, the site of the first development of the oil industry in Canada in 1865. The Academy has secured part of the required matching funds from eastern Canada, and will be seeking the balance from appropriate governments. The results from this feasibility study, with supporting investigations, will be presented at an Academy workshop in Sarnia on May 21, 2013.

To keep the Academy's work evergreen, we plan to issue the 2013 Edition of the Energy Superpower Book late this year, with the following possible topics, emerging out of our commitment on Page 24 in Volume I to "Imagine Deeper into our Energy Future":

1. "Canada 2050" – An analysis of what Canada's economy will look like in 2050 if the 9 "big projects" are undertaken, and what it would look like if they are not.
2. "MacKenzie River Hydroelectric Feasibility Project" - An extensive feasibility study which follows some of the work done in the context of the original "Superpower" book.
3. "Nuclear Big Project" – An extension of our previous nuclear work to investigate nuclear power plant "farms" with the production of multiple energy currencies.
4. "District Energy/Geothermal Energy" – An examination of the potential of impact of district and geothermal energy systems in large metropolitan areas of Canada.
5. "Muskrat Falls Hydro Project and DC Transmission System" – An examination of Newfoundland and Labrador's biggest public works project.

New Publication (cont'd)

(Continued from page 9)

burn through their money and vanish. Such firms destroy wealth, rather than creating it. But some others succeed, and become our new established innovative firms. The leading indicator of their success is sustained growth in sales revenues that exceeds the growth in R&D spending. The needs of such companies are always more urgent than those of established firms, and any government support for which they qualify has to be delivered with that in mind.

In the final chapter of INNOVATION IN CANADA, I propose the elements of a supportive government innovation policy, and outline the different design principles for government assistance programs needed to provide effective support to the two different groups of innovative companies. But there is a note of caution (or humility perhaps) at the head of the chapter that is worth remembering: *"Innovation policy doesn't produce innovations. Entrepreneurs do that."*

An Historical Update (2002 – 2012) of the CAE (cont'd 2)

(Continued from page 7)

Affiliated Organizations

Our Academy is itself a member of the International Council of Academies of Engineering and Technological Sciences (CAETS). CAETS with 26 member academies holds annual meetings, typically attended by our current President and Executive Director. The 18th Convocation was hosted by CAE in Calgary in 2009 as noted above. Subsequent annual meetings have been held in Denmark, Mexico and Switzerland.

We are a member of the Partnership Group for Science and Engineering (PAGSE) which advocates public policy development for the benefit of science and engineering in Canada. Among other activities, it organizes the Bacon and Eggheads breakfast meetings with parliamentarians in Ottawa and produces SciencePages information sheets on matters of topical interest.

We are also a member of the Canadian Engineering Leadership Forum (CELF), along with Engineers Canada, the Engineering Institute of Canada (EIC), the Association of Consulting Engineering Companies – Canada (ACEC), the National Council of Deans of Engineering and Applied Science (NCDEAS), and the Canadian Federation of Engineering Students (CFES). CELF exists to add visibility to the importance of engineering to our national development. A significant event organized by the CELF was the first-ever National Engineering Summit held in Montreal in May 2009, which brought Canadian engineers together with experts from a broad range of sectors and disciplines to consider key trends, critical issues and future projections related to health, the environment, safety and security, global competitiveness and quality of life.

The Board and Head Office

Our Academy has been served diligently by the Board members and Officers elected at Annual General Meetings. The Board has typically met four times per year, with the Executive Committee meeting more frequently to deal with routine matters and set agendas for Board meetings. Succession planning has normally involved a seasoned member of the Board moving to President-Elect and subsequently to President. Past Presidents of our Academy are listed on the website. Many members have devoted considerable time and energy to the affairs of our Academy.

At the beginning of the decade in 2002, Philip Cockshutt, formerly with NRC, was appointed as the third Executive Director of the Academy. At this point, the head office was located at 180 Elgin Street, sharing premises with the Canadian Council of Professional Engineers (now Engineers Canada). Michael A. Ball, formerly with Transport Canada, succeeded Philip in 2006 and served as Executive Director through to the end of 2011 when Kevin R. Goheen assumed the position. Both Philip and Michael, with the continuing support of Office Managers, currently Valérie Broadfoot, the Academy's first full-time employee, improved and advanced the operations of the Academy, especially in the context of communications with members through the newsletter and website, and with related organizations including CAETS, CCA and its other Member academies, CELF, Engineers Canada, PAGSE, and federal and other governments departments and agencies. The head office moved to new quarters shared with the Council of Canadian Academies on the 14th floor of 180 Elgin Street in 2010.

Financial Resources

Over the years, annual fees, augmented by donations, paid by our members have constituted the main source of ongoing income to our Academy. There has also been a modest annual return on our investment portfolio. Projects, such as the Energy Pathways, Canada Power Grid and the TEFP have attracted financial support from sponsors. However, our financial resources provide only for the support of our Head Office and the core functions of the Academy, member services including the selection and induction of new Fellows and the organization of annual meetings. Over the years, the Board has tried to open up additional significant revenue. However, the creation of the CCA blocked direct funding from the Federal Government. Fundraising through planned giving was promoted without success. Corporate memberships may be an important part of the solution, along with additions to our investment fund. Our main asset is, in fact, our members which have multiple links into other organizations. Part of the way forward could be to leverage our limited financial resources by partnering with these other organizations on projects of mutual interest. Given the strength of the representation of engineering schools in our Academy, partnerships with them could be facilitated with mutual benefits. A good example from the past is the Canadian Energy Challenge Workshop held jointly with UOIT in 2006.

Honours

Our Academy has recognized outstanding service within its ranks. In 2007, the Honours Committee, led by Ron Crotogino, developed guidelines for the Distinguished Service Award. The first recipient was Clem Bowman later that year. In 2008, the award was renamed the Léopold Nadeau Memorial Award for Distinguished Service to commemorate Léopold Nadeau's role in founding our Academy and serving as its Executive Director for the first ten years. Recipients of this award have been the late Morrel Bachynski in 2008 and Philip Cockshutt in 2012. Also in 2007, the Honours Committee spent considerable time developing the concept of a major award with a substantial monetary component to be made in the name of our Academy "to

(Continued on page 12)

Executive Director's Report

I'm sure that many of you take time on Christmas Day to watch the message of the Queen. I always have. Whether you are a Monarchist, a Republican or have politic leanings somewhere in between, I hope that we can all agree that the Queen leads through example. She has served the people of the British Empire and the Commonwealth for 60 years, through a workload that would kill the average 30 year old.

This year, she urged citizens to serve others through their vocations, such as serving in the armed forces or working in public health care, or through volunteerism. This is a valuable message that I would also urge upon our membership. We have a need at the CAE for new ideas, but more importantly, we have the need for resources to carry out these ideas. When the Board met in April 2012 for a strategic planning session, it determined that the 2009 strategic plan was fine; the problem was that we had just not executed it. So please do continue to bring new ideas to me and the Board, but also be prepared to gather the financial and human resources to execute them (and by human resources, I mean you and other Fellows you are able to convince to work with you). Our modest "head office" consists of a full-time Office Manager and a part-time Executive Director and between Valérie and me, we only have the ability to perform so many tasks.

The other point I wanted to raise about the Queen's Christmas message is her willingness to embrace new technology. She was the first British monarch to use television as a medium of communication, and also was on the leading edge of websites, and Social media. This year saw her first use of 3D TV. We are an engineering organization and I would hope that we are at least as technologically savvy as an 86-year-old monarch of the realm. The Board has adopted a policy of having a modest additional charge for those members who still wish to receive hard copies of the newsletters, as the printing, postage and handling costs of paper reports are considerable. The vast majority of provincial engineering organizations, think tanks, and government departments have eliminated paper reports, and we need to demonstrate our organizational and environmental leadership by doing the same.

The Board also approved a fee increase, the first since 2009. After this, on an inflation adjusted basis, the current Fellows are only paying as much as the original founders did 25 years ago. The fee increases are going towards tangible improvements of member services, such as the convenience of credit card payments, offering advice as to improving fellowship nominations, supporting Local Section activities, and more frequent communication via Linkedin and Facebook. In addition, a much better website is in the works. The fee increase also helps the CAE provide vigorous oversight of our research programs, have modernized by-laws and up-to-date insurance, and have more efficient meetings of the Board, Executive and standing committees. I also recognize that we cannot come to the Fellowship often to finance improvements, so we are actively looking at alternative revenue sources. We are continuously looking for cost savings. In 2012, we achieved large savings in telecommunications, audit and office rentals and will hopefully do more in terms of further office rental savings and translation services this year.

I wish you the Best for 2013 and hope to see as many of you as possible actively participating in CAE activities this year.

An Historical Update (2002 – 2012) of the CAE (cont'd 3)

(Continued from page 11)

recognize and celebrate significant Canadian engineering achievements, to increase public awareness of the role of engineering in our society, and to raise the profile of the profession in order to draw to it our best minds". Unfortunately, sponsorship of such an award was not forthcoming at that time. Our Academy also has the opportunity to appoint Honorary Members. Two outstanding individuals, Arthur Carty and Mike Lazaridis, were so named in 2008. Over the years, many members of our Academy have received professional engineering awards, honorary doctorates and societal recognition, have been appointed to the Order of Canada, and have also received much International recognition, all reflecting the high stature of our fellowship.

Looking Ahead

At our AGM in 2012, Richard Marceau as our new President spoke of the importance of establishing regional activities within our Academy and Pierre Lortie as President-Elect confirmed that the importance and relevance of manufacturing to the national economy would be the theme of the next Annual Meeting in Montreal. These initiatives, among others, deserve our wholehearted support.

Acknowledgement

The assistance of Philip Cockshutt, Michael A. Ball and Valérie Broadfoot with the preparation of this historical account is gratefully acknowledged.