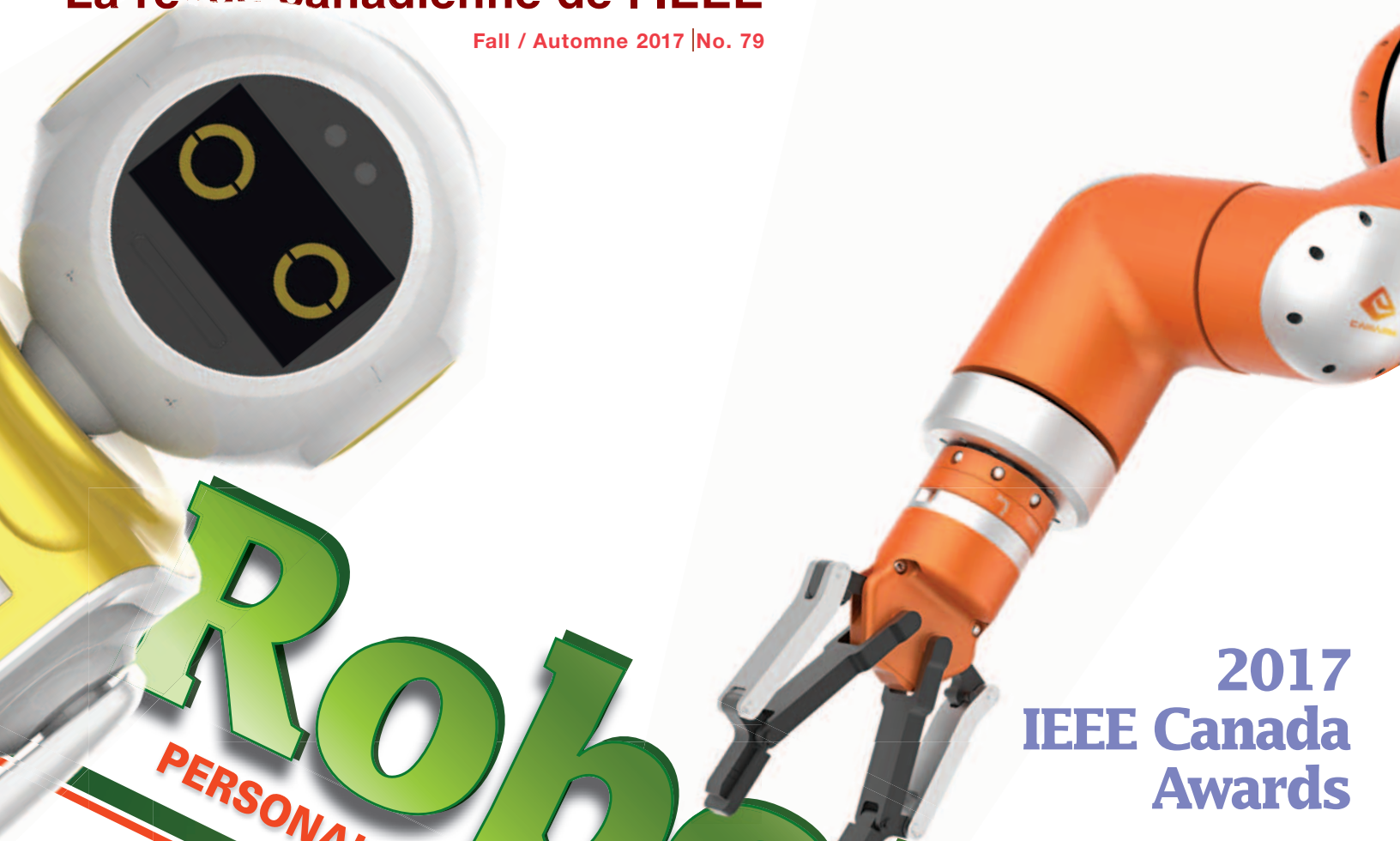
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Fall / Automne 2017 | No. 79

Sections Congress 2017 Report



Robotics

PERSONAL, TECHNOLOGY AND VIEWPOINTS (PART 1 OF 2)

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Witold Kinsner
PhD, PEng, FEIC, FEC, FCAE



2016-2017
IEEE Canada President and Region 7 Director

For the fifth time, warm greetings and best wishes to all IEEE Canada members, volunteers, and activists, both young and seasoned!

In this issue, I will focus on the effort to re-engage industry directly and indirectly, and will describe some of the recent IEEE and IEEE Canada activities.

1. IEEE and Industry

Feedback from many industrial professionals and practitioners suggests we need to do more to remain relevant to members of these groups. In response, IEEE has been developing several initiatives to address this diminishing link to industry, including (i) a Committee on Industry Engagement (CIE) to consult with industry on their needs, (ii) Industry Outreach (IndOut) to collect specific linkages and needs from industries, and (iii) development of new products and services for industry.

The Industry Outreach implemented over the last two years was intended to visit major companies and institutions in order to discuss their use of current IEEE offerings, and to identify needed improvements. In 2015 AND 2016, IEEE Board members visited 425 individuals in 92 companies.

(Continued on page 4)

Pour la cinquième fois, meilleurs vœux et salutations à tous les membres, bénévoles et militants de l'IEEE Canada, tant jeunes qu'expérimentés!

Dans ce numéro, je décrirai les efforts déployés pour réengager l'industrie et décrirai quelques activités récentes de l'IEEE et de l'IEEE Canada.

1. L'IEEE et l'industrie

Selon les commentaires de nombreux professionnels et praticiens de l'industrie, nous devons faire plus pour les intéresser. L'IEEE a donc pris diverses initiatives pour réagir à cet éloignement progressif de l'industrie : (i) la création d'un comité de consultation de l'industrie chargé de consulter cette dernière sur ses besoins, (ii) la création d'un comité de liaison avec l'industrie chargé d'établir des liens en réponse à certains besoins spécifiques de l'industrie et (iii) la création de nouveaux produits et services pour l'industrie.

Le comité de liaison avec l'industrie mis sur pied il y a deux ans a entrepris de visiter de grandes entreprises et divers établissements d'enseignement pour discuter de leur utilisation des services de l'IEEE et déterminer les améliorations souhaitées. En 2015 et 2016, les membres du CA de l'IEEE ont rendu visite à 425 personnes au service de 92 entreprises.

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PERSONAL, TECHNOLOGY AND VIEWPOINTS (PART 1 OF 2)

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SOME OF THE ROBOTS AVAILABLE FROM ESI AND ANZER

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In response to the visits and subsequent Board strategic deliberations, IEEE acquired GlobalSpec's Engineering360 platform as a search engine and a source of news, data, and analytics for the engineering and technical communities. Another new development includes a platform to access patents and other innovation literature from the IEEE Innovation Q Plus (in partnership with IP.com). Still another development is the creation of APIs (application programming interfaces) for the IEEE *Xplore* Digital Library to study its pertinent content to evolve it into an intelligent personal assistant (IPA).

IEEE can also play a role in the longer-term viability of companies through training and education in preparing the work force for new jobs in the various emerging areas, including deep learning, data analytics, and cybersecurity. In addition to Seasoned Professionals (SPs), IEEE's Young Professionals (YPs) and Women in Engineering (WIE) should play a major role in the programs. Another IEEE contribution could be in redefining the role of a practising professional in education: the practitioner could be seen as a knowledge creator, as described next.

2. IEEE-Industry Role in Education

Together with a number of other Regional Directors, I have been developing the concept of Body of Knowledge (BoK) for and by practising professionals to capture the best practices and design patterns. The idea of the BoK is not new, and has been used to develop new acadmic programs such as Computer Engineering and many others [1]. A BoK is the ontology for a specific discipline, containing the prescribed aggregation of knowledge in a specific discipline that a student is expected to have mastered to be considered suitable for entering the process of either certification or licensing as a practising professional. From a professional perspective, a BoK contains the facts, experience, processes, and wisdom that are collected within a discipline in order to inform the profession, while providing the foundation from which further improvements and innovative changes can occur. From a business perspective, a BoK is the collection of essential information whose mastery is required for success in a field or profession.

The BoK for/by Practitioners (BoK-P) is intended to help not only fledgling practitioners, but also universities and colleges. Our education process is an open-loop system. Together with other mechanisms, the BoK-P can help close the loop. Figure 1 shows the engineering/technologist knowledge and practice acquisition system.

A typical educational morphing of a student into a professional in a specific discipline follows several steps. A professional program is first developed by a professional school and taken by its students. The program is evaluated and accredited by an independent body such as the Canadian Engineering Accreditation Board. Further skills are developed through co-op and internship programs, as administered by the educational institutions and monitored by a professional association. Licensure and certification are administered and renewed by the professional association. A licensed professional can practice in industry and/or business, as monitored by the corresponding professional association. Professional development is required by most professional associations for renewal of licenses. Professional societies may be also involved in any stage of the process.

This well-established process is, however, incomplete because there is very limited feedback from the professional practitioners to the educational system. Various attempts have been made to help the students. For example, practising engineers are hired into the educational programs as Engineers-in Residence (EiR) to provide input on design issues and help in the capstone and other projects. The BoK-P could provide the desired input, without taking the EiR away from industry. IEEE Collabratec could also be used as one of the conduits

(Message du Président suite de p. 3)

Après ces visites et les délibérations stratégiques du CA, l'IEEE a acquis la plateforme GlobalSpec's Engineering360, un moteur de recherche et une source de nouvelles, de données et de résultats d'analyse à l'intention des communautés d'ingénieurs et de techniciens. Il s'est également procuré IEEE Innovation Q Plus (avec IP.com), une plateforme donnant accès aux brevets et à des publications sur l'innovation. Il a enfin créé des interfaces de programmation d'applications (API) pour sa bibliothèque numérique Xplore afin de faire évoluer son contenu utile dans un assistant personnel intelligent (IPA).

Par ailleurs, l'IEEE peut jouer un rôle dans la viabilité à long terme des entreprises en offrant de la formation et de l'éducation pour préparer la main-d'œuvre aux nouveaux postes qui s'ouvriront dans différents domaines émergents dont l'apprentissage en profondeur, l'analyse de données et la cybersécurité. En plus des professionnels chevronnés (SP), les jeunes professionnels (YP) et les femmes en ingénierie (WIE) devraient jouer un rôle important dans ces programmes. Une autre contribution de l'IEEE pourrait être de redéfinir le rôle des professionnels en exercice en éducation : les praticiens pourraient être vus comme des créateurs de connaissances, tel qu'il est décrit ci-après.

2. L'IEEE - rôle de l'industrie dans l'éducation

Avec d'autres directeurs régionaux, j'ai élaboré le concept de ensemble de connaissances (BoK) à l'intention et avec l'apport des professionnels en exercice afin de réunir les meilleurs modèles de conception et pratiques. L'idée du ensemble de connaissances n'est pas nouvelle et a été utilisée pour élaborer de nouveaux programmes d'enseignement tel le programme de génie informatique1. Un ensemble de connaissances est l'ontologie d'une discipline donnée. On y trouve la somme de connaissances prescrites qu'un étudiant est censé avoir maîtrisées pour pouvoir obtenir un certificat ou un permis d'exercice de sa profession. D'une perspective professionnelle, le BoK contient les faits, l'expérience, les processus et l'érudition qui préparent à l'exercice d'une profession tout en fournissant les fondements à partir desquels il est possible d'apporter des améliorations et des changements innovateurs. Sur le plan des affaires, un BoK réunit l'information essentielle à maîtriser pour réussir dans un domaine ou une profession.

Le ensemble de connaissances à l'intention et avec l'apport des professionnels en exercice (BoK-P) a pour but d'aider non seulement ceux qui débutent dans leur profession, mais aussi les universités et les collèges. Notre processus éducatif est un système en boucle ouverte. De concert avec d'autres mécanismes, le BoK-P peut aider à boucler la boucle. La figure 1 illustre le système d'acquisition des connaissances et pratiques des ingénieurs ou des technologues.

Le processus de transformation type entre un étudiant et un professionnel d'une discipline donnée est composé de diverses étapes. D'abord, un programme professionnel est élaboré par une école d'enseignement professionnel et est suivi par ses étudiants. Le programme est évalué et agréé par un organisme indépendant tel que le Bureau canadien d'agrément des programmes de génie. D'autres compétences sont développées par des programmes coopératifs ou de stages administrés par les établissements d'enseignement sous la surveillance de l'association professionnelle. Le permis d'exercice et le certificat sont administrés et renouvelés par l'association professionnelle. Un professionnel licencié peut exercer dans l'industrie ou une entreprise, sous la surveillance de l'association professionnelle correspondante. La plupart des associations professionnelles exigent un perfectionnement professionnel pour renouveler les permis d'exercice. Les corporations professionnelles peuvent participer à toute étape du processus.

Ce processus bien établi est toutefois incomplet parce que les professionnels en exercice offrent très peu de rétroaction au système éducatif. Diverses démarches ont été entreprises pour aider les étudiants. Par exemple, des ingénieurs en exercice sont embauchés par des programmes d'enseignement à titre d'ingénieurs en résidence afin d'intervenir dans des problèmes conceptuels, des récapitulatifs et d'autres projets. Le BoK-P pourrait apporter une contribution attendue sans que l'on ait à retirer les ingénieurs en résidence de l'industrie. IEEE Collabratec pourrait être utilisé comme l'un des canaux de collaboration dans cette

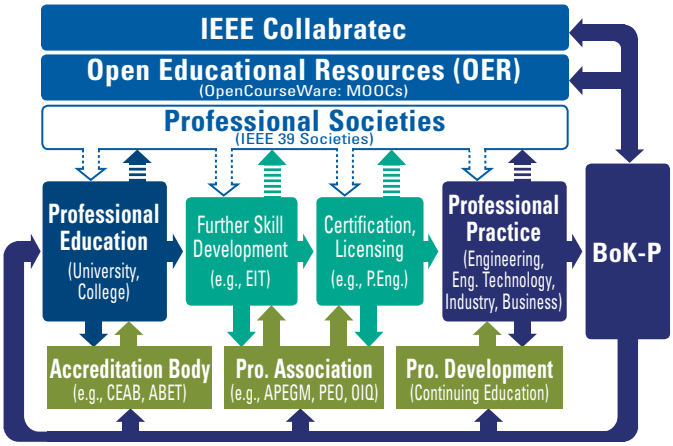


Fig. 1 Closing the educational loop through industry.

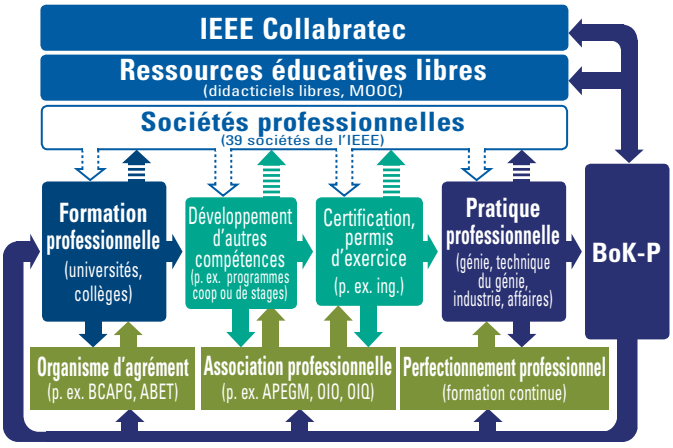


Fig. 1 – Boucler la boucle éducative en mettant à profit l'industrie

of collaboration in that teaching. Open Educational Resources (OER) could be used as another conduit, including teaching, learning and research materials in any medium (digital or otherwise) that reside in the public domain or have been released under an open licence that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. In this model, the practitioner becomes a knowledge creator and a potential educator.

3. IEEE MGA and BoD

Two exciting projects I'm contributing to are IEEE DataPort and IEEE in the North and South Poles. The DataPort stores datasets (up to 2 TB in size) that could be shared to support research activities and data analytics, as well as host and manage Data Competitions. This new data repository offers many benefits to researchers, data analysts, and institutions, and it is currently available at no cost (use coupon code DATAPORT1). Log into the site (https://ieee-dataport.org) with IEEE login credentials. If you do not have an IEEE login, you can get one for free at https://www.ieee.org/profile/public/createwebaccount/showRegister.html (no membership required).

The IEEE in the North and South Poles project is a wonderful example of how IEEE expertise can be applied across a range of issues in sensitive and vulnerable ecosystems. Some of the technology involved includes new in-situ and remote sensors, or networks of sensors. Issues addressed include: communications; transportation needs of local communities; ecological, security and health impacts associated with an increased human presence in a pristine environment; fisheries and oil exploration in a fast-changing polar environment and associated engineering challenges; and educational opportunities in the form of research and/or projects to be carried out by teams of students mentored by faculty and scientists from different IEEE societies, Organizational Units, (OUs) and even non-IEEE scientific and technical agencies. It was my honour to contribute to this initiative through research in the Arctic in late August. IEEE in the North and South Poles is led by Marina Ruggieri, Vice President of the IEEE Technical Activities Board.

4. IEEE Canada BoD and Other Activities

There is much "local" news to share since my last report to you. Our IEEE Region 7 volunteers have been very active in mounting conferences and helping to develop a long-term strategy for our continued success.

Conferences – IEEE Canada's "triple crown"

The three major conferences that IEEE Canada organizes every year were again stories of success. The IEEE Canadian Conference on Electrical and Computer Engineering (CCECE '17) was held May 1-3, 2017 in Windsor at the Ceasars Windsor Hotel. The major R7 award ceremony took place at the CCECE17 Gala. The conference had a large number of good papers and keynote

(Continued on page 50)

forme d'enseignement. Les ressources éducatives libres pourraient servir d'autre canal, en offrant des documents d'enseignement, d'apprentissage et de recherche sur divers supports (numériques ou autres) pourvu qu'ils soient dans le domaine public ou publiés sous une licence générale ouverte permettant un accès, une utilisation, une adaptation et une redistribution gratuits par d'autres sans restrictions ou selon des restrictions limitées. Dans ce modèle, les professionnels en exercice deviennent des créateurs de connaissances et des enseignants potentiels.

3. Le CA et le CAGM de l'IEEE

Dans le cadre du Comité des activités géographiques et pour les membres (CAGM) et du conseil d'administration (CA) de l'IEEE, je participe à deux projets fabuleux : IEEE sur le portail de données de l'IEEE, et l'IEEE aux pôles Nord et Sud. Le port de données emmagasine des ensembles de données (jusqu'à 2 térabits) à partager pour soutenir les activités de recherche et l'analyse de données, de même que pour héberger et gérer des concours de données. Ce nouvel organe d'archivage de données offre de nombreux avantages aux chercheurs, aux analystes de données et aux établissements d'enseignement, et il est actuellement disponible sans frais (code DATAPORT1). Accédez au site (https://ieee-dataport.org) avec les données de connexion de l'IEEE. Si vous ne les avez pas, vous pouvez les obtenir gratuitement au https://www.ieee.org/profile/public/createwebaccount/showRegister.html (il n'est pas nécessaire d'être membre).

Le projet L'IEEE aux pôles Nord et Sud est un formidable exemple de la manière dont l'expertise de l'IEEE peut être appliquée à une vaste gamme d'enjeux dans des écosystèmes sensibles et vulnérables. Au regard de la technologie employée, mentionnons les nouveaux capteurs de télédétection et capteurs sur place, ou les réseaux de capteurs. Au rang des enjeux figurent les communications, les besoins de transport des communautés locales, les problèmes écologiques, sécuritaires et sanitaires associés à une présence humaine accrue dans un environnement vierge, l'exploration pétrolière et la pêche dans un environnement polaire en évolution rapide avec ce que cela suppose comme difficultés techniques, et les possibilités éducatives sous la forme de recherches ou de projets menés par des équipes d'étudiants encadrés par des universitaires et des scientifiques de différentes sociétés de l'IEEE, des unités organisationnelles et même des organismes scientifiques et techniques qui ne font pas partie de l'IEEE. J'ai été honoré de participer à cette initiative en menant des recherches en Arctique à la fin d'août. Le projet est dirigé par Marina Ruggieri, vice-présidente du Conseil d'activités techniques de l'IEEE.

4. Activités du CA de l'IEEE Canada et autres

J'ai de nombreuses nouvelles « locales » à vous communiquer depuis mon dernier rapport. Les bénévoles de notre Région 7 de l'IEEE ont été très actifs à organiser des conférences et à aider à élaborer une stratégie à long terme pour assurer le maintien de notre réussite.

Conférences – La « triple couronne » de l'IEEE Canada

Les trois grandes conférences que l'IEEE Canada organise chaque année ont de nouveau connu un succès retentissant. La Conférence canadienne de

(Suite p. 50)

A few words from the Editor in Chief / Quelques mots du rédacteur en chef



Bruce Van-Lane, P.Eng.

Certains membres ont exprimé le désir d'obtenir une version entièrement électronique de cette revue. C'est chose faite. Je remercie Wahab Almuhtadi, Ph. D., membre de la section d'Ottawa et président du Comité des publications et des communications de l'IEEE Canada, pour l'aide apportée dans ce projet. Le Congrès des sections de l'IEEE est un rendez-vous triennal des dirigeants de sections de l'IEEE du monde entier, tenu cette année à Sydney, en Australie (Région 10). Nous rapportons certains éléments retenus par les participants de l'IEEE Canada (Région 7) quant à la façon dont les besoins des membres pourraient être mieux satisfaits à l'échelle des sections.

L'auteur de notre article-vedette démontre que les entreprises technologiques en démarrage devraient d'abord analyser et satisfaire les besoins des clients en élaborant un plan d'affaires. Andrew Goldenberg, Ph. D., est spécialiste de la robotique, une expertise acquise au cours d'une brillante carrière, et son analyse a une portée générale tout en présentant certaines applications robotiques qu'il a mises au point.

J'avais l'intention de poursuivre ici l'hommage au regretté Bob Alden, directeur de la Région 7 de l'IEEE en 1988-1989, fondateur de cette publication, pionnier Internet à l'IEEE et récipiendaire de nombreux honneurs en vertu de ses réalisations. Le volume des témoignages reçus depuis la publication de la première partie m'a toutefois amené à opter plutôt pour une publication des deux parties sur le site Web de la revue.

Nous accueillons un nouveau directeur adjoint, Haibin Zhu, Ph. D., professeur d'informatique à l'Université Nipissing. L'expertise de M. Zhu couvre les théories et technologies de collaboration, le génie logiciel et l'ingénierie des systèmes.

Merci à Terry Malkinson pour ses deux chroniques fort instructives. Merci aussi à Dario Schor pour la version longue de sa chronique de même qu'à tous ceux qui ont collaboré à ce numéro. Merci à vous, lecteurs. Répondons-nous à vos besoins d'information? N'hésitez pas à m'en faire part à vanlane@ieee.org. ■

From the industrious ants we skirt on a summer's hike, to Apple Inc., whose products cannot be missed in our social landscape, successful organizations glean and meet the needs of their members/customers.

Some IEEE Canada members have been looking for optional full-electronic delivery of this magazine. Well, it's here. My thanks to Dr. Wahab Almuhtadi, Ottawa Section member and IEEE Canada Publications and Communications Committee Chair, for his guidance in putting the components together. IEEE Sections Congress is a triennial gathering of world-wide Section leadership, hosted this year in Sydney, Australia by Region 10. We've gathered the take-aways of some of our IEEE Canada (Region 7) attendees on how they can better meet Section-level member needs.

The author of our cover story makes a compelling case for why technology startups should first identify and satisfy customer needs in developing a business plan. Dr. Andrew Goldenberg's expertise is in the field of robotics, acquired over a stellar multi-phase career. But his analysis applies broadly. He also highlights robotics applications he's developed.

It was my intent to include additional tribute material to the late Bob Alden, IEEE Region 7 Director 1988-1989, founder of this publication, internet pioneer within IEEE, and holder of many other IEEE honours and achievements. The volume of further remembrances received since the publication of Part 1 has necessitated a change in plan. Instead, both Parts I and II will be made available on the magazine's web site.

We welcome a new Associate Editor, Dr. Haibin Zhu, Computer Science Professor at Nipissing University. Dr. Zhu's expertise includes collaboration theories and technologies, software engineering and systems engineering.

I thank Terry Malkinson for his usual informative two columns, Dario Schor for an expanded version of his column, and all other contributors to this issue. I thank you, our readers. Are we meeting your information-needs? Please let me know: vanlane@ieee.org. ■

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Biz-tech Report



by Terrance Malkinson

Rahman Orthotics based in Calgary [www.rahmanorthotics.ca] played a key role in the success of Canada's Para ice hockey (formerly known as sledge hockey) team. The team won the world championship Gold medal game in South Korea defeating the United States 4-1. Rahman, a certified Orthotist, became a fan of the sport when he spent time with the Para hockey team members during the process of fitting their sledges with customized seats. He and his friend Dave Lysay, along with a colleague in Kitchener, Allan Moore, adapted the seats for 17 out of 19 athletes on the team. Using innovative design and materials engineering these custom made seats for the player's sledges are truly an example of Canadian innovation at its best. John Rahman has been providing custom-made orthotics, splints and braces that have improved people's lives through pain reduction and/or sport performance improvement.

David Schindler discusses Canadian public policy on science, scientific research, and its infrastructure in his article "Facts Don't Matter" [Alberta Views. June 30, 2017. www.albertaviews.ca]. In the article, he describes some of the challenges that the Canadian scientific community has experienced; which he attributes to the "poor state of science literacy among Canadian politicians, provincially and federally." This, in spite of rhetoric about the importance of innovation and the training and retention of highly-skilled workers. Science and technology national policy is an important continuing long-term investment for the benefit of all. Canada must quickly embrace new opportunities presented by advanced technology and the digital revolution rather than continuing as a supplier of unprocessed natural resources.

A new generation of young tech-savvy, and highly competitive men and women known as "Generation Z" is entering the workforce. Born between 1995 and 2012 they make up a large proportion of the population (72.8M) and are distinguished by knowing only a totally wired, multicultural, and post 9/11 world. They are entrepreneurial, self-reliant, personally independent and are radically different from the preceding millennial generation. David and Jonah Stillman provide important insights based on the first national studies of Generation Z's workplace attitudes in their book Gen Z@ Work [HarperCollins, 2017]. It is thought by many that this generation will rewrite the rules of the workplace and transform the future of business. Canadian business leaders responsible for recruiting, managing, and retaining this generation of skilled workers need to pay attention to their characteristics in order to take advantage of their abilities.

SAIT Polytechnic recently completed its year of Centennial celebrations with the internment in a ceremony "full of pomp and circumstance," on June 5 of a time capsule that won't be opened until its 200th birthday on Oct. 16, 2116. The SAIT-manufactured capsule contains objects representing SAIT's centennial year including a letter from



A SAIT time capsule begins its long journey towards 2116. Along for the ride is a 3D-printed figurine of the campus' Heritage Hall.

Prime Minister Justin Trudeau, artifacts suggested by members of the SAIT community, and even a can of SAIT Centennial-Ale beer produced by Tool Shed Brewing Company. In breaking news (August 17) SAIT announced a $2 million gift from The Joyce Family Foundation to help continue setting its School of Hospitality and Tourism students up for success through its "Introduction to Cook" apprentice program and SAIT entrance awards. The Summer Cooks program is changing lives with many of the students obtaining work in the hospitality industry or progressing to advanced training in the industry. As one of the students stated "all of the skills I learned I applied right away."

Charles Wilkins describes the Canadian High Arctic Research Station set to open in Cambridge Bay, Nunavut later this year in his article "It's Been Raining! In the High Arctic!" [Canadian Geographic. 137(4):62-71. August, 2017. www.canadiangeographic.ca]. With global warming, and the large area of Canada that is in the Arctic it is critical that Canada be a leader in research on its land, water and people. This station will give researchers from Canada and other countries unprecedented levels of state-of-the-art laboratory and residence support. Other articles of interest in this issue include "Titans of the Great Lakes which is a glimpse into what life is like aboard the freighters that travel the Great Lakes and "A Story in Stone" a portrait of the work of the stone carvers who are working to rejuvenate Canada's Parliament buildings.

The opening round of talks to renegotiate the North American free-trade agreement have begun among Canada, Mexico, and the United States. At stake is a large amount of business which last year totaled $US 1.1-Trillion. Expected to take many years of difficult negotiation the final agreement will be critically important to all parties and influence their economies for many years into the future. With the growth of national protectionism discussions are difficult and the professional negotiators at the table are working hard to achieve mutually beneficial results. It is important that all professionals in Region 7 follow these negotiations and communicate their suggestions and concerns to their Member of Parliament.

The University of Waterloo's Innovation Summit [www.waterlooinnovationsummit.com] was held September 14-15. "Hacking the Future" delivered 16 sessions, over 3 days. Participants learned about the trends driving innovation from keynote speakers, and had the opportunity to participate in workshops and interactive discussions. Topics included corporate disruption, and the talent imperative. This Summit attracts leaders from every sector—government, the private sector, academia, incubators and accelerators and creates an ideal environment for innovative thinking and cross-pollination of ideas. ■

About the Author

Terrance Malkinson is a communications specialist, business analyst and futurist. His career path includes technical supervisor and medical researcher at the University of Calgary, business proposal manager for the General Electric Company, and research administrator with the School of Health and Public Safety at SAIT Polytechnic in Calgary. He is currently an international correspondent for IEEE-USA *Today's Engineer*, contributing editor for *IEEE Canadian Review*, and a member of the editorial advisory board of IEEE *The Institute*. He was Vice-Chair of the IEEE-USA Communications Committee (2004-2010), and editor-in-chief of IEEE-USA Today's *Engineer Digest* (2004-2008). He was an elected Governor of the IEEE Engineering Management Society as well as past editor of *IEEE Engineering Management*. He is the author of more than 550 earned publications, and an accomplished triathlete. **malkinst@telus.net**



Jeffrey Arcand
B.A.Sc., U. of Ottawa
Webmaster Volunteer, IEEE Canada
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After a failed start at University of Waterloo, I came back to Ottawa to complete programs at both Algonquin College and University of Ottawa. It was at uOttawa that I became involved in IEEE activities, first with the student branch, then with the section, and later with the region.

It started in 2010 when a classmate asked me to help with organizing the Battle Royale LAN party—an annual 25-hour, 150-person video game competition. I only played video games casually, but I knew that I could help with the website and with the computer network infrastructure. I had such a great experience, that I continued as one of the co-leads for the next two events, which grew to 250 people. I still don't play much video games, but I really enjoyed the other aspects of running an event: strategic planning; team leadership; budget management; logistic operations; ticket sales, etc.

While a volunteer and officer of the student branch, I also had opportunities to work on various other activities. All gave me more experience that complemented my efforts with Battle Royale.

Early 2012, a group of volunteers from the IEEE Ottawa Section were working on final arrangements for the IEEE International Conference on Communications happening that summer. Since some arrangements required a particular technical skill set, I was asked to help them. At first, I was just helping with the website, but my responsibilities quickly grew to include the conference's paperless mobile app, the distribution and inventory of tablets, the supervision of the wifi network's provisioning and operation, and the author management system that distributed 1500 author presentation files into 25 rooms for 9 concurrent sessions.

While this was a challenging project, I was lucky to be part of a great team that provided guidance and support. I felt confident and never overwhelmed. This, is the aspect of IEEE that I appreciate the most: Opportunities to take on big challenges and achieve great accomplishments. Entrepreneurship with a safety net! Bring on the next challenge! ■

Jeffrey would like to thank former uOttawa Student Branch executive members Alexandra Phillips and Samira El-Rayyes for giving him the opportunity to run Battle Royale's 5 and 6 with them: "It was a lot of fun and I couldn't have done it without them!"

Montreal Section YPs Reach Out

Two back-to-back events create strong interest in Student Branch Activitites

Collaboration between Montreal Young Professionals (YP) and Montreal Section led to two highly successful events in early October. A Welcome Reception & YP Meetup for the IEEE International Conference on Wireless for Space and Extreme Environments at Concordia University brought together keynote speakers, conference attendees from around the globe, students and YP's. Perseverance, big dreams, working hard and team work were common themes among the professionals speaking about their career success.

IEEE Day 2017, mounted world wide and now in its 8th year was celebrated in Montreal by a one -day event designed to inspire the creation of new IEEE student branches, increase current membership and promote collaboration among student branches. Event organizers invited students from universities across Montreal to the one-day event showcasing the benefits of IEEE membership. Montreal section members from industry and academia spoke on the benefits of IEEE membership to their career and professional development.

Dr. Saida Maaroufi, Vice Chair, Women in Engineering (WIE) Montreal, summarized her group's activities as did representatives of the IEEE student branches of Concordia and McGill. A panel discussion on the importance of extra-curricular activities and a networking session rounded out the day.

Attended by 83 students, since only 32 were IEEE members, outreach goals were achieved. All student branches were approached by students wishing to join. In addition, the Montreal Section Chair was approached by a student wishing to rekindle an inactive branch. Success was so great, that plans are underway to make this an annual event. ■



Photo: La maison Simons

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The 31st Canadian Conference on Electrical and Computer Engineering (CCECE 2018) will be held in Québec City, Canada on May 13-16, 2018 at the Québec City Convention Centre. CCECE is the flagship conference where researchers, students, and professionals in Electrical and Computer Engineering meet annually in a Canadian city to get up to speed with the latest developments, foray into new fields and emerging topics, network with colleagues to strengthen partnerships, and foster new collaborations.

Tracks	
Circuits, Devices and Systems	Amine MILED, Université Laval Ebrahim GHAFAR-ZADEH, York University
Communications & Networking	Jean-Yves CHOUINARD, Université Laval Claude D'Amours University of Ottawa
Computer & Software Engineering	Nadia TAWBI, Université Laval Stéphane COULOMBE, ÉTS
Signal Theory & Signal Processing	Paul FORTIER, Université Laval Benoît CHAMPAGNE, McGill University
Optoelectronics & Photonics	Leslie RUSCH, Université Laval Wei SHI, Université Laval
Non-Destructive Testing	Abdelhakim BENDADA, Université Laval Marc GENEST, National Research Council
Control & Robotics	André DESBIENS, Université Laval David SAUSSIÉ, Polytechnique Montréal
Bioengineering & Biomedical Apps	Benoît GOSSELIN, Université Laval Daniel MASSICOTTE, UQTR
Power Electronics & Energy Systems	Hoang LE-HUY, Université Laval Innocent KAMWA, IREQ
Machine & Computer Vision	Denis LAURENDEAU, Université Laval Guillaume-Alexandre BILODEAU, Polytechnique Montréal
Sustainable Energy	Morad ABDELAZZIZ, Université Laval Ehab EL-SAADANY, University of Waterloo

Papers, in French or English, are solicited in the above tracks.

Special Sessions: Proposals are invited for sessions that can extend the areas of interest of the conference or highlight specific hot topics within these areas. In keeping with the conference theme of Innovation for a Better World, each special session is encouraged to contain one overview paper that addresses the impact of the topic in the special session on humanity, society, and/or the environment. For details on how to submit Special Session Proposals, please see the conference web site: ***ccece2018.org***

Tutorials: Proposals are invited in all areas of interest of the conference, but are not limited to such. Tutorials will take place on Sunday May 13, 2018, in morning and afternoon three-hour sessions. For details on how to submit Tutorial Proposals, please see the Conference web site: ***ccece2018.org***

Deadlines

Special Session & Tutorial Proposals:	**Sunday, December 10, 2017**
Notification of Acceptance of Special Sessions/Tutorials:	**Monday, December 18, 2017**
Full Paper Submission (see ***ccece2018.org*** for details):	**Thursday, January 18, 2018**
Notification of Acceptance:	**Friday, March 2, 2018**
Author Registration & Final Paper Submission:	**Sunday, March 18, 2018**

IEEE MONTRÉAL

IEEE Canada

IEEE SECTION DE QUEBEC

Two prominent IEEE Canada members appointed to the Order of Canada

Announced on December 30, 2016, the appointment of Dr. John Bandler as an Officer recognizes "his scientific contributions that have helped to position Canada at the forefront of microwave engineering." Leonard Bateman's many contributions are summarized as "advancing the development and distribution of hydroelectric power, notably as the former head of Manitoba Hydro."

Dr. John Bandler
Officer (O.C.)



His Excellency presents the Officer insignia of the Order of Canada to John Bandler, O.C.



Dr. John Bandler is Professor Emeritus in the Department of Electrical and Computer Engineering at McMaster University's Faculty of Engineering. He was President of Optimization Systems Associates Inc., which he founded in 1983, until 1997 when it was acquired by Hewlett-Packard Company. He is President of Bandler Corporation, which he founded in 1997. His record spans more than 50 years of scholarly, pioneering and professional contributions in radio frequency and microwave theory and techniques, optimization of circuits and systems, and computer-aided engineering (more than 500 papers). He studied at Imperial College of Science and Technology and received his degrees from the University of London.

Based on Dr. Bandler's work, advances such as design with tolerances, yield-driven design, and electromagnetic optimization—once academic fantasies—are now taken for granted by microwave engineers. His implementations into major commercial design tools have impacted high-frequency and microwave design initiatives world-wide.

Dr. Bandler has received numerous awards and recognitions from IEEE for his achievements. He was elected IEEE Fellow in 1978 for "contributions to computer-oriented microwave and circuit practices. " In 2004, he was honoured with the IEEE Microwave Theory and Techniques Society's (MTT-S) Application Award for "implementation of optimization tech-

Leonard Bateman
Member (M.C.)



The Governor General presents the Member insignia of the Order of Canada to Leonard A. Bateman, C.M., O.M.



Leonard Bateman's appointment as Member to the Order of Canada comes just two years after his receipt of the Julian C. Smith Medal from the Engineering Institute of Canada, having been nominated by IEEE Canada. The award recognizes "Achievement in the Development of Canada." IEEE Winnipeg Section members and others familiar with Mr. Bateman's 36 years with electric utilities in Manitoba, and his subsequent consulting career and volunteer service to the profession, will not be surprised by this most recent honour.

Mr. Bateman is given much of the credit for completion of a series of dams and hydroelectric power plants on the Nelson River in Northern Manitoba, together with the long-distance DC transmission lines connecting them to load centres in the south of the province. DC lines of this kind had never been installed before in Canada. When the first of these lines became operational in 1972, then known as the Nelson River Bipole system, they were the longest and highest-voltage (+/- 500 kV) direct current lines in the world.

Mr. Bateman began his career working with Winnipeg Hydro in 1942 after graduating with a B.Sc. in electrical engineering from the University of Manitoba. He completed his M.Sc. in 1948. Leaving Winnipeg Hydro in 1956, he joined what was then called the Manitoba Hydro Electric Board as a Systems Planning Engineer. After the amalgamation of this organization with the Manitoba Power Commission in 1961, he was appointed Director



Dr. Bandler receiving the 2012 IEEE Canada McNaughton Gold Medal. Beside him is IEEE Canada Awards & Recognition Committee Chair 2010-2012, Dr. Hussein Mouftah.

nology, design with tolerance and yield driven design to microwave devices, circuits and systems." He is the 2012 recipient of IEEE Canada's A.G.L. McNaughton Gold Medal for "pioneering contributions to optimization technology and microwave CAD." In 2013 he was recognized by IEEE MTT-S with its Microwave Career Award for that year, for "a career of leadership, meritorious achievement, creativity and outstanding technical contributions in the field of microwave theory and techniques."

Many other accolades have been conferred upon Dr. Bandler by both the engineering profession and Canada. He was elected Fellow of the Royal Society of Canada, Academy of Science, in 1986 and the Canadian Academy of Engineering in 2003. In 1977, Dr. Bandler was a guest of Her Majesty the Queen and His Royal Highness the Duke of Edinburgh in Ottawa upon the occasion of the Queen's Silver Jubilee; young Canadians achieving excellence in the Arts and Sciences were honoured at a dinner and reception. He was further honoured by her Majesty in 2012 as a recipient of the Queen's Diamond Jubilee Medal.

One of Dr. Bandler's most notable achievements is his discovery of space mapping methodology, which speeds up model generation and design optimization of a system. From automotive crashworthiness to magnetic systems, his concept has been adopted into design portfolios across the entire spectrum of engineering, making possible the high-fidelity design of devices and systems at a cost of only a few high-fidelity simulations. In an article entitled "Have You Ever Wondered About the Engineer's Mysterious 'Feel' for a Problem?" published in the Summer 2013 issue of the *IEEE Canadian Review* he explains the discovery and gives examples of its application.

In recent years, Dr. Bandler has become a highly sought after keynote speaker and workshop presenter. He has lectured on the creative process to audiences all across North America, mainland China and in Hong Kong. He also regularly offers workshops and mentoring in presentation skills across North America. He was one of the organizers of a Three Minute Thesis (3MT®) Competition for the 2017 IEEE MTT-S International Microwave Symposium (IMS) in Hawaii, open to students and young professionals. ■



Photo: Jeff Debooy, Winnipeg Tribune

Leonard Bateman in 1973 in front of a display of the first Nelson River HVDC line, known as Bipole 1. The occasion was the official opening of Bipole 1 and the Kettle Rapids generating station.

of Production responsible for system operations throughout the province. In 1967 he was assigned responsibility for all planning functions, including designing and approving the basic design criteria of the Nelson River D.C. Transmission System. He was promoted in 1970 to Assistant Chief Engineer, and became Assistant General Manager and Chief Engineer in 1971.

In 1972 Mr. Bateman became Chairman and CEO of Manitoba Hydro. During his six-year tenure the utility expanded at an unprecedented rate. Two additional generating stations were completed, as well as the Lake Winnipeg Regulation project, the Churchill River Diversion project and the second phase of the Nelson River D.C. Transmission project (Bipole II). He also oversaw an interconnection with Minnesota Light and Power in 1976, and negotiated an agreement with Northern States Power for interconnection at 500 kV. Upon leaving Manitoba Hydro he founded Bateman and Associates, a consulting company.

Mr. Bateman's legacy at Manitoba Hydro includes a provincial carbon-emission- to-GDP ratio under the national average, even though its climate is one of the harshest in the country. This is due to his choice of developing Manitoba's hydroelectric resources over coal-fired thermal generation. The interconnections he oversaw with utilities in the United States have brought ongoing revenue to Manitoba, while also providing service backup. For more details, see "A History of Electric Power Development in Manitoba," by Mr. Bateman, published in the Winter 2005 issue of the *IEEE Canadian Review*.

Mr. Bateman was President and/or Vice-President of several professional organizations, including The Canadian Nuclear Association, The Canadian Electricity Association, and The Association of Professional Engineers of Manitoba. He was the founding President of the Canadian Society for Senior Engineers, a member society of the Engineering Institute of Canada. He is a recipient of The Canadian Council of Professional Engineers' (now Engineers Canada) Gold Medal, the Queen's Silver, Golden and Diamond Jubilee medals, and in 2003 was invested into the Order of Manitoba. He turned 98 in 2017. ■

...Continued from page 3 »

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Lift Off

by **Dario Schor**

Canada is overdue for a national space strategy. In August 2017, the renewed Space Advisory Board (SAB) submitted its recommendations to the Minister of Innovation, Science, and Economic Development. The report incorporates the views from not only the experienced board members, but also from in-person and virtual roundtable discussions engaging industry stakeholders, thus providing a more comprehensive outlook on the future of Canada in space. This article summarizes the main discussion points from the stakeholder meetings and reviews the key recommendations from the SAB as they relate to Canada's future in space.

Ad adstra,

Dario Schor; schor@ieee.org

THE STAKEHOLDER MEETINGS

From April to May 2017, the SAB hosted seven in-person meetings in different cities and two virtual events engaging northern communities and young professionals to collect input from different space industry stakeholders. The meetings were well attended by students, industry professionals, academia, teachers, space enthusiasts, journalists, and others. The "Consultation Paper for the Space Advisory Board: Driving Canada's Future in Space" laid out the two main topics for discussion: using space to drive broader economic growth and leveraging space for the benefit of Canadians. Over 150 participants attended the in-person and online meetings. The three most prominent discussion points during those meetings were (i) balanced space program, (ii) modernizing laws and regulations, and (iii) education and outreach.

A balanced space program would include a combination of stable funding for flagship missions and smaller scientific and technology demonstration "contributions" missions, the latter subsidized by the CSA. Large programs like the International Space Station provide high visibility for Canada while contributing to international research collaborations, strengthening humanitarian activities such as disaster management and ecosystem monitoring, as well as supporting national needs; e.g., security. Smaller initiatives enhance Canada's ability to respond to new developments in the field that enable industry and academia to obtain flight heritage on emerging technologies and contribute instrumentation or technologies to international partner missions while developing skills and talent in a competitive market. A balanced program would improve the current model where many preliminary studies are conducted, but missions are scattered over long periods, thus making it difficult for both industry and academia to find opportunities to test new developments in flight and to maintain viable teams.

Space Legislation

A strong case was made to update Canada's space legislation to keep up with international trends in areas like remote sensing and space mining. For instance, while Article 2 of the Outer Space Treaty from 1967 states that outer space and other celestial bodies are not subject to national appropriation, there is no consensus on whether this extends to materials extracted from the celestial bodies. The United States has already passed the so-called Commercial Space Launch Competitiveness Act in 2015 explicitly allowing US citizens to "engage in the commercial exploration and exploitation of space resources" and other nations are expected to follow. Similarly, there is a need to revisit the Canadian Remote Sensing Space Systems Act that attempts to balance the dual use of space activities as it relates to space assets, ground stations, and data collected. An independent review published in February 2017 by Ram Jakhu and Aram Daniel Kerkonian from the McGill University Institute of Air and Space Law further anticipates that the act may not be able to keep up with emerging technologies and possibly hinder national and international business opportunities with its strenuous licensing processes; e.g., the current delay in approving the use of Inuvik's satellite ground station to communicate with the fleet of satellites from the American remote sensing firm Planet. The act also places stringent regulations on the dissemination of "raw data" that has potential to be used for many applications versus the oversight applied to "remote sensing products" that have been transformed for specific uses. Combined with existing favoured public-private partnership models where the Canadian government does not own the satellites collecting remote sensing data, results in data access for Canadians are being limited. Alternative models, where the government subsidizes data access, can thus be considered more advantageous in order to support researchers and startups who are trying to leverage advances in the availability and processing of big data for addressing global challenges and looking for new market opportunities, respectively.

ROCKET ENGINEERING COMPETITION

The Intercollegiate Rocket Engineering Competition (IREC) *challenges university teams to design, build, and launch rockets to 10,000 feet or 30,000 feet while carrying a 10 pound payload. The competition takes place at Spaceport America in New Mexico, United States over the course of a week. Canadian teams have been participating in the competition since 2011 and have been recognized with many awards.*

rockÉTS from École de technologie supérieure in Montreal is one of the many university teams in Canada participating in IREC since 2012. The group of over 30 passionate engineering students designed the EMERILLON-IV consisting of a carbon fibre body that is 139.54 inches high, has a 5.16 inch diameter, and houses a payload, avionics, and parachute. The scientific experiment is designed to execute autonomously during the 2-3 minute long trajectory that reaches speeds of over 550 mph.

There is strong evidence that graduates from Canadian space programs lack opportunities for employment in Canada; e.g., the CSA's recent astronaut search revealed that 26 of the 72 Canadian applicants shortlisted were living abroad at the time of application.

Preparing the next generation

The education and outreach discussions stressed the important role space plays in developing STEM activities to inspire the next generation. However, besides the traditional methods involving astronauts and flagship missions, the discussions focused on the important roles played by some of the non-traditional initiatives. There are student competitions that develop leaders who become ambassadors for the sector visiting schools, using their enthusiasm to connect with pre-university students, and challenge this cohort to think big. These activities are driven by a push to train highly qualified personnel for the space industry. However, there is strong evidence that graduates from Canadian space programs lack opportunities for employment in Canada; e.g., the CSA's recent astronaut search revealed that 26 of the 72 Canadian applicants shortlisted at that stage of the competition were living abroad at the time of application. Comments made by participants at the Space Advisory Board's young professionals meeting reflected this concern: a frequent theme being that many bright individuals are looking to develop their career elsewhere, with a sizeable number of participants calling in from the United States and Europe.

THE SAB RECOMMENDATIONS

The SAB report entitled "Consultations on Canada's Future in Space: What we Heard" was released in August 2017. It describes the roundtable discussions as being filled with "bold, aggressive, and inspirational" ideas for a national space strategy and provides two main recommendations to (i) designate space as a national strategic asset, and (ii) expand the role of the SAB.

The first recommendation links all of the aforementioned topics from this article. It further emphasizes the need for the government department and agencies to work together to synchronize policies to form a whole-of-government approach needed as the basis for a national space program. As an example, this would include implementing interdepartmental standards for space data organization, collection, analysis, storage, and distribution. Some attempts for an integrated approach are already underway as described in a CASI ASTRO 2016 conference paper entitled "RCM Data Utilization & Application Plan" by Daniel de Lisle from the Canadian Space Agency. Other important steps would be updating procurement policies to favour domestic products and acquiring space services from the private sector as opposed to government owned and operated space systems. These two policies combined would create a more

Custom avionics control the experiment, measure the performance of the rocket, and log data for post-processing. After a few top five finishes, in 2016, the team received first place in the Basic Category (10,000 feet) and the Jim Furfaro Award for Technical Excellence. Team lead Robert Houde highlighted one of the new features added for the 2017 competition: an ejection system relying on noble gases only instead of the traditional black powder. This novel technology earned the team the 2017 Dr. Gil Moore Award for Innovation. Looking forward, the team is working towards getting access to the test facilities needed to push their designs to the Advanced Category.





Rocketry team from École de technologie supérieure, Montreal

University of Victoria's **ROCKETRY TEAM** is another Canadian success story. Their first entry into the competition in 2016 received third place in the Basic Category. Raising the stakes for 2017, Annaliese Meyer, the Payload Science Lead, and her team developed a novel ultraviolet sterilization unit for interplanetary sample retrieval. In this experimental setup, bacteria was placed on aluminum squares where it was exposed to three specific wavelengths of ultraviolet light during the flight. The preliminary results showed a significant reduction of the survival rate of flight tests versus their control experiments - furthering the understanding of effects of the flight for future sample return missions. The advanced payload design earned the first place in the Space Dynamics Laboratory Payload Challenge in 2017. The team collaborated with members of the IEEE Student Branch in the design of the guidance, navigation, and control unit under the direction of Martin Kellinghusen. They designed custom boards, firmware, and software to run the experiment autonomously. Rather than using the traditional "remove-before-flight" pin, a hall effect sensor was used to detect a magnet placed to arm the rocket on the launch pad. The novel design removed many structural constraints placed on the electrical design. Although not required, a 70cm amateur radio band transmitter was used to send live telemetry to a nearby portable ground station, thus enabling them to monitor the state of the rocket while on the launch pad and in flight. Live telemetry feeds help to mitigate risks to ensure the system is operational before launch (e.g., not overheating) and also serves as a forensic measure in the event of a catastrophic failure.





These activities are not easy and require lots of sponsors; a special acknowledgement goes out to the IEEE Canadian Foundation (ICF) for supporting the University of Victoria rocketry team.

"UVic Rocketry would like to extend our profuse thanks to ICF for their generous donations and support of our team," says Annaliese Meyer, Payload Science Lead. "The foundation makes it possible for our wide range of members to reach new heights in their professional and academic goals."

The success of these teams builds on the rich history of Canadian sounding rockets that dates to the first Black Brant launch on September 5, 1959. For more information on the IREC competition and the teams participating, please visit http://www.soundingrocket.org/. And who knows, perhaps these students will get a minor in "rocket science" with their engineering degrees. ■

welcoming environment for New Space entrepreneurs that focus not only on the space assets, but also on the downstream applications related to the big data movement. Finally, there is a strong recommendation to dedicate 10% of the Canadian Space Agency budget to research at Canadian universities that includes both developing new technologies and providing flight opportunities to establish flight heritage.

The second recommendation focuses on the role of the SAB. At first glance, this can appear to be self-promoting, however, if one reads the details, this point speaks on behalf of the citizens the board is representing. The first part of this recommendation aims to continue engaging with the community of stakeholders to continue discussing the "bold, aggressive, and inspirational" ideas throughout the development of a national space policy. The second portion of this recommendation focuses on what many roundtable attendees pondered: how are they going to measure progress? The board is volunteering to help develop metrics to evaluate the implementation of the plan, monitoring the progress against the metrics, and advising the minister on the various findings. It is holding the government accountable to the input from the many stakeholders.

CONCLUDING REMARKS

Ultimately, an updated space strategy with a long-term vision must balance many factors, including national security and commercial interests. The items highlighted in this review all point to needed policy changes. More support is necessary in order to build a more balanced space program including the encouragement of novel commercial ventures; these will not only inspire the next generation, but also provide employment opportunities within Canada. Hence, the Space Advisory Board and the Canadian government have a lofty challenge ahead of them: drafting a national Space Strategy to position Canada at the forefront of the New Space movement. For more information, please refer to the consultation papers and the summaries for each of the meetings at https://www.ic.gc.ca/eic/site/ad-ad.nsf/eng/h_ad03983.html. ■

About the Author



Dario Schor is currently a Software Engineer at Magellan Aerospace while pursuing a Space Studies Ph.D. at the University of North Dakota. He obtained his B.Sc. and M.Sc. in Computer Engineering from the University of Manitoba in 2008 and 2013 respectively before attending the 2013 Space Studies Program from the International Space University in Strasbourg, France. Dario has served in various roles within IEEE Canada and the Winnipeg Section. He can be reached by email at schor@ieee.org.

CCECE 2017 – taking no chances with successs

Held at Caesars Windsor, the venue might suggest the organizers weren't averse to a roll of the dice. But if so, the outcome of this venerable conference was never in any doubt!













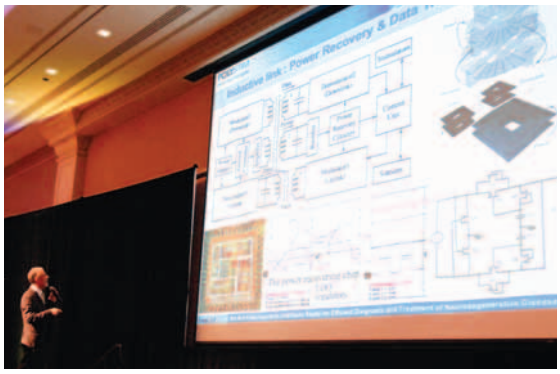
Though Windsor is well known for its casino, it is also symbolic of the world's largest bilateral trade relationship, with more than 2.3 million truck crossings per year. So it was quite apt the 2017 Canadian Conference on Electrical and Computer Engineering (CCECE 2017) was themed "Two Great Nations Innovate the Technology."

Conference General Chair, Majid Ahmadi, General Co-Chair, Esam Abdel-Raheem and Technical-Program Co-Chairs, Mounir Boukadoum, Ehab El-Saadany and Kemal Tepe mounted an informative and diverse program drawing from over 400 submissions, from 35 countries spanning all 5 continents. The dedicated reviewers accepted 263 papers (61 percent) reflecting the ongoing high technical standards of the conference.

Eight different technical tracks were explored: Bioengineering, Communications and Networks, Computer and Software Techniques, Control and Robotics, Devices, Circuits and Systems, Power and Energy Circuits and Systems and Signal Theory and Signal Processing.

A highlight of each CCECE is the Annual Awards Gala where Region 7 members are honoured for their technical and service excellence. Those selected this year were again all "aces."

CCECE 2017 was sponsored by IEEE Canada and supported by the University of Windsor, Keysight Technologies, Siemens, Mersen, Tourism Windsor Essex and Pelee Island, Wiley, Quanser, Testforce, TestEquity and Tektronix - the conference organizers are thankful for their generous support.■









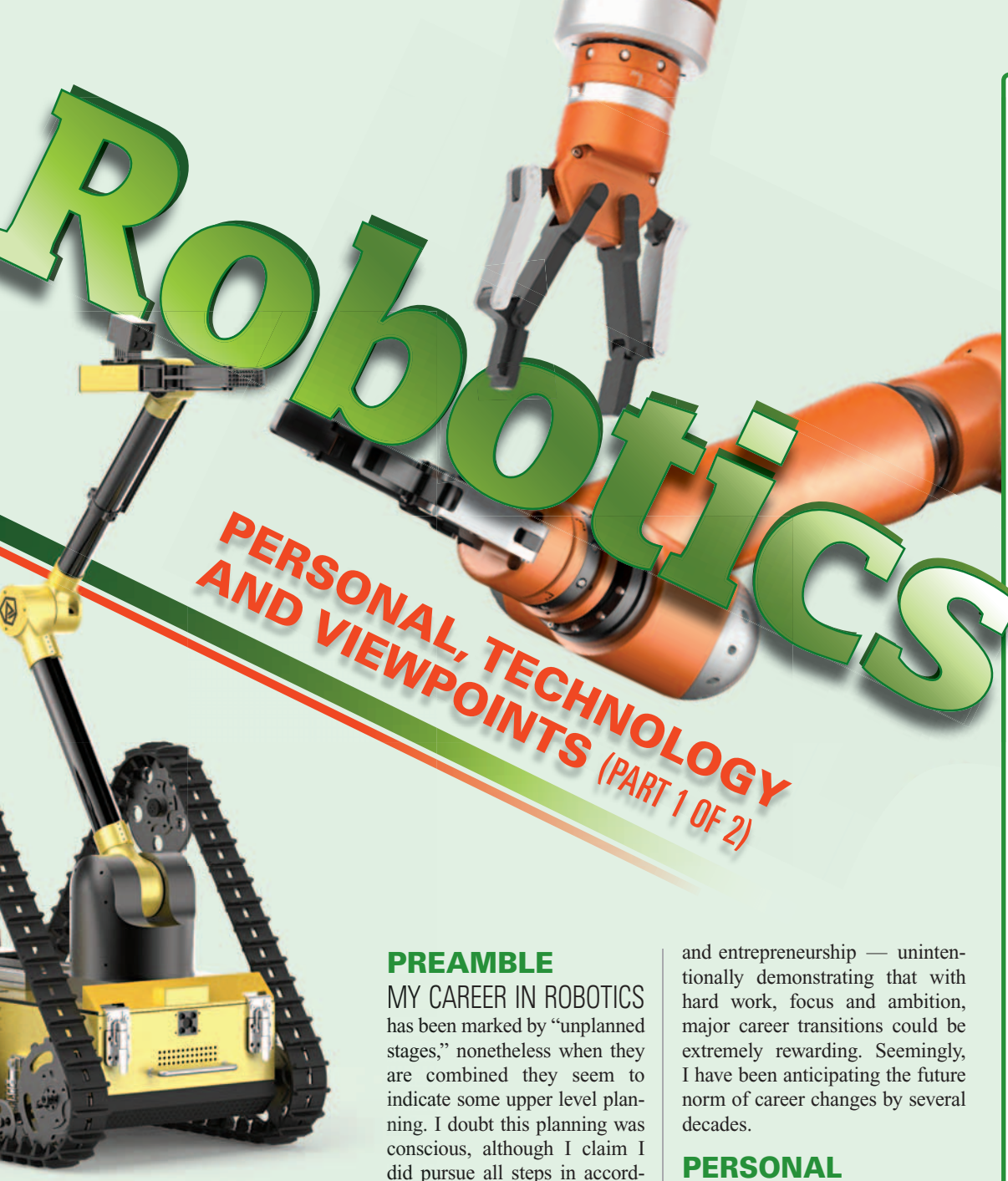






Robotics

PERSONAL, TECHNOLOGY AND VIEWPOINTS (PART 1 OF 2)



Andrew Goldenberg
PhD, PEng, CEng, FIEEE, FASME, FAAAS, FCAE, FEIC

Chief Technology Officer:
- SuperRobotics Ltd., Hong Kong, China
- ANZER Intelligent Systems Co. Ltd., Shenzhen, Guangdong, China
- Engineering Services Inc., Toronto, Ontario, Canada

Professor Emeritus,
University of Toronto

N.Ed.: Dr. Andrew Goldenberg is the 2016 recipient of the IEEE Canada McNaughton Gold Medal, the highest award given by IEEE Canada.

PREAMBLE

MY CAREER IN ROBOTICS has been marked by "unplanned stages," nonetheless when they are combined they seem to indicate some upper level planning. I doubt this planning was conscious, although I claim I did pursue all steps in accordance with my "best judgement" based on whatever information I had available at any given time, and also based on "gut feeling" and common sense that always served me very well.

I have decided to write about my career with the hope that it will raise, in some ways, a potential interest because of the variety of roles I have played throughout my career. Increasingly, young professionals are told to be prepared for several different areas of employment in their professional life. I have followed a path that included higher degrees education, industry, academia, business and entrepreneurship — unintentionally demonstrating that with hard work, focus and ambition, major career transitions could be extremely rewarding. Seemingly, I have been anticipating the future norm of career changes by several decades.

PERSONAL CAREER STAGES

My professional career is divided into six stages.

FORMATION STAGE

Early on after military service I only partially understood my choices of career; nonetheless I listened, observed and received clues from various sources. It ended up with a great choice of profession: engineering — a perpetually challenging discipline — and electronics, which with the explosion of sensor and microprocessor technology has impacted every facet of engineering. These choices were supported by selecting well-known academic

...Continued on page 19 »

One issue that has been preoccupying me for a long time has been the relationship between academia and industry. I have read many reports in various media addressing the matter, but I have never found sufficient insight nor adherence to my views, until I read an article published in the *IEEE Robotics & Automation Magazine*, Sept. 2016 issue, "Robotics Academia and Industry: We Need to Talk!." The article is authored by Professor Erwin Prassler from Hochschule Bonn-Rhein-Sieg, Germany. He addresses, in part, the long-standing need for greater industry participation in university research. I found the article very interesting, and his assessment of the divide between the two communities by-and-large in agreement with my own.

In my experience, the issues raised in the article apply broadly to most industrialized countries. In this piece, I include many of the points made by Prof. Prassler, adding to them my own observations and beliefs. Whilst he wrote as an academic, I am largely claiming to present the industry perspective.

Why should university research community attract industry? Because:

(a) it is the major reason for its existence in terms of its role in education, training, and use of research results

(b) focusing on research without solving operational problems of interest to industry leads to practical irrelevancy

(c) by-and-large, industry needs the research community — especially in the context of modern robotics: logistics, autonomous mobility, human-machine interaction, reasoning, and machine learning

(d) ongoing dialogue between the two communities builds understanding of their divergent scopes and objectives: Research — publish or perish; Industry — economic relevancy

What kind of industry the research community should aim to attract?

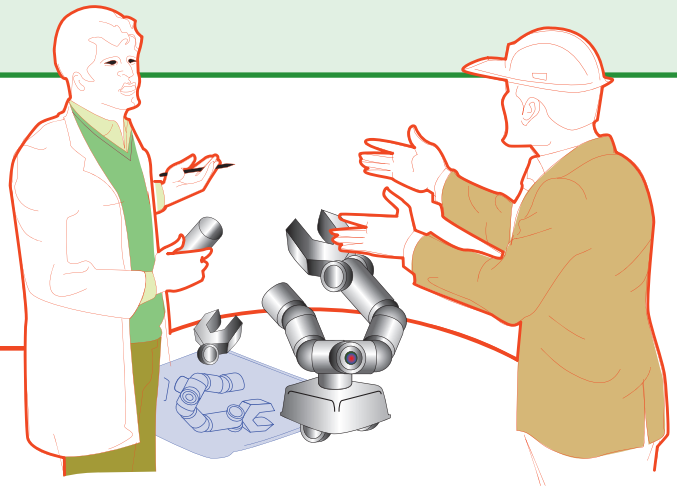
(a) any industry that uses robotics

(b) start-ups in robotics

What makes robotics research attractive to industry?

(a) industry does not perform basic research

Why University Robotics Researchers Need to Reach Out to Industry



(b) industry needs to address advanced topics impacting future product developments
(c) training and advanced education
(d) robotics challenges
(e) publishing survey articles

Origins of academia-industry divide

(a) the control systems research community was the first to address robotics research in late '70s
(b) electromechanical design of robotics was not addressed by the early university research community concerned with robotics – it became the realm of industry. In the '90s the research community became interested, however.
(c) Computer Numerical Control was the first to address robotics as an industry
(d) the computer research community was attracted to knowledge-base and early AI as a bridge to robotics in the '80s
(e) while current university research meets Technology Readiness Level (TRL) 3-4; industry finds it useful only at TRL 7-8
(f) industry does not approach the research community because it sees it as irrelevant to immediate issues
(g) no strong evidence of operational links between university research and industry on issues of immediate concern
(h) industry prefers to perform critical research internally (an IP matter)
(i) embodiment of modern robotics technology requires intensive applied research
(j) university research is primarily dependent on public or institutional funding

Suggested paths to rapprochement between university robotics research and industry

(a) industry addresses development of products
(b) research community addresses basic research
(c) both should aim to generate core technology to be embedded in products
(d) product development and research to be performed simultaneously

Industry is best served by creating products that have a market value, as opposed to laboratory exploration that is the undertaking of basic research. Where academia undertakes applied-oriented research, it could be channeled towards "core technology" that is the foundation of any product. Thus, product development and research would both contribute to the development of the core technology embedded in the products. Core technology, expressed through patents, trademarks, technical secrets and know-how would be valued by the market through its perceived efficacy in creating new products. This market value is further raised by the perceived market impact and penetration of the new products. In this manner, the research becomes relevant to creation of products that in turn may provide sustainment to the research efforts and cover their costs.

Academic and research-oriented institutions focus almost unilaterally on the development of basic technology. They are guided by perceived future market needs, competition between research institutions expressed by the publications and citations of each, and shear curiosity of research staff. These related undertakings are usually not linked directly to product development as done by industry. This leads to excessive generation of basic technology that may — or may not — be useful. Granted though, it may be ahead of the state-of-the-art, sometimes by a decade or more; therefore, one cannot fully assess the impact of generating new basic and core technology.

The fact is that core technology that is directly related to market-driven products is rarely addressed outside those businesses whose main undertaking is to develop the products in the first place. The university-based research could be a significant contributor to the product development if it would allow targeted research to dominate, as opposed to total disengagement from immediate use that loads heavily on the taxpayer money.

ROBOTICS AS AN INDUSTRY

If we look historically at the computer and robotics industries we would note that the latter is older. This may be a surprise if one considers the stage of existence of the computer industry. It is mature and already in its fourth or fifth global business life cycle. The names of Microsoft, Dell, HP, and many others are well known. Why is the robotics industry still in diapers? The main reason is that it evolved as a novel academic exercise instead of being undertaken fully by the business community. Nonetheless, nowadays there are well known names in the robotics industry

> "The primary aim should be to make the robotics industry create jobs for the masses, and not just for those with a Ph.D. Too often unsustainable businesses are created, conceived as high-end "advanced" projects but lacking a fundamental business basis of growth that could lead to job creation."

such as Fanuc, Kuka, Adept, and many more suppliers of subsystems and components. However, as an industry, it still represents a very small number of employees globally, when compared with the computer industry, and is still repeatedly referenced and viewed as an "emerging technology," although the field is more than 40 years old.

It is time to leave out the "wow" of futuristic applications featured in YouTube videos, and get serious with the maturity of the robotics field as a current employment opportunity.

The primary aim should be to make the robotics industry create jobs for the masses, and not just for those with a Ph.D. Robotics should benefit the society at large, instead of the few and far between often supported by ill-informed funding decisions. This applies to both private-sector investments that do not reflect market needs and its capacity to adopt the new technology, as well as government funding that seeks to demonstrate forward-looking economic policies to a public largely ignorant on matters of technology and its impact on the welfare of the society. In either case, too often unsustainable businesses are created, conceived as "advanced" projects but lacking the fundamentals of business growth that could lead to job creation.

ROBOTICS START-UPS

To grow a technology business there is a need to develop a business plan based on a unique business model, as opposed to relying solely on the uniqueness or advanced nature of the proposed technology. Good business models succeed in so far as competing at an advantage, whereas good technologies without a suitable business model do not. This issue relates primarily to start-ups; governments and media focus on the rate of start-up formation as a measure of success. They ignore growth and sustainability in relation to the investment made.

Capturing a novel and unique business model has been my primary pre-occupation throughout my entire business journey. It has proven to be successful. I recommend to not adopt a known or existing business model simply because it is used by others. Devise the unique model that suits you and your technology. ■

Personal Robots



HOST AND RECEPTIONIST ROBOT

The robot for service in public areas. It provides a mobile kiosk to dispense information upon request through touch-screen interface, guidance through Q&A in public spaces, source of local maps, and link to customer relations personnel. The robot can be used in more formal gatherings such as conferences and conventions, sports events, train and bus stations, and airports.

It includes interactive means for two-way interaction with the public in a wide range of venues. It can move autonomously or can be controlled remotely.

The main functionalities and applications are:

- Mobile navigation in public spaces
- Remote viewing, inspection of environments, transfer of images
- Auto docking and power charging with operation of more than 6 hours
- Automatic detection of obstacles and automatic stop for safety
- Local touch-screen display
- Inter-person voice communication including expressions of emotions
- Reception services
- Guidance in public spaces
- Payment outlets
- Advertising and promotion services
- Educational service

HOME ASSISTANT ROBOT

The robot is a mobile device for active support of humans mainly in domestic environments. It incorporates the Mobile Platform and a pair of arms mounted on a vertical trunk attached to the platform. It can be controlled through voice, gesture and display of emotional interaction. The robot can be programmed for specific premises and tasks to help around the house. The robot could help seniors and disabled persons to stand up from the bed and chair. This help could be provided by remote control from a service center. The robot could also provide some functions around the kitchen. The robot could operate with one or two arms.

Working and serving a human interactively raises safety issues. In this context, the arms are back-drivable (compliant joints) to provide a diminishing force of interaction when unwanted contact between robot and human occurs. The robot APM can be mounted on various mobile platforms.



The main functionalities and applications are:

- Mobile navigation in private premises
- Remote viewing, inspection of surroundings, and transfer of images
- Auto docking and power charging station with operation of more than 6 hours
- Automatic detection of obstacles and automatic stop for safety
- Fetch-and-carry tasks such as serving a drink
- Delivery of light items to user
- Provide help to a person to stand up
- Home cleaning and simple operation of appliances
- Door opening and closing
- Doing laundry such as using a washing machine
- Alarm and assist in case of emergency such as in the case of a fall
- Support to do remote control of some personal health measurements
- Entertainment and communication

...Continued on page 16

institutions for learning: Technion in Israel for 1st and 2nd degree and University of Toronto for the 3rd degree. It worked very well for me because I spotted the right trends.

As an undergraduate, I was a so-and-so student until the 3rd year when I met a better scholar than me from the Faculty of Architecture of the same school (Technion) — my wife of over 47 years. By the 2nd half of the 3rd year I became a studious person, hungry for professional and general knowledge and looking forward to challenges; this continues unabated to date.

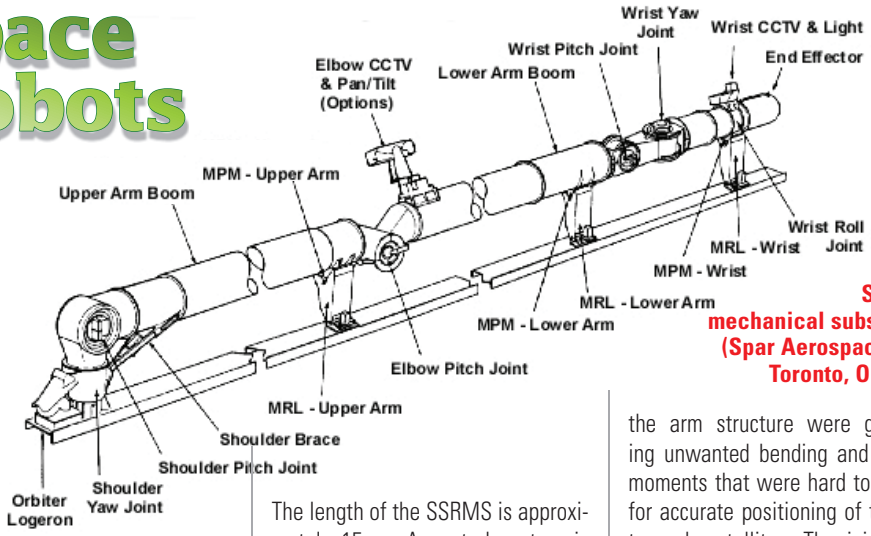
All and all, I have had great undergraduate studies, exceptional graduate studies supervision and great inspiration from selected models — professionals who were unaware that I was studying them, leading to extremely good preparation professionally, mentally and strong habits of working intensively and passionately.

INDUSTRY STAGE

When I finished my PhD at Toronto in 1975 I tried to land a post-doctoral position in Canada; there were not many opportunities available back then that were suitable for me. However, I was extremely lucky to be hired in July 1975 by SPAR Aerospace Ltd. of Toronto to work on what was then called Space Shuttle Remote Manipulator System — SSRMS and later renamed Canadarm. I started working on the control system of the SSRMS joint. Later I worked on the whole of SSRMS kinematics, dynamics and its 99-DOF simulation model, as well as on other space robotics and various satellite projects.

The SSRMS project completely shaped my professional future: it was unique, ahead of the times, very challenging and outrageously interesting. A totally captivating endeavour. It was the period of growing up and maturing professionally (and personally with a pair of identical twin daughters) to eventually realize that knowledge is never complete, and learning is an endless job. This applies to me today as it did then.

Space Robots



SSRMS mechanical subsystem (Spar Aerospace Ltd., Toronto, Ontario)

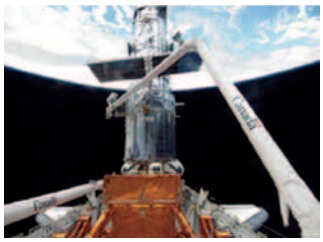
SPACE SHUTTLE REMOTE MANIPULATOR SYSTEM (SSRMS)

The Space Shuttle Remote Manipulator System (SSRMS) or "Canadarm" was a joint venture between the governments of the United States and Canada to supply the NASA Space Shuttle program with a robotic arm for the deployment/retrieval of space hardware from the payload bay of the orbiter.

A schematic view of the SSRMS is shown at top. It is a robotic arm consisting of a shoulder, elbow and wrist separated by an upper and lower arm boom giving it a total of six DOFs (shoulder pitch and yaw, elbow pitch, wrist pitch, yaw and roll). At a total weight of approximately 431 kg, the SSRMS is capable of maneuvering payloads of up to 14,515 kg at a rate of 0.06 m/sec with a maximum contingency operation payload weight of 265,810 kg. Under unloaded conditions the SSRMS can achieve a maximum translational rate of 0.6 m/sec. However, the SSRMS is incapable of supporting its own weight on earth. It must be supported by specialized ground handling equipment during its testing and packaging for shipment.

Although the SSRMS can handle very heavy payloads, movement of the tip is very accurately controlled, allowing precise handling of delicate payloads.

The length of the SSRMS is approximately 15 m. A control system is used to deploy payloads in automatic mode to a positional accuracy of +/- 2.0 in and +/- 1.0 degree of a pre-programmed target point and orientation at the afore-mentioned rates and load conditions. The SSRMS may also be operated manually (remote control) by the



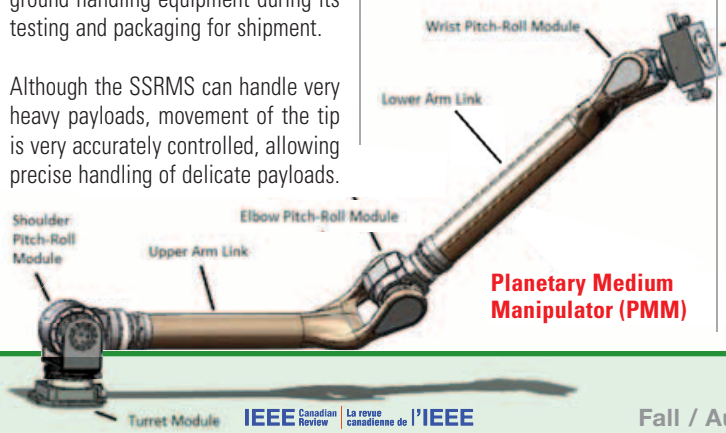
astronauts to the same accuracy with the use of hand controllers and closed circuit televisions (CCTV) mounted on the manipulator arm. The SSRMS was designed to have a life of 10 years or 100 missions.

Analytically, the major challenge in the development of the SSRMS was the structural flexibility of the mechanical system generated by the limitations of SSRMS weight. On the ground the arm had to be supported with braces. In the weightless of space, its own mass was no issue, but the light materials that made the arm structure were generating unwanted bending and torsion moments that were hard to control for accurate positioning of the arm to grab satellites. The joints and the boom were very flexible; the system had 99 DOFs, making the control system design of the joint and of the arm a major challenge that has not been completely solved even to date.

ADVANCED ROBOT ARMS: PLANETARY MEDIUM MANIPULATOR

This robot was developed to advance the state-of-the-art of manipulators for planetary exploration and to perform simulated Moon and Mars missions on Earth. It is made up of eight modules: Turret, Shoulder, Upper Arm, Elbow, Lower Arm, Wrist, Automatic End Effector Exchanger (AEEE) and Controller. The turret provides azimuth motion, while the shoulder, elbow and wrist each provide pitch and roll.

The system operates under remote control commands, as well as autonomously through a scripting interface. The autonomous motion is achieved using advanced methods of visual servo, force, impedance, and adaptive control. The AEEE interface is used to autonomously load tools and other payloads onto the arm.



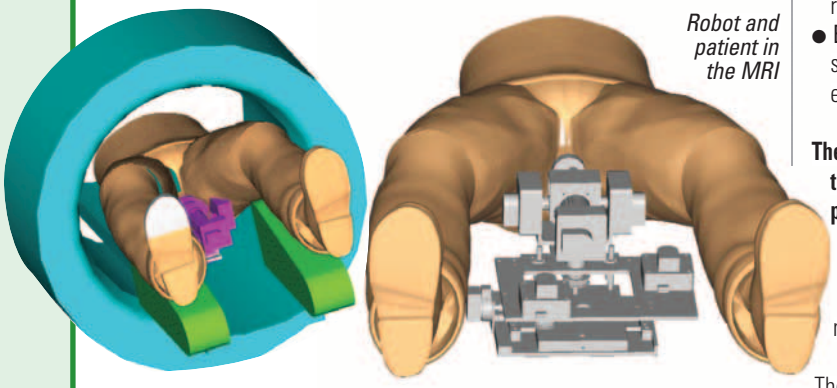
Planetary Medium Manipulator (PMM)

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Medical Robots

Medical Robots technology is offered through a range of products. Surgical robots have been developed or are under development for the following therapies: **(i)** Minimally invasive prostate surgery in closed-bore MRI, **(ii)** Minimally invasive general surgery in closed-bore MRI. The robots are modular and re-configurable to allow mounting and fitting into the MRI environment. The robots are semi-autonomous. They are remotely controlled when operating in the human body through MRI and PC-based images. The robots are endowed with advanced Operator Control Units allowing complete control of the interventions. The robots can be adapted to other surgical procedures and organs by exchanging therapy-focused modular subsystems of the robot.

MRI-GUIDED ROBOT-ASSISTED IN-BORE PROSTATE SURGERY



Robot and patient in the MRI

Prostate cancer is the most common cause of cancer in men and the second-most common cause of mortality due to cancer. Publicly available information indicates that more than 230,000 men are diagnosed each year in North America. A conservative estimate of the prevalence of prostate cancer in North American males in the age range of 55 to 69 is 7,500,000 men.

The traditional curative treatments of this disease include radical surgery and external or interstitial radiation therapy. These are reasonably effective for localized cancer, but are associated with significant quality of life penalties. These may include incontinence, impotence, bowel dysfunction, and prolonged recovery. The cause of these problems is not removal of the prostate but damage to surrounding tissue and nerves.

While most believe that prostate cancer is a multi-focal disease, recent evidence supports the notion of a dominant focus that is the largest of intra-prostatic cancer sites and the major source of extra-prostatic spread (90%). Recent improvements in imaging of tissue by magnetic resonance scanning have allowed for the visualization of these sites.

Image-guided focal ablation of the dominant focus in selected men with low to low-intermediate risk cancer can control spread of the cancer from the prostate in most men and render it a chronic disease that is largely devoid of side effects. This paradigm treatment shift is not dissimilar to treatment of colonic polyps by colonoscopy as opposed to colectomy or lumpectomy for localized breast cancer instead of mastectomy.

The ideal implementation of this concept is with a minimally invasive robot-assisted MRI-guided focal ablation system. The procedure is performed in closed-bore MRI that is considered superior to other techniques of image-guided interventions (open-bore MRI, Ultrasound, Computerized Tomography (CT) scan). The procedure uniquely integrates direct cancer imaging, real time precision computer-aided navigation of the tool to the target, optimal energy distribution into the target, real time imaging of tissue destruction using MR thermography for visual confirmation of target destruction.

The robot could be used with different surgical tools to perform a range of prostatic interventions:

- Ablation - thermal lesions resulting in cell death without untoward patient effects
- Brachytherapy - insertion of radioactive seeds in the gland
- Biopsy – extraction of tissue samples from the gland based on established protocols

The image-guided surgical interventions in closed-bore MRI may be performed using either:

- a remotely-controlled surgical robot tool; or
- a manually-controlled instrumented surgical tool

The surgical tool is identical in both approaches. It is carried by either the surgical robot tool or by the instrumented tool. The procedures are image-guided.

One major issue is that the surgical tools and carriers must be MRI-compatible; that is, the robot or instrumented tool and the MRI would not affect each other (the imaging process and carrier operation, respectively). The technology also includes a methodology of evaluating the therapy (ablation) by real-time MRI scanning during and post-intervention.

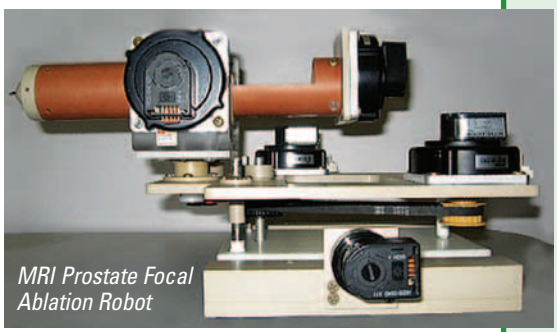
The new technology provides high added value to the medical practice as it would impact on both precision of surgical procedures and reduction of side effects that may appear post-interventional and affect the quality of life.

The robotic platform includes: (i) a six-joint robot; (ii) robot-based trocar for mounting surgical tools; (iii) hand controller for navigating the surgical tool by remote control; (iv) robot controller; (v) a laptop-based user interface for robot control and image display; (vi) laser dispenser, power, and control; (vii) MRI monitoring station (including MR Temperature mapping). The robot system could be adapted for operation in 1.5T - 3T MRI scanners. The robot is functional simultaneously while the scanner is operating without affecting the images or the robot operation.

During surgical procedures, the patient lies on the MRI roll-in table with leg supports attached to the table (shown schematically). The robot is mounted & secured onto the table and between patient's legs. The robot controller is at a distance from the scanner, connected to the robot, and to the Laptop that is in the adjacent control room. The surgeon will remotely manipulate the tools based on MRI and laptop-based images using a hand controller (joystick) or manually. Control of surgical tool penetration is based on visual feedback provided by MR imaging. The image allows the user to identify the tool tip location relative to the target, and perform suitable adjustments of the tool path to reach the target. When the tool is at the target, the laser is turned on, and ablation of tissue is performed. MR thermography allows for real time imaging of tissue destruction. After the ablation process is completed, the scanner provides images of the heated and coagulated volumes of tissue.

The technological features of one such robot are:

- Modular Design: Surgical tool support (trocar) allows for a variety of tools to be used
- MRI-compatible
- Rugged and compact design
- Bio-compatible
- Safe and efficient in the MR environment



MRI Prostate Focal Ablation Robot

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ACADEMIC STAGE

I was very lucky to be called to serve and be hired by the University of Toronto in 1981 on contract as a Research Professor, and later in 1982 as full-time tenure-track Professor in the Department of Mechanical Engineering. The departmental chairman, Dr. Ron Venter, was critical to my quick and successful integration at U of T and early successes.

I became infatuated with robotics: publications galore, very large number of graduate students, activities in professional societies, large research funding, editor of journals, conferences, presentations, speeches, etc.; high international recognition; accolades at right and left including three medals, the last being the IEEE McNaughton, and fellowships in several professional societies internationally, US and nationally.

In fact, I was the founder of the field of Robotics at the University of Toronto where I have been since 1982. I have supervised the largest number to date of graduate students in the Faculty of Applied Science and Engineering (46 PhD and 64 MASc), and have an exceptional publication record with more than 7,500 citations (128 archival journal papers, 294 papers in major conferences, 15 book chapters and 75 patents granted and applied). Though now and since 2011 I am a Professor Emeritus, I still maintain a reasonable load of graduate students and research.

Over the years, I was asked and accepted to be an editor of the archival international journal *IEEE Transactions on Robotics and Automation* from 1986-1994, and I am still a member of the editorial boards of *Robotica*, *Robotics in Japan*, *Journal of Robotics*, *Robotics Journal*, *Scientific World Journal*, *Industrial Engineering and Management Journal*, *SOJ Robotics and Automation* and *International Journal of Automation and Computing*.

From the early work as an academic I needed to show that I can build systems and see how they really work in practice. This prevailed, but it was concurrent with high-end academic work, leading to setting up at the University a commercial undertaking

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Space Robots ...continued from page 19 »

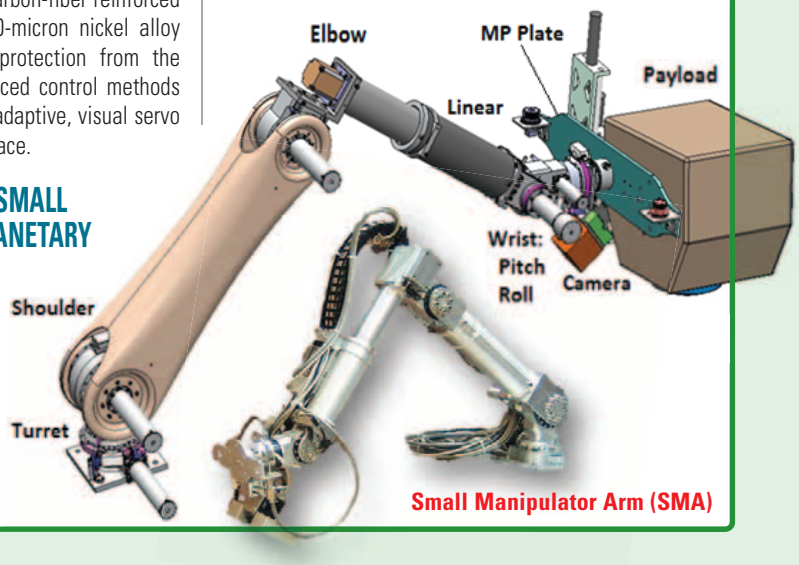
The robot can be used effectively in security and defense applications while mounted on mobile platforms, as well as in manufacturing, robotic-based custom automation, and for research. The robot is 2.3 m long with DOF. It can be used in aerospace applications where light weight is a key factor, security and defence where high accuracy and dexterity is a key requirement, as a test bed for R & D in advanced control methods with open software architecture, visual servo applications of guided tool operations and tool exchanging, and testing in environments with harsh Electromagnetic Compatibility (EMC), temperature and humidity requirements. It can be used indoor and outdoor.

The design is modular consisting of one single-joint and three two-joint modules, links and AEEE. The joints are compliant (back-drivable). Light-weight and high-stiffness arm links made of carbon-fiber reinforced plastic (CFRP) are coated in a 50-micron nickel alloy layer. Internal cabling provides protection from the environment and snagging. Advanced control methods that are used include impedance, adaptive, visual servo control and control in Cartesian-space.

ADVANCED ROBOTS ARMS: SMALL MANIPULATOR ARM FOR PLANETARY EXPLORATION

The Small Manipulator Arm was also developed to advance the state-of-the-art in manipulators for planetary exploration and to perform simulated Moon and Mars missions on Earth. It is a light-weight, high payload-to-weight ratio manipulator with advanced control systems including force control, visual servo control, and open software architecture. The arm has six joints, links, payload interface, electronics (drivers and controller), harness, user interface software, and operator control unit. The arm can be operated in remote control and closed loop modes. It can be used effectively in security and defence applications while mounted on mobile platforms, as well as in manufacturing, robotic-based custom automation, and research. The arm complies with military standard (MIL-STD-461 Rev E) on EMC and Electromagnetic Interference (EMI) requirements, and with space-quality requirements on vibration and shock resistance.

The arm has a high payload-to-weight ratio of 1:1.1, high repeatability and accuracy at full extension, modular two-joint wrist with tilt and roll motion, and a payload interface module for multiple payloads.■

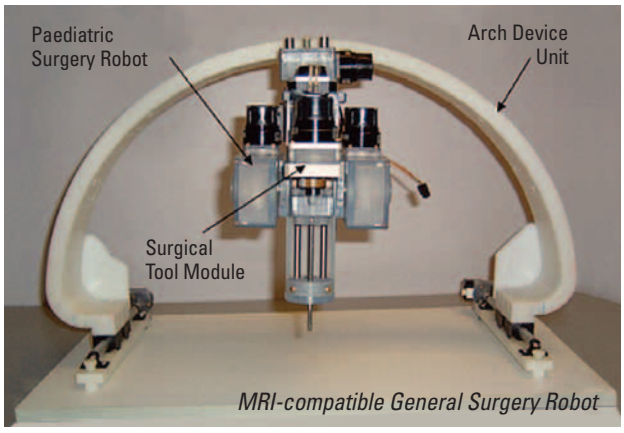


Small Manipulator Arm (SMA)

Medical Robots ...continued from page 20 »

GENERAL SURGERY ROBOT IN MRI

MRI-Compatible General Surgery Robot including its auxiliary technology (surgical tool, control station and arch-base device) is a new surgical robot prototype for MRI-guided bone biopsy and general surgery. The robot is modular, re-configurable and fits into the MRI, mounted on a MRI-bore shaped arch. The re-configurability provides a means of finding the best possible configuration for specific bone biopsy and other surgical interventions. The robot with various surgical tool modules can operate under remote control as well as autonomously. Haptics technology can be used to provide the sensing of drilling force in bone biopsy interventions. Embedded Control Software and Graphical User Interfaces are part of the robot system. Software for visualization and navigation is currently being developed.



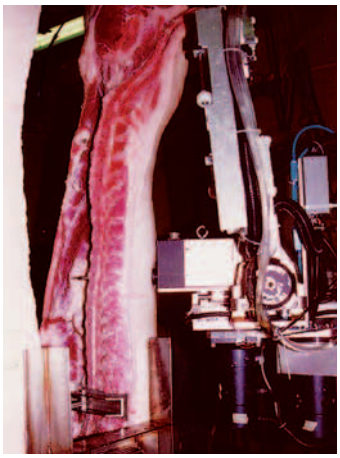
MRI-compatible General Surgery Robot

The main features of the medical robot are modularity of robot and surgical tool, MRI-compatibility, visualization and navigation software for interaction with MR images, and easy attachment/detachment of the surgical tool module for sterilization. An arch device unit compact enough in size to fit in the limited space of 3-T close-bore MRI is also available. ■

Custom Robots

ROBOT SYSTEM FOR MEAT GRADING

In commercial abattoirs, meat grading is routinely performed to establish the thickness of fat. The grading is performed at a federally-legislated point on the back of the carcass. The grading is performed with widely used electronic equipment that measures the thickness. The equipment has a long needle that gets inserted manually by the grader. The equipment measures the impedance of the tissue, and the differentiation between the impedance of the fat and that of the meat generates a reading of the thickness. The grading device, operated by a qualified grader, must be inserted in every single carcass. In the abattoir, the carcass is transported attached to an overhead conveyor. The operator must perform the task while the conveyor is moving, at a rate of maximum 700-800 carcasses per hour shifts in large abattoirs.



Meat Grading Robot, Sensing, and Probing Subsystems



Meat Grading Clamping Subsystem

This work is performed along the cutting line, as one of the several steps of preparing the meat for packaging. The work is tedious; the environment is hardened by odors, and generally leads to serious fatigue. The operator works continuously only 20 minutes at a time, and rests for the next 20 minutes. Thus, two operators are working in every eight-hour shift. Large abattoirs have two or even three shifts. The fatigue of the operator leads to inconsistent grading. The insertion of the needle must be done in one stroke, at a certain speed, and the needle must be inserted perpendicular to the surface of the meat. In the case of hogs that is at 7 cm from the spine between the third and fourth rib below the neck. When it arrives at the grading station, the carcass is already split along the spine from the tail down about half way. The operator inserts his arm between the two parts of the carcass (the carcass back is facing the operator), finds the third rib, and presses his hand against the third and fourth rib while he inserts the needle. Clearly, experience helps the operator finding the ribs, insert the needle between them, maintain the needle orthogonal to the surface, maintain the speed of insertion, and perform the insertion in one stroke. The equipment is connected to a PC, and it registers the carcass number and the grade automatically.

The operation described above measures only the thickness of fat. The meat processing industry has been asked to perform additional measurements indicating the quality of the meat. There are developments currently underway to develop measurement devices for all sorts of meat properties. It is also desirable to effect grading in a non-invasive way. This would preserve the integrity of the carcass surface.

The operator fatigue, inconsistency in grading, the need to perform additional measurements, provision for both invasive or non-invasive grading, and the high cost of grading operations have led to considerations of robotic-based automation.

A system for grading hogs was developed in collaboration with the robot developers and pork meat processors. The approach and methodology is applicable to the "red meat" industry as well.

The robot replaces the grader in the repetitive and tedious manual task of grading pork carcasses. Automatic grading can be performed for fat/lean thickness, as well as PSE (paleness, softness and exudativeness) characteristics, and marbling content of a fresh pork carcass.

Automatic grading can be performed: (i) invasively, by the insertion of a grading probe, at a designated spot identified using ultrasound technology; (ii) non-invasively, using ultrasound and infrared technology; and (iii) as a combination of both. Manual fat/lean thickness grading is representative of invasive grading. Non-invasive grading ensures that no cross contamination occurs.

The robot system comprises three sub-systems: Robotic Subsystem, Sensing and Probing Subsystem and Clamping Subsystem. The Robotic Subsystem carries the Sensing and Probing Subsystem which scans the pork carcass, as the carcass is moving along the conveyor line to: (i) locate the designated spot for probing (invasive or non-invasive); and (ii) perform the grading. The Clamping Subsystem automatically clamps the pork carcass as it enters the grading station and presents the carcass at a constant position and orientation during the grading operation performed by the Robotic and Probing Subsystems. The Sensor Probing Subsystem uses a dual-echo ultrasonic technology to detect the probing site and perform the probing.

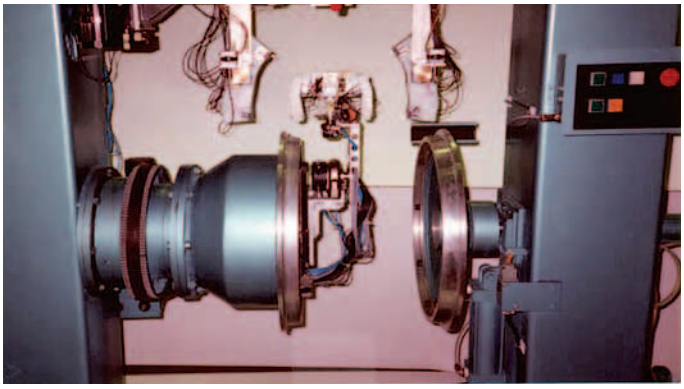
ROBOT SYSTEM FOR TIRE CASING ANALYSIS

Truck tires wear-and-tear generates a need for replacing them as often as needed. The industry of used tire re-treading is growing, due to environmental concerns. Tire re-treading is a growing business that requires effective detection of used tires that are candidates for re-treading.

An automatic robot-based tire casing analyzer has been developed. It detects defects and wear. It marks the locations of defects, and it provides a report on the state of the tire. The operator then decides if the tire could be re-treaded. For many years, the tire industry has been searching for a nondestructive, simple way to inspect tires and tire casings for flaws. Good casings are presently being discarded and disposed of in landfill sites, causing a detrimental effect on the environment. Or, tires are often prepared for re-treading only to discover that the casing has major irreparable flaws. The new technology eliminates these problems resulting in significant economic benefits. The technology is based on an intelligent controller that uses two robotic systems and carries 28 ultrasonic sensors. The controller provides autonomous positioning and guidance of the sensors, which are delivered into the tested tire by a very compact foldable robot. The sensors manifold conforms to the interior shape of the tested tire. Based on the ultrasonic signal, the sensors detect and evaluate defects in the tire. An intelligent algorithm has been developed to evaluate defects, classify them according to size, shape, etc., and graphically zoom in on a detected defect to be displayed on a computer screen.

The robotic arms are performing the ultrasonic inspection from within the cavity of the tire (carrying the emitters) and over the external surface (carrying the receivers). Loading and unloading of tires is done automatically by the operator using a lifting device.

...Continued from page 21



View of internal and external robot arms carrying ultrasonic sensors



General view of the tire grading system

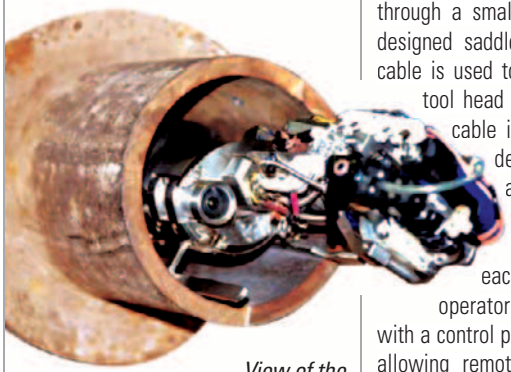
After loading, the unit starts operating by pressing a set of disks onto the sides of the tire to enclose its inner cavity. Then a foldable robot arm that was stowed inside one of the disks gets deployed internally. The robot arm carries a manifold of ultrasonic sensors that have three segments. The segments get deployed in such a way that the center segment faces the inner side of the tire tread, and the two other face the inner sides of the tire. The manifold positions itself at a suitable distance from the internal surface of the tire to enable ultrasonic waves to penetrate and reach the receivers that are connected on an external manifold mounted on the other robot arm external to the tire. Emitters and receivers are automatically aligned for maximum efficiency. The operation of the ultrasonic sensors, including the positioning and alignment is fully automatic.

After both the emitters and receivers were positioned accurately, the tire starts rotating at a pre-determined speed to perform the inspection.

ROBOT FOR INTERNAL OPERATIONS IN UNDERGROUND GAS PIPES

Underground cast iron gas pipes are made from 12′ long sections connected by bell-and-spigot joints. A joint is generally filled with jute packing and sealed with lead. The joint can develop leaks over time and must be repaired. One of the most frequent repair procedures is to inject an anaerobic sealant into the jute packing. This procedure requires a 4′ x 6′ excavation at each joint to allow the utility to reach the pipe (in the north-east US and Canada the pipes are 8′ deep in the ground), drill a hole through the bell into the jute and inject a measured quantity of anaerobic sealant. Such a process is hazardous, laborious and costly, and it interferes with transportation and pedestrians in urban areas.

To alleviate the above problems a novel technique was developed to perform cast iron bell and spigot joint sealing from inside the pipe using a remotely controlled robot. The robot is launched into the pipe through a special opening, travels inside the pipe until a desired joint is reached, and drills a hole into the joint spigot at the highest point. Then anaerobic sealant is injected into the jute packing to re-seal the joint. This approach replicates the repair procedure currently done externally. The sealant flows under gravity and saturates the jute. The operation is done while the main is kept in service.



View of the gas pipe robot end-effector

The internal sealing system can seal several joints from a single excavation while keeping the main in service. The system has been designed for 6″ (15 cm) diameter pipes. It can be inserted into the main up to 150′ (over 45 meters) in each direction from the entry point. Up to 24 joints can therefore be sealed from a single excavation. Adaptation of the concept to larger pipe diameters (up to 36″) has also been performed using a different methodology of moving inside the pipe.

The joint sealing system consists of a small robotic working head equipped with a video camera for search and joint identification, an umbilical cable, cable insertion unit, system storage reel with the tool control components, and an operator's station that includes a control panel and video monitor. In operation, the robot head is inserted into the main through a small tap, and pushed along the pipe by its motorized umbilical cable. The operator visually locates the desired joint, and positions the robot at the joint. The robot head is then raised into drilling position, and a small hole is drilled through the spigot into the joint cavity. Then, the sealant head is rotated into position, and a measured amount of sealant is injected into the joint. The head is retrieved, and the unit is then moved to the next joint.

The robotic tool head is inserted through a small tap using a custom-designed saddle. Semi-rigid umbilical cable is used to push and control the tool head position. The umbilical cable is stored on a custom-designed reel. A miniature video camera mounted on the tool head is used to locate each joint for sealing. The operator's station is provided with a control panel and video monitor, allowing remote control of the tool head for drilling and sealant injection. ■

to exercise the making of robots as opposed to dealing only with theory of robots. In the 80s this approach at the University was a first of its kind.

As a result, and although I was a full-time Professor, I interacted extensively with the industry, and succeeded in securing funding for real-life robotic developments with Northern Telecom, Ontario Hydro, IBM Canada and some smaller companies. It forced me to hire design engineering staff in my laboratory to provide the design infrastructure that could not be accomplished with graduate students. Further on, to expand the scope of these activities and legally separate them from the University, I founded and became the President of Engineering Services Inc. (ESI)—a high-technology company involved in the development of robotics-based automation.

Under my leadership, the company has achieved significant growth and a global leading role in a wide range of industrial sectors. In 2000, the company business in robotics for biotechnology was acquired by an Ontario-based publicly-listed (TSE) company. From 2000-2001 I was also the president of Virtek Engineering Science Inc. (VESI), a high-technology company formed after the acquisition of part of ESI. In 2006, I also founded (and became president of) Anviv Mechatronics Inc. (AMI) a high-technology company involved in the development of mechatronics products. The acquisition in 2000 had provided the means for complete early retirement; I did not follow through because of the love of the profession and my personal attachment to the field of robotics.

With the increase in my business activities, it became quite challenging to concurrently devote the time to my duties at the UofT that I felt was required. The departmental chairman had provided great support, but in the end, I opted for early retirement. It had been very rewarding, and I left knowing that I had put the school on the map and created a new field (robotics) in the University.

The fundamental roles of universities in terms of basic research versus applied research and how well it prepares students at the graduate

...Continued on page 24

...Continued from page 23

High Payload Robot Arm

HYDRAULIC ROBOT ARM FOR HIGH PAYLOAD HAZARDOUS TASKS

Utility companies must provide tree trimming near live aerial electrical distribution lines to avoid outages due to ruptured cables caused by erratic motion of tree branches during storms and other natural causes. The operation of tree trimming is usually done with hydraulic wood cutting tools by a trained operator stationed in a bucket mounted at the end of an "aerial boom" of approxi-



Slave manipulator mounted on the aerial boom

mately 45' in length. The boom is a two-link hydraulic arm with up to four joints that is mounted on a specially retrofitted truck. Two sets of controllers for the aerial boom are used in parallel: one in the operator bucket, and one on a panel aboard the truck, where a second operator (usually the driver) provides guidance and support from the ground. The operator has the ability to lift the bucket to a height of approximately 45'.

The operator carries in the bucket a set of tools: circular saw, linear saw, grappling hook, etc. The operator can connect one tool at a time to the source of hydraulic power available on the bucket. The tools are hand-held, and the operator can perform the cutting operations as needed.

The above-mentioned operations have been proven to be dangerous for workers. Occasionally the operator's tool touches live cables, and due to grounding of the boom and bucket, serious injuries of the operator result. There are also cases where the bucket, the upper boom, or the operator contacts the cables. It should be noted that in most cases the cables carry 22.5 kV. While there is insulation, and grounding is assumed to be avoided, there are instances where the configuration of the system and the work of the operator generate electric shocks to that person.

In response to concerns for worker safety, a remote master-slave hydraulic manipulator was developed with the intent of relocating workers away from the hazardous tasks. The operator is located on the truck platform away from the hazard, and is provided with a hand-held controller (the master) which controls the slave (a new five -joint hydraulic manipulator) that is attached at the end of the aerial boom, replacing the bucket where the operator used to be located. To control the slave the operator uses a second hand-held controller that is a replica of the slave. An assortment of hydraulic tools can be attached to the slave to enable its use in a variety of high-risk tasks.

The slave is a five-DOF hydraulic manipulator arm, and the master is a five-DOF electric arm shaped as a reduced-size replica of the slave. The master is instrumented to provide the operator with torque feedback with respect to two axes of rotation. This allows the operator to feel the forces and moments along and about certain directions at the contact between the tool and branches. Such capability could be extended to a complete (six DOF) force and moment reflection onto the master. The communication between the master and slave is via a fiber-optic cable to ensure electric isolation between the tools and the ground equipment. ■

level for roles in industry have always been a major concern for me; this concern is still there. My experience and career path would allow me to propose and support a preferred model of university research-industry interaction as discussed elsewhere in this article.

ENTREPRENEURIAL STAGE I

ESI grew into an exclusive small entity with international recognition and a wide range of advanced technologies protected by a large portfolio of patents.

ENTREPRENEURIAL PHASE 2

Emerging applications of intelligent robotics and automation can be found in several sectors such as space, operations, security and medical as decribed in this article.

ENTREPRENEURIAL PHASE 3

In May 2015, the shares of ESI were fully acquired by a Chinese Consortium that included my obligation to lead the company, now a subsidiary of the acquirer, for a period; retirement was not on the agenda. The acquisition led further at the end of 2016 to a public offering in Hong Kong. I became an Executive of a Public Company as Chief Technology Officer.

CONCLUSIONS, PART 1

I have experienced great learning, great employer – Canadarm, great academic life, and great business opportunities, and great family life; no complaints and I am extremely thankful. What made it possible? Personal initiative, no dull day and no static day, trust in gut feeling, great learning, great support at critical times, great life partner, natural restlessness, hard work, and some luck to be in the right place at the right time. ■

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About the Author



Dr. Goldenberg is the founder of the field of Robotics at the University of Toronto where he has been since 1982 as a Professor of Mechanical and Industrial Engineering (now Emeritus), cross-appointed in the Institute of Biomaterials and Biomedical Engineering, and formerly cross-appointed in the Department of Electrical and Computer Engineering. He has supervised to date many graduate students: 46 PhD and 64 MASc. From 1975-1981 he was an employee of SPAR Aerospace Ltd., of Toronto, working on the development of the first Space Shuttle Remote Manipulator System (Canadarm).

Dr. Goldenberg is also the founder of Engineering Services Inc. (ESI) established in 1982 and operating in the development of robotics-based automation. Under his leadership, the company has achieved significant growth and a global leading role in a wide range of industrial sectors. In 2015 ESI was acquired by a Shenzhen-based Chinese consortium, and as of November 2016 the company become publicly listed in Hong Kong. Dr. Goldenberg is the CTO of the public company.

Acknowledgements: *The illustrations for this article come from the three different robotics corporations that I am CTO of. The task of collecting — and in some instances enhancing — them has been a major undertaking. Much of this was achieved through the efforts of Mr. Ken Tang, patent specialist at Engineering Services Inc. His assistance has been greatly appreciated.*



Photo: La maison Simons

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For outstanding contributions to signal integrity of high-speed systems and interconnects
Pour des contributions exceptionnelles à l'intégrité de signaux des systèmes à grande vitesse et des interconnexions

Michel Nakhla

Michel Nakhla (LFIEEE) is a Chancellor's Professor of electrical engineering at Carleton University. He received the Ph.D. from University of Waterloo. Before starting his academic career, he worked at Bell-Northern Research beginning as a research engineer and advancing to become senior manager of the VLSI design automation group. In 1988 he joined Carleton University where he held the NSERC-Nortel Industrial Research Chair in Computer-Aided Design of High-Speed Circuits.

Dr. Nakhla made trend-setting achievements to the state of the art in the design automation of microwave and high-speed VLSI circuits and interconnects. He has pioneered the concept of the Piecewise Harmonic Balance Technique, which was later adopted and evolved by numerous leading researchers worldwide and is the backbone of current high-frequency circuit simulators. His innovative algorithms for prediction and correction of high-speed effects at the early stage of the design cycle are widely used. He is among the pioneers in developing new approaches for simulation of



high-speed circuits and interconnects using the revolutionary concept of model-order reduction. Publishing more than 350 research articles in top-tier journals and conferences, he has received several Best Paper Awards and the IEEE Microwave Prize in recognition of the most significant contribution by a published paper to a field of interest to the MTT Society.

Dr. Nakhla is Life Fellow of the IEEE and Fellow of the Canadian Academy of Engineering. He served as an Associate Editor of the IEEE Transactions on Circuits and Systems and is currently an Associate Editor of the IEEE Transactions on Components, Packaging and Manufacturing Technology. ■

Michel Nakhla (LFIEEE) est professeur émérite de génie électrique à l'Université Carleton. Il a reçu son Doctorat de l'Université de Waterloo. Avant de commencer sa carrière universitaire, il a travaillé à Bell-Northern Research en tant qu'ingénieur de recherche et est devenu chef de file du groupe d'automatisation de conception VLSI. En 1988, il a joint l'Université Carleton où il a occupé la chaire de recherche industrielle CRSNG-Nortel en conception assistée par ordinateur de circuits à grande vitesse.

M. Nakhla a réalisé des avancées techniques majeures en automatisation de conception de circuits et interconnexions VLSI hyperfréquences et haute vitesse. Il a été le pionnier du concept de la technique de l'équilibre harmonique des pièces, qui a ensuite été adopté et développé par de nombreux chercheurs de premier plan dans le monde entier et qui constitue l'épine dorsale des simulateurs de circuits à haute fréquence actuels. Ses algorithmes innovants pour la prédiction et la correction des effets à grande vitesse au début du cycle de conception sont largement utilisés. Il est un des pionniers dans le développement de nouvelles approches pour la simulation de circuits à grande vitesse et d'interconnexions qui utilisent le concept révolutionnaire de réduction de l'ordre des modèles. Il a publié plus de 350 articles de recherche dans des revues et conférences de premier rang. Il a reçu plusieurs prix dont le Prix du Meilleur article et le Prix «Microwave» de l'IEEE en reconnaissance de sa contribution phare qui est la publication du plus important document dans un domaine d'intérêt pour la Société MTT.

M. Nakhla est Compagnon à vie de l'IEEE et membre de l'Académie canadienne du génie. Il a été éditeur associé des Transactions de l'IEEE sur les circuits et les systèmes et est actuellement éditeur associé des Transactions IEEE sur les composants, l'emballage et la technologie de fabrication. ■

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- Harry M. Ellis (1990),
- John S. Foster (1989),
- Rudolf deBuda (1988),
- Theodore Wildi (1987),
- Harold A. Smith (1987),
- Simon Haykin (1986),
- John A. Hopps (1985),
- H. Halton (1984),
- J. Lionel Boulet (1983),
- Gordon F. MacFarlane (1982),
- W. Bennett Lewis (1981),
- Wallace S. Read (1980),
- John H. Chapman (1979),
- Harold A. Smith (1978),
- James M. Ham (1977),
- J.C.R. Punchard (1976),
- George Sinclair (1975),
- Robert H. Tanner (1974),
- Hector J. McLeod (1973),
- Alphonse Ouimet (1972),
- Thomas Ingledow (1971),
- John T. Henderson (1969).

2017 IEEE CANADA R.A. FESSENDEN MEDAL
MÉDAILLE R.A. FESSENDEN DE L'IEEE CANADA 2017

For contributions to communications systems in optical & wireless technology
Pour des contributions aux systèmes de communication en optique et en technologie sans fil

Leslie Rusch



Leslie Ann Rusch (FIEEE), full professor in ECE and the Centre for Optics, Photonics, and Lasers at Université Laval, holds a Canada Research Chair in Communications Systems Enabling the Cloud. She received the B.S.E.E. degree (with honors) from the California Institute of Technology in 1980, and the M.A. and Ph.D. degrees in electrical engineering from Princeton University, in 1992 and 1994, respectively. While on leave from Université Laval, she spent 2001-2002 at Intel creating and managing a group researching new wireless technologies.

Prof. Rusch is well known for her research in fast frequency hopped optical code division multiple access (FFH-OCDMA) that influenced large research efforts worldwide. The novel use of fibre Bragg gratings inspired broader application of that technology to OCDMA. Prof. Rusch holds the record for most orbital angular momentum (OAM) modes demonstrated in fiber. Université Laval is the only facility worldwide with OAM fiber design, fabrication, and characterization co-located with coherent detection systems. She is sole author on a broad Intel patent on reconfigurable radio, and authored several highly cited papers on multiuser detection from her thesis and Intel research.

Prof. Rusch has published more than 300 journal and conference articles that have been cited more than 5000 times per Google Scholar. Prof. Rusch received the 2013 IEEE Canada J.M. Ham Medal for Graduate Supervision and is Fellow of the Optical Society of America and IEEE. She currently serves on the IEEE Photonics Society Board of Governors. She was assistant editor of the IEEE/OSA Journal of Optical Communications and Networks from 2011-2014. ■

Leslie Ann Rusch (FIEEE) est professeure titulaire au département de génie électrique et de génie informatique et au Centre d'optique, de photonique et de lasers à l'Université Laval. Elle est également titulaire d'une chaire de recherche du Canada niveau 1 en systèmes de communication permettant l'informatique en nuage. Elle a reçu son diplôme B.S.E.E. (avec honneurs) de l'Institut de Technologie de la Californie en 1980, sa M. A. et son doctorat en génie électrique de l'Université de Princeton, en 1992 et 1994, respectivement. Pendant son congé de l'Université Laval en 2001-2002, elle a œuvré chez Intel à créer et gérer un groupe de recherche de nouvelles technologies sans fil.

La professeure Rusch est bien connue pour ses recherches sur le codage optique à accès multiple par partition et fréquence rapide par bons (FFH-OCDMA) qui ont influencé de grands efforts de recherche dans le monde entier. La nouvelle utilisation des réseaux de fibres Bragg a inspiré une application plus large de cette technologie à OCDMA. La professeure Rusch détient le record pour la plupart des modes de moment angulaire orbital (OAM) démontrés par fibre. L'Université Laval est la seule installation dans le monde entier pour la conception, la fabrication et la caractérisation de fibre OAM Co-implanté avec des systèmes de détection cohérents. Elle est l'unique auteur d'un vaste brevet d'Intel sur la radio reconfigurable et a rédigé plusieurs articles hautement cités sur la détection multi-utilisateurs à partir de sa thèse et de ses recherches chez Intel.

La professeure Rusch a publié plus de 300 articles de revues et de conférences qui ont été cités plus de 5000 fois par Google Scholar. La professeure Rusch a reçu la médaille J.M. Ham 2013 pour la supervision des diplômés et elle est Compagnon de la Société d'Optique d'Amérique et de l'IEEE. Elle siège actuellement au conseil d'administration de la Société de photonique de l'IEEE. Elle a été éditrice en chef adjointe du Journal des communications et des réseaux optiques IEEE / OSA de 2011 à 2014. ■

SPONSORED BY / COMMANDITÉ PAR **TELUS**

PAST WINNERS/ ANCIENS LAURÉATS

- Hussein Mouftah (2016),
- Yahia Antar (2014),
- ZhiZhang (David) Chen (2013),
- David Haccoun (2012),
- M. Jamal Deen (2011),
- Norman Beauliu (2010),
- David Falconer (2009),
- Simon Haykin (2008),
- Vijay Bhargava (2007),
- David V. Plant (2006),
- Tho Le-Ngoc (2005),
- K. Wu (2004),
- Lot Shafai (2003),
- Maier Blostein (2002),
- Norman Toms (2001),
- David Vice (2000)

2017 IEEE CANADA POWER MEDAL
MÉDAILLE D'ÉLECTRICITÉ DE L'IEEE CANADA 2017

For contributions to the theory and practice of high frequency power converters
Pour des contributions à la théorie et la pratique des convertisseurs d'énergie de haute fréquence

Praveen Jain



Praveen Jain (FIEEE) received his MASc and PhD degrees in electrical engineering from the University of Toronto in 1984 and 1987 respectively. He is currently a Professor of Electrical and Computer Engineering, a Tier-1 Canada Research Chair in Power Electronics, and Director of the Queen's Centre for Energy and Power Electronics Research (ePOWER) at Queen's University. Prior to this, he had worked at Canadian Astronautics, Nortel, Concordia, ABB and Crompton Greaves. He is the founder of two successful companies, CHiL Semiconductor in digital power controllers; and SPARQ Systems in photovoltaic microinverters.

Dr. Jain's advancements of power conversion methods have improved the use of power electronics for practical real-life applications. He developed new single-stage ac-to-dc converters for high-frequency space power distribution systems that provided reduced mass and volume on a spacecraft. He was one of the first to propose control for constant frequency operation of resonant converters that revolutionized the design of ultra-high-density power supplies for telecommunications. He developed a digital transient controller for ultra-high-speed computer processors to supply nearly glitch-free voltage. He also proposed a just-in-time digital control method that has minimized the energy storage requirements in photovoltaic microinverters.

Among many awards and honors that Dr. Jain has received are the IEEE William Newell Power Electronics Award, the Engineering Medal of the Professional Engineers of Ontario, Fellow of the Royal Society of Canada, Fellow of the IEEE, Fellow of the Engineering Institute of Canada, and Fellow of the Canadian Academy of Engineering. ■

Praveen Jain (FIEEE) a reçu ses diplômes de MASc et de Doctorat en génie électrique de l'Université de Toronto en 1984 et 1987, respectivement. Il est actuellement professeur d'ingénierie électrique et informatique, titulaire d'une chaire de recherche de niveau 1 du Canada en électronique de puissance et directeur du Centre de la Reine pour la recherche sur l'énergie et l'électronique de puissance (ePOWER) à l'Université Queen's. Avant cela, il avait travaillé chez Canadian Astronautics, Nortel, Concordia, ABB et Crompton Greaves. Il est le fondateur de deux sociétés prospères, CHiL Semiconductor dans les contrôleurs de puissance numériques et SPARQ Systems dans les micro-onduleurs photovoltaïques.

Les avancées réalisées par M. Jain sur les méthodes de conversion de puissance ont amélioré l'utilisation de l'électronique de puissance pour des applications pratiques de la vie réelle. Il a développé de nouveaux convertisseurs CA-à-CC à une seule étape pour les systèmes de distribution d'énergie spatiale à haute fréquence qui ont permis de réduire la masse et le volume sur un engin spatial. Il a été l'un des premiers à proposer un contrôle pour le fonctionnement à fréquence constante de convertisseurs résonnants qui ont révolutionné la conception d'alimentations ultra-haute densité pour les télécommunications. Il a développé un contrôleur transitoire numérique pour les processeurs informatiques à ultra-haute vitesse qui fournissent une tension électrique impeccable. Il a également proposé une méthode de contrôle numérique juste à temps qui a minimisé les exigences de stockage d'énergie dans les micro-onduleurs photovoltaïques.

Parmi les récompenses et les honneurs que M. Jain a reçus, mentionnons le Prix de l'électronique de puissance William Newell de l'IEEE, la Médaille d'ingénierie des ingénieurs professionnels de l'Ontario. M. Jain est aussi membre de la Société royale du Canada, Compagnon de l'IEEE, membre l'Institut Canadien des Ingénieurs et membre l'Académie canadienne du génie. ■

SPONSORED BY / COMMANDITÉ PAR **LONDON HYDRO**

PAST WINNERS/ ANCIENS LAURÉATS

- Claudio Cañizares (2016),
- William Kennedy (2015),
- Wenyuan Li (2014),
- Wilsun Xu (2013),
- Mohinder S. Sachdev (2012),
- Frank DeWinter (2011),
- John Densley (2010),
- Bill McDermid (2009),
- Roy Billinton (2008),
- Herman W. Dommel (2007)

2017 IEEE CANADA C.C. GOTLIEB MEDAL
MÉDAILLE C.C. GOTLIEB DE L'IEEE CANADA 2017

For outstanding contributions to computer networks science and engineering
Pour des contributions exceptionnelles aux sciences et à l'ingénierie des réseaux informatiques

Hussein Mouftah



Hussein Mouftah (LFIEEE) is a Distinguished University Professor and Tier 1 Research Chair at the School of Electrical Engineering and Computer Science at the University of Ottawa. Previously, he was a professor and associate head with the Department of Electrical and Computer Engineering at Queen's University. He also has six years of industrial experience at Bell Northern Research of Ottawa.

Dr. Mouftah is developing next-generation technologies that will serve as a foundation for smart cities. He has made significant contributions to the understanding and knowledge of computer networks, including ad hoc and sensor networks related to the Internet of Things (IoT). He is currently developing a solution to securely charge electric and autonomous vehicles within smart grid environments, allowing vehicles to locate the nearest charging station, then book and pay for it. An internationally acclaimed scholar, Dr. Mouftah has authored or co-authored 12 books, 145 industrial reports and more than 1,500 technical papers; to date, he holds 14 patents and six invention disclosures.

Dr. Mouftah is a Fellow of the IEEE, the Canadian Academy of Engineering, the Engineering Institute of Canada and the Academy of Science of the Royal Society of Canada. His volunteer contributions to IEEE are numerous. Within IEEE Canada, he served as Chair of the Regional Awards & Recognition Committee. Within the IEEE Communications Society, he has served as Editor-in-Chief of IEEE Communications Magazine, Director of Education and was named a Distinguished Lecturer. He has also served as a Member of the Board of Governors. ■

Hussein Mouftah (LFIEEE) est Professeur distingué d'université et titulaire d'une chaire de recherche du Canada de niveau 1 à l'École de génie électrique et informatique de l'Université d'Ottawa. Auparavant, il était professeur et directeur adjoint au Département d'ingénierie électrique et informatique de l'Université Queen's. Il a également six ans d'expérience industrielle à Bell Northern Research d'Ottawa.

M. Mouftah développe des technologies de nouvelle génération qui serviront de base aux villes intelligentes. Il a contribué de manière significative à la compréhension et à la connaissance des réseaux informatiques, y compris les réseaux ad hoc et capteurs liés à l'internet des objets (IoT). Il développe actuellement une solution pour charger en toute sécurité des véhicules électriques et autonomes dans des environnements de réseaux intelligents, permettant aux véhicules de localiser la station de recharge la plus proche, puis réserver et payer. Érudit internationalement acclamé, M. Mouftah est l'auteur ou co-auteur de 12 livres, 145 rapports industriels et plus de 1 500 documents techniques. A ce jour, il détient 14 brevets et six divulgations d'inventions.

M. Mouftah est Compagnon de l'IEEE, de l'Académie canadienne du génie, de l'Institut Canadien des Ingénieurs et de l'Académie des sciences de la Société Royale du Canada. Ses contributions volontaires à l'IEEE sont nombreuses. Au sein de l'IEEE Canada, il a été Président du comité régional de reconnaissance et de récompenses. Au sein de la Société des Communications de l'IEEE, il fut éditeur en chef du magazine IEEE Communications. En tant que Directeur de l'éducation il fut aussi nommé conférencier distingué. Il a également été membre du conseil des gouverneurs. ■

PAST WINNERS/ ANCIENS LAURÉATS

- Azzedine Boukerche (2015),
- Ling Guan (2014),
- Abdulmotaleb El Saddik (2013),
- Calvin Gotlieb (2012),
- William A. Gruver (2011),
- Mohamed S. Kamel (2010),
- Ken Smith (2009),
- Witold Pedrycz (2008),
- Nicolas D. Georganas (2007)

2017 IEEE CANADA OUTSTANDING ENGINEER MEDAL
MÉDAILLE D'EXCELLENCE EN INGÉNIERIE DE L'IEEE CANADA 2017

For contributions to the study of several classes of nano-materials

Pour des contributions à l'étude de plusieurs classes de nano-matériaux

Federico Rosei



Federico Rosei (SMIEEE) is Professor and Director of the Centre Énergie, Matériaux et Télécommunications of INRS, Varennes (QC) Canada. Since January 2014 he has held the UNESCO Chair in Materials and Technologies for Energy Conversion, Saving and Storage and since May 2016 he also holds the Canada Research Chair (Tier I) in Nanostructured Materials. He received MSc (1996) and PhD (2001) degrees from the University of Rome "La Sapienza."

Dr. Rosei has reported major discoveries on structure/property relationships in nanostructured (inorganic, organic and biocompatible) materials. He has synthesized a number of novel nanoscale materials to address emerging challenges in solid state science and technology, designing and fabricating novel optoelectronic and photonic devices. He synthesized novel Quantum Dots with original architectures, tailoring structure vs. properties and integrating them in various devices, such as nanothermometers, photovoltaics and photoelectrochemical solar cells, reporting record performances. He has published more than 245 articles in prestigious international journals, and spoken at more than 250 international conferences.

He is Fellow of the Royal Society of Canada, the Canadian Academy of Engineering, the Engineering Institute of Canada, the European Academy of Science, the World Academy of Art and Science, the American Physical Society and the Institution of Engineering and Technology, amongst many others. He held the IEEE Nanotechnology Council's Distinguished Lectureship for 2015. Dr. Rosei's research has been recognized internationally through awards from numerous organizations including Humboldt Foundation (Bessel Award), NSERC (Steacie Fellowship), Canadian Association of Physics, Canadian Society for Chemistry, as well as from the governments of China and Iran. ■

Federico Rosei (SMIEEE) est professeur et directeur du Centre énergie matériaux et télécommunications de l'INRS de Varennes (QC) Canada. Depuis janvier 2014, il est titulaire de la chaire de l'UNESCO en matériaux et technologies pour la conversion, l'économie et le stockage de l'énergie et depuis mai 2016 il détient également la chaire de recherche du Canada (niveau 1) en matériaux nanostructurés. Il a reçu ses diplômes de maîtrise (1996) et de doctorat (2001) de l'Université de Rome "La Sapienza".

M. Rosei a réalisé des découvertes majeures sur les relations structure/propriété dans les matériaux nanostructurés (inorganiques, organiques et biocompatibles). Il a synthétisé un certain nombre de nouveaux matériaux à l'échelle nanométrique pour répondre aux nouveaux défis de la science et de la technologie à l'état solide, la conception et la fabrication de nouveaux dispositifs optoélectroniques et photoniques. Il a synthétisé de nouveaux points quantiques avec des architectures originales, adaptés à la structure selon les propriétés tout en les intégrant dans différents dispositifs tels que les nanothermomètres, les cellules solaires photoélectrochimiques et photovoltaïques aux performances exceptionnelles. Il a publié plus de 245 articles dans des revues internationales prestigieuses et a participé à plus de 250 conférences internationales.

Il est Compagnon de la Société royale du Canada, de l'Académie canadienne du génie, de l'Institut canadien des ingénieurs, de l'Académie européenne des sciences, de l'Académie mondiale de l'art et de la science, de la Société américaine de physique et de l'Institut de génie et de technologie et de beaucoup d'autres. Il a obtenu le titre de Chef de file distingué du Conseil de nanotechnologie de l'IEEE en 2015. La recherche de M. Rosei a été reconnue à l'échelle internationale grâce à des récompenses de nombreuses organisations dont la Fondation Humboldt (le Prix Bessel), le CRSNG (Compagnon Steacie), l'Association canadienne de physique, la Société canadienne de chimie et aussi des Gouvernements chinois et iranien. ■

PAST WINNERS/ ANCIENS LAURÉATS

- Anthony Damini (2016),
- William Kennedy (2014),
- Rangaraj M. Rangayyan (2013),
- Edward J. Davison (2010),
- Rajnikant Patel (2009),
- Kim Roberts (2008),
- Barna Szabados (2007),
- Charles Despins (2006),
- Haran Karmaker (2004),
- Charles Henville (2003),
- Ted Sargent (2002),
- Ibrahim Gedeon (2001),
- John Lodge (2000),
- Wayne D. Grover (1999),
- James R. McFarlane (1998),
- Wenyuan Li (1996),
- R. N. Scott (1995),
- Len Bruton (1994)

2017 IEEE CANADA R.H. TANNER MEDAL
MÉDAILLE R. H. TANNER DE L'IEEE CANADA 2017

For outstanding contributions to collaborative intelligent systems
Pour des contributions exceptionnelles aux systèmes collaboratifs intelligents

Weiming Shen



Weiming Shen (FIEEE) is a Senior Research Scientist at National Research Council Canada and an Adjunct Professor at Western University. He received his Bachelor and Master's degrees from Beijing Jiaotong University, China (in 1983 and 1986) and his PhD degree from the University of Technology of Compiègne, France, in 1996. He worked as a lecturer at Beijing Jiaotong University from 1986 to 1992, and has been working at National Research Council since 1999.

Dr. Shen has significantly advanced the field of collaborative intelligent systems. As a pioneer in the field, he developed a reference architecture and integration methodology that became a theoretical foundation of agent-based collaboration to solve difficult legacy systems integration problems. His iShop Floor concept was recommended by Society of Manufacturing Engineers and adopted by many companies. His recent contribution is on the development/deployment of smart building technologies in 10+ government buildings. The promising results of 15% average energy savings have triggered a plan for wide deployment in 100+ buildings with projected savings of $10M per year while reducing GHG emissions.

Dr. Shen is a member of the Steering Committee for IEEE Transactions on Affective Computing and Associate Editor of several journals including: IEEE Transactions on Automation Science and Engineering; IEEE Transactions on SMC: Systems; IEEE SMC Magazine; Computational Intelligence; and Intelligent Buildings International. He is Co-Chair of IEEE Technical Committee on Computer Supported Cooperative Work in Design, and served as Chair/Co-Chair for more than 30 international conferences. He is a Fellow of Engineering Institute of Canada and member of Professional Engineers Ontario. ■

Weiming Shen (FIEEE) est chercheur principal au Conseil national de recherches du Canada et professeur adjoint à l'Université Western. Il a obtenu son baccalauréat et sa maîtrise de l'Université Jiaotong de Pékin, en Chine (en 1983 et 1986) et son doctorat de l'Université de Technologie de Compiègne en France en 1996. Il a travaillé comme conférencier à l'Université Jiaotong de Pékin de 1986 à 1992, et oeuvre au Conseil national de recherches du Canada depuis 1999.

M. Shen a considérablement perfectionné le domaine des systèmes collaboratifs intelligents. En tant que pionnier dans le domaine, il a développé une architecture de référence et une méthodologie d'intégration qui est devenue une base théorique de la collaboration basée sur les agents afin de résoudre des problèmes d'intégration de systèmes hérités difficiles. Son concept iShop Floor a été recommandé par la Société des ingénieurs de fabrication et été adopté par de nombreuses entreprises. Sa contribution récente concerne le développement et le déploiement de technologies de construction intelligente dans 10 bâtiments gouvernementaux. Les résultats prometteurs de 15% d'économies d'énergie en moyenne ont déclenché un plan pour un large déploiement dans plus de 100 bâtiments, avec des économies projetées de 10 M $ par année tout en réduisant les émissions de GES.

M. Shen est Compagnon du Comité directeur des transactions de l'IEEE sur l'informatique affective et Éditeur associé de plusieurs revues, y compris: les transactions de l'IEEE sur la Science et l'ingénierie de l'automatisation, les transactions de l'IEEE SMC: Les systèmes, le Magazine IEEE SMC, l'Intelligence informatique et les Bâtiments intelligents internationaux. Il est coprésident du Comité Technique de l'IEEE sur les travaux coopératifs assistés par ordinateur en design et a été président/coprésident de plus de 30 conférences internationales. Il est Compagnon de l'Institut canadien des ingénieurs et membre des Ingénieurs professionnels de l'Ontario. ■

SPONSORED BY / COMMANDITÉ PAR **IEEE FOUNDATION / FONDATION DE L'IEEE**

PAST WINNERS/ ANCIENS LAURÉATS

● Gamal Refai-Ahmad (2014), ● James Maynard (2013), ● Colin Clark (2011), ● Ibrahim Gedeon (2010), ● Lorry Wilson (2009)

2017 IEEE CANADA W.S. READ OUTSTANDING SERVICE MEDAL
MÉDAILLE D'EXCELLENCE DE SERVICE W.S. READ DE L'IEEE CANADA 2017

For volunteering within IEEE at the local level and within several societies
Pour du bénévolat au sein de l'IEEE au niveau local et au sein de plusieurs sociétés

Fabrice Labeau



Fabrice Labeau (SMIEEE) is Associate Dean (Faculty Affairs) at McGill University's Faculty of Engineering, where he also holds the NSERC/ Hydro-Québec Industrial Research Chair in Interactive Information Infrastructure for the Power Grid. He joined McGill's ECE Department in 2000 after receiving a PhD degree from Université catholique de Louvain in Belgium.

Dr. Labeau's conference organizing skills and delivery of IEEE Technical Activities Board programming have impacted across all of IEEE Canada. A major focus of his efforts has been within the IEEE Vehicular Technology Society (VTS). His leadership in a series of Montreal and Quebec City VTC Conferences began in 2006 as TPC Chair, progressing to serve as General Co-Chair for Fall VTC 2016. As Chapters coordinator, he helped increase chapter count by 10%; he also oversaw the revival of and is still managing one of the largest IEEE Distinguished Lecturer programs. He was President of VTS in 2014-2015 and is currently VTS Vice-President (Membership). For these and other efforts he received the 2016 VTS Outstanding Service Award. Within IEEE Montreal Section, he was Chair for 2015-2016, creating five new chapters, reviving two that were dormant as well as an affinity group, and creating an active Industry Relations Committee. He is a member of the Steering Committees for two IEEE transactions and a member of the IEEE Periodicals Committee.

Dr. Labeau is heavily involved in McGill's Faculty of Engineering equity, inclusivity and diversity programs; these efforts have been recognized in 2015 and 2017 through the McGill Equity and Community Building Award (team category). ■

Fabrice Labeau (SMIEEE) est vice-doyen à la Faculté d'ingénierie de l'Université McGill, où il détient également la Chaire de recherche industrielle CRSNG-Hydro-Québec en infrastructure informationnelle interactive pour le réseau d'électricité. Il a joint le département de génie électrique et informatique de McGill en 2000 après avoir obtenu un doctorat de l'Université catholique de Louvain en Belgique.

Les compétences dans l'organisation de conférences de M. Labeau et sa prestation à la programmation du Conseil d'activités techniques de l'IEEE ont eu une influence sur l'ensemble de l'IEEE Canada. Ses efforts déployés dans le cadre de la Société des technologies pour les véhicules (VTS) de l'IEEE sont également notables. Son leadership dans une série de conférences VTC à Montréal et Québec a débuté en 2006 en tant que président TPC, puis coprésident général de VTC en automne 2016. En tant que coordonnateur des chapitres, il a aidé à augmenter le nombre de chapitres de 10%. Il gère toujours l'un des plus grands programmes de conférenciers distingués de l'IEEE après en avoir assuré la relance. Il a été président de la VTS en 2014-2015 et en est actuellement vice-président (aux membres). Pour ses contributions, il a reçu le prix du Service exceptionnel VTS 2016. Au sein de la Section IEEE de Montréal, il a été président 2015-2016, en créant cinq nouveaux chapitres, en redémarrant un groupe d'affinité et deux chapitres qui étaient inactifs. Il y a aussi créé un comité actif en relations industrielles. Il est membre des comités de direction de deux transactions de l'IEEE et membre du comité des périodiques de l'IEEE.

M. Labeau est fortement impliqué dans les programmes d'équité, d'inclusivité et de diversité de la Faculté d'ingénierie de McGill. Ses efforts ont été reconnus en 2015 et 2017 avec le Prix d'Équité et développement communautaire de McGill (catégorie d'équipe). ■

SPONSORED BY / COMMANDITÉ PAR **IEEE CANADIAN FOUNDATION / FONDATION CANADIENNE DE L'IEEE**

PAST WINNERS/ ANCIENS LAURÉATS

- Sreeraman Rajan (2016),
- Raed Abdullah (2015),
- Gerard M. Dunphy (2014),
- Wahab Almuhtadi (2013),
- Vijay Bhargava (2012),
- Ashfaq (Kash) Husain (2011),
- Mohamed El-Hawary (2010),
- Dave Kemp (2009),
- Bruno Di Stefano (2008),
- Celia Desmond (2007),
- Adam Skorek (2006),
- Miro Forrest (2005),
- Witold Kinsner (2004),
- Michel Lecours (2003),
- Ray Findlay (2002),
- Ferial El-Hawary (2001),
- Wally Read (*new medal now named in Dr. Read's honour*) (2000),
- Robert Alden (1999),
- Vijay Sood (1998),
- Louis Dessaint (1997),
- Thomas East (1996),
- Hussein Mouftah (1995)

2017 IEEE CANADA E.F. GLASS WESTERN CANADA MERIT MEDAL
MÉDAILLE D'EXCELLENCE E.F. GLASS DE L'OUEST DU CANADA DE L'IEEE CANADA 2017

For volunteering within IEEE at the local level of the Northern Canada Section
Pour du bénévolat au sein de l'IEEE au niveau local de la section du Nord du Canada

Rossitza Marinova



Rossitza Marinova (SMIEEE) has been a Professor in Mathematics and Computing Science at Concordia University of Edmonton since 2004. She has a Ph.D. in Computational and Applied Mathematics (Bulgarian Academy of Sciences), M.Sc. in Mathematical Modeling, and B.Sc. in Mathematics (Sofia University, Bulgaria). Dr. Marinova also worked as a research scientist in the software development industry in Canada and in the National Aerospace Laboratory of Japan. She has maintained strong professional scholarship in the areas of computational mathematics, computer science and information technology, and mathematics outreach.

Dr. Marinova's involvement with IEEE started in 2005. Her positions within the Northern Canada Section include vice-chair, chair of various committees such as: Educational Activities, Awards and Recognition, Communications, and the IEEE Teacher In-Service Program (TISP). Nationally, she is a member of the IEEE TISP Canada committee, contributing through her long-standing service as co-secretary, co-organizing numerous Edmonton-area events and playing a role in several national TISP Canada workshops. Moreover, Dr. Marinova contributed to the establishment of the IEEE Concordia Student Branch, being the first branch counsellor.

Currently, Dr. Marinova is the Chair of the Canadian Math Kangaroo Contest and Canada's representative in the International Association organizing the competition "Mathematical Kangaroo," for students from grade 1 to 12. Her service includes bringing together supporters to work towards advancement of education by increasing the appreciation of mathematics. Dr. Marinova is a Life Member of Canadian Mathematical Society and a member of Canadian Applied and Industrial Mathematics Society. She has received numerous awards and grants for research and outreach. ■

Rossitza Marinova (SMIEEE) est professeure en mathématiques et sciences informatiques à l'Université Concordia d'Edmonton depuis 2004. Elle a un doctorat en informatique et mathématiques appliquées (de l'Académie bulgare des sciences), une M.Sc. en modélisation mathématique et un B.Sc. en mathématiques (de l'Université de Sofia, Bulgarie). Mme Marinova a également travaillé comme chercheure scientifique dans l'industrie du développement de logiciels au Canada et au Laboratoire Aérospatial National du Japon. Elle a maintenu une solide érudition professionnelle dans les domaines des mathématiques informatiques, de l'informatique et des technologies de l'information et de la diffusion des mathématiques.

La participation Mme Marinova à l'IEEE a débuté en 2005. Ses postes au sein de la Section du nord du Canada comprennent la vice-présidence, la présidence de divers comités tels que les activités éducatives, les récompenses et les reconnaissances, les communications et le programme de perfectionnement des enseignants de l'IEEE (TISP). À l'échelle nationale, elle est membre du comité TISP de l'IEEE Canada, contribuant par son service de longue date en tant que co-secrétaire, en co-organisant de nombreux événements dans la région d'Edmonton et en jouant un rôle dans plusieurs ateliers nationaux de TISP Canada. De plus, Mme Marinova a contribué à la création de la Branche étudiante de l'IEEE à Concordia. Elle en fut la première conseillère.

À l'heure actuelle, Mme Marinova est la présidente du Concours canadien de mathématiques kangourou et la représentante du Canada à l'Association internationale organisant le concours «Mathématiques kangourou» pour les étudiants de la 1ère à la 12e année. Son service comprend le regroupement de supporters pour travailler à l'avancement de l'éducation en augmentant l'intérêt pour les mathématiques. Mme Marinova est membre de la Société de mathématiques canadienne et membre de la Société canadienne de mathématiques appliquées et industrielles. Elle a reçu de nombreux prix et subventions pour ses recherches et activités de sensibilisation. ■

PAST WINNERS/ ANCIENS LAURÉATS

- Rasheek Rifaat (2016),
- Ljiljana Trajkovic (2015),
- Tim Driscoll (2014),
- Mooney Sherman (2013),
- Lindsay Ingram (2011),
- Meliha Selak (2010),
- Dave Michelson (2009),
- David Gregson (2008),
- Denard Lynch (2007),
- Hilmi Turanli (2006),
- Witold Kinsner (2005),
- Rob Anderson (2004),
- Dan Wong (2003),
- Neale Partington (2002),
- Bill Kennedy (2000),
- John Maniawski (1998),
- Brian Lee (1997),
- Hugh J. Kay (1991),
- David Kemp (1990),
- Om Malik (1986)

IEEE Canada Members elected as
Membres de l'IEEE Canada élus

2017 IEEE Fellows
Fellows de l'EEE 2017

RAVIRAJ ADVE (FIEEE)
Toronto, ON
For development of signal processing techniques for airborne radar
Pour le développement de techniques de traitement du signal pour le radar aérien

KANKAR BHATTACHARYA (FIEEE)
Waterloo, ON
For contributions to electricity markets and reactive power ancillary services
Pour les contributions aux marchés de l'électricité et aux services auxiliaires de puissance réactive

ROBERT BOYD (FIEEE)
Ottawa, ON
For contributions to the fields of nonlinear optics and photonics
Pour les contributions aux domaines de l'optique non linéaire et de la photonique

HOSSAM HASSANEIN (FIEEE
Kingston, ON
For contributions to protocols, architectures and analysis of multi-hop wireless networks
Pour les contributions aux protocoles, architectures et analyse des réseaux sans fil multi-hop

JURI JATSKEVICH (FIEEE)
Vancouver, BC
For contributions to modeling of electric machines and switching converters
Pour contributions à la modélisation des machines électriques et des convertisseurs de commutation

JIN JIANG (FIEEE)
London, ON
For contributions to methodology, design, and evaluation of engineering systems safety
Pour les contributions à la méthodologie, à la conception et à l'évaluation de la sécurité des systèmes d'ingénierie

AMIR KHANDANI (FIEEE)
Waterloo, ON
For contributions to resource allocation and interference management in network information theory
Pour les contributions à l'allocation des ressources et à la gestion des interférences dans la théorie de l'information du réseau

WITOLD KRZYMIEN (FIEEE)
Edmonton, AB
For contributions to radio resource management for cellular systems and networks
Pour les contributions à la gestion des ressources radio pour les systèmes et les réseaux cellulaires

XIAODONG LIN (FIEEE)
Waterloo, ON
For contributions in secure and privacy-preserving vehicular communications
Pour les contributions aux communications sécurisées et à la protection de la vie privée

JIANGCHUAN LIU (FIEEE)
Burnaby, BC
For contributions to multimedia communications and content distribution over the Internet
Pour les contributions aux communications multimédias et à la distribution de contenu sur Internet

DAVID LOWTHER (FIEEE)
Montreal, QC
For contributions to, and industrial applications of computer aided design in electromagnetics
Pour les contributions aux applications industrielles du design assisté par ordinateur en électromagnétisme

PANOS NASIOPOULOS (FIEEE)
Vancouver, BC
For leadership in DVD authoring and digital multimedia technologies
Pour le leadership dans la création de DVD et les technologies multimédias numériques

YANG SHI (FIEEE)
Victoria, BC
For contributions to networked and distributed control systems
Pour les contributions aux systèmes de contrôle en réseau et distribués

SHERVIN SHIRMOHAMMADI (FIEEE)
Ottawa, ON
For contributions to multimedia systems and network measurements
Pour les contributions aux systèmes multimédias et aux mesures réseau

SORIN VOINIGESCU (FIEEE)
Toronto, ON
For contributions to silicon and silicon-germanium microwave and millimeter-wave devices and integrated circuits
Pour les contributions aux dispositifs à micro-ondes et à ondes millimétriques et aux circuits intégrés de silicium et de silicium et de germanium

XIANBIN WANG (FIEEE)
London, ON
For contributions to OFDM systems and distributed transmission technologies
Pour les contributions aux systèmes OFDM et aux technologies de transmission distribuée

ZHEN WANG (FIEEE)
Vancouver, BC
For contributions to statistical signal processing for multimedia security and brain data analytics
Pour les contributions au traitement statistique des signaux pour la sécurité multimédia et l'analyse des données cérébrales

HALIM YANIKOMEROGLU (FIEEE)
Ottawa, ON
For contributions to wireless access architectures in cellular networks
Pour les contributions aux architectures d'accès sans fil dans les réseaux cellulaires

ZUO-GUANG YE (FIEEE)
Burnaby, BC
For contributions to piezoelectric and ferroelectric materials for high-performance electromechanical transducers
Pour les contributions aux matériaux piézoélectriques et ferroélectriques pour les transducteurs électromécaniques hautes performances

IEEE Canada Members elected as
Membres de l'IEEE Canada élus

2017 EIC Fellows & Medalists
Les Médaillés l'ICI 2017 et les Boursiers

WAHAB ALMUHTADI (SMIEEE)—Ottawa Section
For his excellence in engineering, education, research, and services to the profession and to society
Pour son excellence en ingénierie, en formation, en recherche et ses services à la profession et à la société

JENS BORNEMANN (FIEEE)—Victoria Section
For his exceptional contributions to high-frequency systems, and the theory and modeling of integrated circuits, feed networks and antennas
Pour ses contributions exceptionnelles aux systèmes de haute fréquence et à la théorie et modélisation des circuits intégrés, des réseaux et des antennes

JOHN WOOD (MIEEE)—Victoria Section
For his exemplary leadership and contributions to engineering and business, and distinguished service to the profession
Pour son leadership exemplaire, ses contributions à l'ingénierie et aux affaires et des services éminents rendus à la profession

SIR JOHN KENNEDY Medal

CRISTINA AMON (FIEEE) — Toronto Section
For her outstanding academic leadership and development of pioneering Computational Fluid Dynamics solutions to thermo-fluids engineering problems
Pour sa remarquable gestion académique et le développement de solutions novatrices de la dynamique des fluides informatiques aux problèmes d'ingénierie des thermo-fluides

JOHN B. STIRLING Medal

JEAN ZU (AMIEEE) — Toronto Section
For her visionary leadership and distinguished service within the Institute and the CSME
Pour son leadership de visionnaire et ses services distingués au sein de l'Institut et de la SCGM

Acknowledgements: *Translations provided by Djahi Clement Ahoua, IEEE Toronto Section and Xavier Maldague, IEEE Québec Section. Photos: Stilldez Stills*

Exemplary Section Awards

Exemplary Large Section Award 2016
Vancouver

2017 Executives

Chair: Rama Vinnakota
Vice Chair: Guillaume Boisset
Treasurer: Steven McClain
Secretary: Nimesh Shah
Past Chair: Lee Vishloff



2016 Executives

Chair: Lee Vishloff
Secretary: Guillaume Boisset
Treasurer: Steven McClain
Vice Chair: Rama Vinnakota
Past Chair: Bob Gill

Rama Vinnakota receives Award from Witold Kinsner on behalf of Vancouver Section

Exemplary Medium Section Award 2016
Southern Alberta

2017 Executives

Chair: Dale Tardiff
Vice Chair: Shan Pandher
Past Chair: Doug Brooks
Secretary: Zahra Lari
Treasurer: Vivek Tadiparty



2016 Executives

Chair: Doug Brooks
Vice Chair: Arman Kiani
Past Chair: Lawrence Whitby
Secretary: Zahra Lari
Treasurer: Dale Tardiff

Dale Tardiff receives Award from Witold Kinsner on behalf of Southern Alberta Section

Exemplary Small Section Award 2016
London

2017 Executives

Chair: Abdallah Shami
Vice Chair: Ahmed Hussein
Treasurer: Allan VanDamme
Secretary: Elizabeth Tomaszewski
Past Chair: Murray MacDonald



2016 Executives

Chair: Abdallah Shami
Vice Chair: Ahmed Hussein
Treasurer: Allan VanDamme
Secretary: Elizabeth Tomaszewski
Past Chair: Murray MacDonald

Murray MacDonald receives Award from Witold Kinsner on behalf of London Section

Exemplary Large Section Award 2015
Toronto

2016 Executives
Chair: Thamir (Tom) Murad
Vice-Chair: Olivier Trescases
Secretary: Ali Nabavi
Treasurer: Marjan Alavi
Past Chair: Emanuel Istrate



2015 Executives
Chair: Emanuel Istrate
Secretary: Olivier Trescases
Treasurer: Naresh Kurada
Past Chair: Xavier Fernando

David Whyte receives Award from Witold Kinsner on behalf of Toronto Section

Exemplary Medium Section Award 2015
Southern Alberta

2016 Executives
Chair: Doug Brooks
Vice Chair: Arman Kiani
Past Chair: Lawrence Whitby
Secretary: Zahra Lari
Treasurer: Dale Tardiff



2015 Executives
Chair: Doug Brooks
Vice Chair: Arman Kiani
Past Chair: Lawrence Whitby
Secretary: Zahra Lari
Treasurer: Dale Tardiff

Witold Kinsner presents Award to a happy contingent of SAS members.
L to R: Dale Tardiff, Jamiul Alam, Rob Anderson, Tushar Sharma, Rasheek Rifaat

Exemplary Small Section Award 2015
Newfoundland

2016 Executives
Chair: Andrew Cook
Vice Chair: Mohamed Shehata
Treasurer: Jonathan Anderson
Secretary: Geoff Holden
Past Chair: Brian Kidney



2015 Executives
Chair: Brian Kidney
Vice Chair: Andrew Cook
Treasurer: Weimin Huang
Secretary: Susan Ryan
Past Chair: Cheng Li

Mohamed Shehata receives Award from Witold Kinsner on behalf of Newfoundland and Labrador Section

MGA Section Awards

Outstanding Medium Section Award
Southern Alberta

2017 Executives

Chair: Dale Tardiff
Vice Chair: Shan Pandher
Past Chair: Doug Brooks
Secretary: Zahra Lari
Treasurer: Vivek Tadiparty



2016 Executives

Chair: Doug Brooks
Vice Chair: Arman Kiani
Past Chair: Lawrence Whitby
Secretary: Zahra Lari
Treasurer: Dale Tardiff

L to R: Rasheek Rifaat, Dale Tardiff, Karen Bartleson (2017 IEEE President), Mary Ellen Randal (2017 IEEE VP, MGA), Shan Pandher

Outstanding Small Section Award
London

2017 Executives

Chair: Abdallah Shami
Vice Chair: Ahmed Hussein
Treasurer: Allan VanDamme
Secretary: Elizabeth Tomaszewski
Past Chair: Murray MacDonald



2016 Executives

Chair: Abdallah Shami
Vice Chair: Ahmed Hussein
Treasurer: Allan VanDamme
Secretary: Elizabeth Tomaszewski
Past Chair: Murray MacDonald

L to R: Maike Luiken, Mary Ellen Randal (2017 IEEE VP, MGA), Murray MacDonald, Karen Bartleson (2017 IEEE President), Elena Uchiteleva

IEEE CANADA PRESIDENTS' MAKE A DIFFERENCE AWARD 2017

There's a perpetual twinkle in the eye of Dave Hepburn. Whatever his soft voice tells you he's up to now, be sure the next step is already fully in mind.

Hepburn has already done enough for two lifetimes—making differences the world over. Graduating in 1952 from the University of Stafford (U.K.), his career in power and energy spanned projects in 28 countries. Then as a consultant for humanitarian initiatives, he supported numerous international development organizations. In 2005 he became active in IEEE's Educational Outreach Program. In 2006 and each year since he has organized an IEEE Canada booth at the annual conference of the Science Teachers' Association of Ontario (STAO), over time expanding IEEE's presence to include demonstration of lesson plans. Not content to just deliver content, he has developed an innovative lesson plan on binary basics for pre-teens, and four foundational plans related to electricty, magnetism and motors. These are now adopted into IEEE's lesson plan database found at tryengineering.org.





As pre-university educational activities within Canada coalesced under the Teacher In-Service Program (TISP), Hepburn has played a pivotal role. He has brought in other volunteers to the STAO initiative, judged science fairs, led numerous workshops and enlivened the pages of the *TISP Canada Courier* (this publication too).

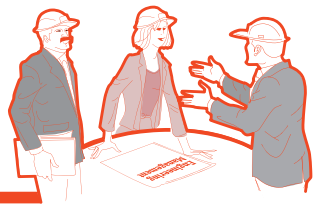
What's next for Hepburn? Don't quote us, but we hear there may be another lesson plan coming. Stay tuned!

***Top**: Dave and Diane Hepburn receive Award Certificate from IEEE Canada President Witold Kinsner, flanked by President-Elect Maike Luiken (L) and Past President Amir Aghdam (R). The award was presented in Windsor at the BoD Saturday-night banquet.*

***Bottom**: Dave Hepburn (LSMIEEE) ready for questions at the Science Teachers' Association of Ontario 2012 Annual Conference.*



What's New in the Literature?



by Terrance Malkinson

"Synanthropes is a term used to describe wild animals that live near and benefit from humans. Kerry Banks in his article Rise of the Synanthropes" [*Canadian Geographic*. 137(3):56-61. May/June, 2017]. www.canadiangeographic.ca] explores why some species of animals thrive in cities and how urban planners are managing their increasing presence. The March/April issue of the magazine focuses on the Canadian North with many interesting articles including: Why the North Pole is so important, learning on the land at NWT's Bush University, and exploring the communities of Baffin Island. Another article "Out of Site" provides information on the James Bay Lowlands in northern Ontario which contain one of the largest potential mineral reserves in Canada. An interview with Michael Byers, an Arctic expert and legal scholar, provides interesting insights into Canada's role in important Arctic issues

The cover story of *The Economist* [Volume 424, #9050. pp. 15-18. July 22, 2017 www.economist.com] focuses on the "Future of Learning." Back in 1953, the Harvard Professor B.F. Skinner built the first "teaching machine". Since then the use of technology for learning has had numerous successes and failures. As discussed in an accompanying piece [pg. 9] "what matters is how edtech is used." The editors suggest three imperatives 1). The skills of a teacher will always be necessary in education, 2). Edtech must narrow inequalities in education, and 3). Educators must embrace technology. The feature article "Machine Learning" [pp 15-18] focuses on how educational technology is changing what the school experience and the new roles of artificial intelligence and the science of learning.

D.T. Max discusses his belief that humans are still evolving under the influence of culture and technology in his article "The Next Human" [*National Geographic*.231(4):40-63. April, 2017.www.nationalgeographic.com]. Similar to other species, we are the product of millions of years of development. Today, many people have technology implants resulting from innovative applied research that enhance their quality of life by mitigating a physiological deficiency or disease. This gives humans new powers that fifty years ago were seen as science fiction and results in the coining of the term "cyborg" - an organism that is part human and part machine.

Today, many people have technology implants resulting from innovative applied research that enhance their quality of life mitigating a physiological deficiency or disease and providing humans with new powers that fifty years ago were seen as science fiction

Elena Lytkina Botelho et al discuss their 10-year research project on 17,000 executives on CEO success. ["What Great CEO's Do Differently: The Behaviors that Set the Best Leaders Apart." *Harvard Business Review*. 95(3):70-77. May/June, 2017. www.hbr.org]. Their results challenge many widely held assumptions that as it turns out have little bearing on CEO success. Emerging from their research were four specific business behaviors that do lead to success. In another article in the same issue "The Worlds Next Great Manufacturing Centre" Irene Yuan Sun describes the growth in Africa's manufacturing sector. This is the result of substantial investment by privately owned Chinese companies that are transforming Africa's economy and society by providing millions of Africans with employment for the first time and fostering a generation of African entrepreneurs.

Fortune magazine has published its annual listing and profiles of America's biggest companies [175(8). June 2017. www.fortune.com]. Leading the list, as it has for five continuous years, is Walmart Stores followed by Berkshire Hathaway and Apple. Profiles of some of these companies and other information of interest are also included in this issue of the magazine. *Inc:* the magazine for growing companies has published its "50 Best Workplaces in America" [pp. 42-53. June, 2017. www.inc.com]. Criteria for their selection as well as profiles are included. "The Richest Self-Made Women" profiles fifty-nine of America's wealthiest female entrepreneurs. [*Forbes* 199(6):86-93 June, 2017 www.forbes.com].

A variety of authors describe the smartest ways to build a brand, win fans, and grow your business in "100 Brilliant Ideas"[*Entrepreneur*. 32-62. June 2017. www.entrepreneur.com]. Many interesting insights and strategies are provided about how to improve something, what people want or even what people do not even know that they want. As stated in the introduction "Entrepreneurship is about ideas. It is the foundation of everything…….a business is an idea come to life: an entrepreneur is an ideas-driven person." Entrepreneurs today often emerge from the millennial generation. In the Recruiting Tip Sheet published in the April issue of Inc. [pp. 48-49] new research is discussed on the characteristics, needs, and management of this outstanding generation of young people.

The drone method of delivery of parcels is a growing industry around the world. In "The Sky's the Limit" [*Design Engineering*. 63(2): 24-25. March/April, 2017. www.design-engineering.com]. Lindsay Luminoso discusses the Canadian start-up venture company Drone Delivery Canada [www.dronedelivery.canada.com] headquartered in Vaughan Ontario. Among other things, the author discusses the technologies involved, challenges during the journey, how the challenges were overcome, current status and as the technology grows practical applications for autonomous vehicles in Canada. Tom Standage discusses many important facets of this technology and its commercial applications in *The Economist's* quarterly technology feature [14-page inset "Taking Flight". June,2017. www.economist.com] .

Dual enrollment programs are seen as an opportunity to introduce college to a population of young people who normally would not think about it.

Many high school students are taking courses for community college credit. Dennis Pierce in his article "The Rise of Dual Enrollment" [*Community College Journal*. 87(5):16-24. April/May, 2017 www.aacc.nche.edu] discusses this program that helps provide a seamless transition from high school to college. Students earn high school and college credits which can significantly reduce the amount of time it takes to earn a degree. Additionally, dual enrollment programs are seen as an opportunity to introduce college to a population of young people who normally would not think about it.

McKinsey & Company is an established global management consulting firm that serves leading businesses, governments, non-governmental organizations, and not-for-profits. [www.mckinsey.com]. Additionally, McKinsey & Company is a prolific publisher of important insights into the current state of business providing you with valuable information that will enhance your success as a manager or staff employee. Their flagship business publication, *McKinsey Quarterly*, has been informing readers since 1964. Some recent publications include: High-Performing Teams, Untangling Your Organization's Decision Making, A Machine-Learning Approach To Venture Capital, and Pushing Manufacturing Productivity To The Max, to name but a few. They also feature collections of articles on topics of current interest. ■

For **Terrance Malkinson**'s biography please see page 7.

IEEE Canada at Sections

With the theme, Brilliant Minds, Bright Futures, IEEE Sections Congress 2017 was a shining example of how a volunteer organization renews itself at the grassroots.

IEEE Sections Congress, sponsored by the Member and Geographic Activites (MGA) Board, is a triennial global leadership conference to provide section leaders with training, skills and resources to better meet the needs of their section members. It also provides many opportunites for networking. Through the recommendations process delegates have an opportunity to influence the development of future goals and priorities for IEEE.

This year, 1250 attendees represented 165 countries and over 300 sections. They heard keynote presentations, attended workshops, tutorials and panel discussions. There were also short five-minute mini sessions, meant to acquaint listeners with topics and inspire a desire for more information. In the exhibitions area, delegates could view and try out many of the numerous IEEE tools and resources available for members.



IEEE Canada's contingent including primary (voting) delegates from all 21 sections, plus an additional 12 secondary delegates. Also attending was our Executive Committee, so that together with representation from the sections, a BoD meeting could be held prior to the start of the first Sections Congress sessions.



The day after Sections Congress concluded, IEEE Canada held a full-day strategic planning session focusing on priority areas: Support for WIE, YP and students; increasing relevance with industry; and conference planning and delivery. More detailed information on the strategic planning session is provided on page 43.

Video recordings of many Sections Congress sessions are available from: https://ieeetv.ieee.org/event-showcase/sections-congress-2017

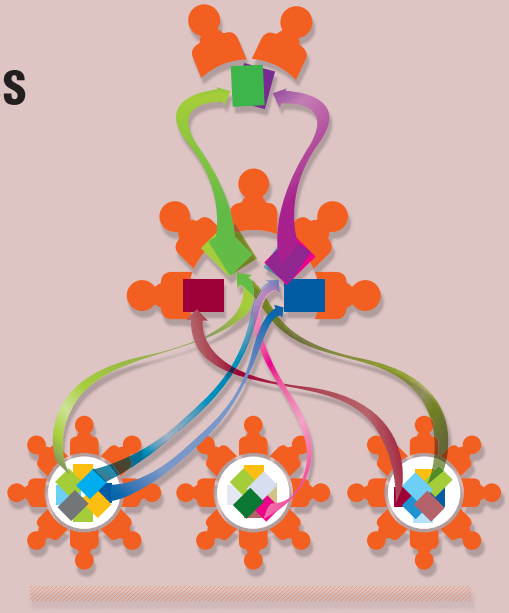
Recommendations development process

BY **CHRISTOPHER WHITT**

THE RECOMMENDATION PROCESS IS an important (and perhaps underappreciated) component of each Sections Congress. It is a key opportunity for volunteers to voice their ideas to IEEE staff and leadership for improving our experience as members.

In 2014 I was a primary section delegate for Canadian Atlantic Section. I participated in a section brainstorming session several months before Sections Congress, and then dove into the discussion at the spring region meeting where we selected the top suggestions from the region to go to SC2014. It was very exciting that one recommendation from our section was a top-voted recommendation three years ago.

This time around it was a different experience as I helped at the regional level



to collect and refine recommendations from all 21 sections. Proposed recommendations were gathered from sections before the spring Region meeting in late April. At the region meeting, section and region volunteers discussed, debated, and re-formulated many ideas.

All three of the recommendations were reviewed and accepted by the MGA Operations committee to be included in the final list of 16 recommendations for voting in Sydney. Our top three recommendations related to improvements in volunteer tools (vTools), ensuring equitable Fellow elevation opportunities for members from industry, and increased collaboration between industry and academia.

It was fascinating to see the process all the way through from beginning to end: brainstorming in my section; debating at the region meeting; and finally having many informal conversations in Sydney with the highest levels of IEEE volunteer leadership. I was impressed by the passion and creativity brought to the process by many individuals. However, the most significant observation was that leaders at all levels of the organization are engaged with the recommendation process, and good ideas don't get lost even if they aren't voted into the top three.

...Continued on page 45 »

Congress 2017

Recommendations response

BY **AMY PINCHUK**

AS A FIRST-TIME ATTENDEE at Sections Congress I was extremely impressed by the organization of the Congress and by the Region 7 organizers' wonderful attention given to the Canadian delegates to help us figure out what to do and where to go. The Congress provided an excellent opportunity for people like me to fill in the blanks on IEEE initiatives and tools.

Here are my thoughts on two of the top recommendations:

Strengthen and Recognize Industry/Academia/Government Collaboration/ Partnerships.

Collaboration and partnerships amongst these three groups are indeed really important. I'm not so sure an award will provide any incentives to industry, though. Multidisciplinary events at an international level would complement what we are doing in Montreal and is being done elsewhere within the region through Industrial Relations Chapters.

Develop an incentive program for corporations to join IEEE as Corporate Member.

This is an initiative that in general I support; however, I hope consideration will be given to reduced membership fees for small business owners and their employees. For large corporations, a well structured membership offering would give sufficient access to IEEE resources for management to champion them with (Continued on page 45)

Recommendations response

BY **MURRAY MACDONALD**

THE 2017 VERSION OF IEEE's Sections Congress was again a great training opportunity for volunteers, both new and more seasoned. There was a wide range of topics and formats ranging from five-minute IGNITE sessions as brief introductions on topics such as IEEE Day, through training on the volunteer suite of tools, to longer and more detailed presentations.

Interestingly, one of the top three recommendations from delegate voting at Sections Congress was "Develop (or expand existing) training programs and/or create partnerships with external organizations to allow members to provide STEM activities to pre-college students". The voting delegates may not have been aware of the IEEE Teacher In-Service Program's available resources and had not considered the logistics required to reach the world's students. For example, there are over 5 million elementary and secondary students in Canada and only 17,000 IEEE members (of which only about 50 are actively involved in education outreach activities). It is clearly impractical for the IEEE to directly reach an impactful number of students even once a year. While engaging directly with the students may be fulfilling, providing the awareness and resources to teachers will reach many more students over many years. This is an embodiment of the proverb "Give a man a fish and you feed him (Continued on page 45)

Three Top Recomendations as voted by SC'17 primary delegates

- **Strengthen and recognize Industry/Academia/Government Collaboration/Partnerships** - Create a Section Award for Industry/Academia/Volunteer collaboration - Organize multidisciplinary Industry/Academia/Government events focused on 'hot' issues - Develop a public communications platform to develop projects and share results - Create a 'dating' platform to communicate industry issues searching for solutions and possible 'applications' of research results.
- **Develop an incentive program for corporations to join IEEE as 'Corporate Member'.**
- **Develop (or expand existing) training programs and/or create partnerships with external organizations to allow members to provide STEM activities to pre-college students.** Provide 'canned' or 'in a box' style demonstrations and presentations that local Sections can deliver to pre-college students. Re-evaluate a 'Junior IEEE' membership program targeted at pre-college students.

Three Top Recomendations from IEEE Canada R7

- **Facilitate Industry and Academia Collaboration with IEEE resources.** IEEE can play vital role by providing networking platform, engaging volunteers and connecting local members. Volunteers can connect (i.e. symposiums) local industry professionals/entrepreneurs/SMEs with academic research groups and government bodies to explore available resources (equipment, skill set, funding) and collaborate. Special recognitions can motivate volunteers (individuals) to contributing effectively. Successful sections/members/organization may receive awards or special recognition from IEEE. IEEE can offer funding in the form of scholarships to students or as a grant to the faculties. To be implemented on a country by country basis.
- **Increase resources for development of vTools.** There has been a history of feature requests to vTools, however, progress to address these requests has been slow due to the lack of resources being given to the platform. It is suggested that IEEE increase support for vTools by hiring additional support to help address the backlog of feature requests and accelerate the completion and integration of these new options.
- **Modify the Fellowship nomination forms and process to make it relevant to non-academics.** Industry, government, military and other non-academic members are challenged as the application form only fits academics, who are expected to publish, write books and patent. This is not expected in the non-academic world; some are constrained by organizational proprietaryness or publishability. Reformat the nomination form to fit non-academic member qualifications.

IEEE Interregional Collaboration and Networking, What is involved in advancing technology for humanity?



A veteran's take

BY **DAN COODE**

I CONSIDER MYSELF FORTUNATE as this was not the first Sections Congress I have had the privilege to attend, and the depth and breadth of IEEE services and diversity of the IEEE volunteer base worldwide never ceases to amaze me. It's interesting to meet other volunteers from other parts of the world that have the same challenges I see locally. It was inspiring to exchange ideas, best practices, and lessons learned with them.

Sections Congress is a special event where Sections from around the world have the opportunity to bring recommendations on how to improve the IEEE. Over the event primary delegates from each Section vote on the recommendations which are most important to them and their Section. The IEEE staff and volunteers then prioritize and work on those recommendations in the years ahead. The top recommendation this year is one close to my heart, creating a corporate IEEE membership, which I believe will better engage industry where I work and a topic I have had many companies ask me about. The recommendation process is an important part of Sections Congress and it gives a powerful voice to all IEEE Sections.

I have been an active IEEE volunteer for close to 20 years and had the honour of Chairing the MGA Center for Leadership Excellence (CLE) committee when it was first rolled out to the membership at Sections Congress in San Francisco giving me a significant amount of experience with IEEE, its services, and its tools. I was pleased to discover that Sections Congress is still a wonderful learning opportunity even with all my experience. I was able to learn about new tools like IEEE CollaboratecTM and how to take advantage of it. I also learned lots about planning conferences and their associated challenges, which is an area in which I have less experience. Most importantly I learned about resources like MCE and POCO that can assist in conference planning.

Outside of volunteer tools and services I learned about newer technical issues facing our society that IEEE volunteers are starting to tackle, such as issues of who is responsible for decisions made by artificial intelligence or self-driving cars. It became clear to me that IEEE has an important role to play in addressing these types of technical/societal issues, and I look forward to seeing the solutions IEEE members discover while I hope to see IEEE as an organization play an important role influencing related policies as they are created around the world.

Dan Coode
SED Systems
West Area Chair, IEEE Canada

A student's take

BY **CHIEN DAT NGUYEN DINH**

BEING RELATIVELY NEW to IEEE, Sections Congress was an amazing opportunity for me to learn and be inspired. The presentations, booths, learning hubs and other sessions covered a large pool of services provided to sections and members. There were longer sessions that began from the afternoon of the first day discussing various topics from increasing interaction with members to case studies and project funding.

There were several breakout sessions on the second day of the congress that caught a lot of attention. One particular topic that interested me was the talk on how to make IEEE relevant to entrepreneurs. The IEEE Entrepreneurship initiative helps local engineering entrepreneurs find the information they need and helps them get in touch with more established entrepreneurs in their field. There were also helpful sessions



Allan Tear of RevUp describes how entrepreneurs can connnect to industry experts

on IEEE Day and the IEEE Xtreme programming competition. I also learned about a variety of projects that improved communities around the world with the support of IEEE.

In addition to the information I gained, Section Congress 2017 was a great opportunity for me to network with delegates from around the world. As part of the organizing team for IEEE Day this fall at the University of New Brunswick, I could speak first-hand about IEEE's global impact, and how much opportunity there is for those who get involved.

Chien Dat Nguyen Dinh
M.Sc. in Engineering student at U. of New Brunswick
IEEE UNB Student Branch

Rewriting the book on Chapter Development

BY **FABRICE LABEAU**

ALTHOUGH THIS WAS MY third time attending Sections Congress, my objectives for this Sydney edition were a bit different from a few years back in Amsterdam and San Francisco. This time, apart from a presentation that I delivered regarding the distinguished lecturers program developed within my home technical society, I spent most of my time on the exhibit floor, sharing time between the booth of the IEEE Vehicular Technology Society (VTS, for which I am the VP for Membership Development) and that of the IEEE Sensors Council. This was an incredible opportunity to meet and discuss with many section representatives from all over the world.

At the VTS booth in particular, the objectives we had were first to pursue new chapter development opportunities and second to increase VTS membership in sections. Before coming to Sydney, our team had developed specific flyers about the benefits of creating a chapter and benefits of membership; we also made sure to bring eye-catching goodies for the booth. These served as ice breakers and conversation starters (together with the remote controlled car we were driving around the exhibit floor), opening up conversations with section leaders from all over the world. We were in this way able to make contact with dozens of sections in two days, many of them having the potential to create a local VTS chapter. Compared to our usual way of trying to create chapters, which involves physically traveling to a section, the concentration of sections leaders in the same place which happens only every three years at Sections Congress created an incredibly efficient way to connect and develop interactions.

The presence of the IEEE Sensors Council had different objectives.



Fabrice Labeau explaining the ABCs of VTS Chapter formation at that Society's booth. He spoke to "dozens" of Section Executives using this approach.

Contrary to an IEEE Technical Society, an IEEE Technical Council does not have individual members: its members are IEEE Technical Societies who decide to put their efforts together in an area that cuts across their mandate. In this case, the field of sensors is so vast that 26 societies of IEEE are members of the Sensors Council. So, without individual members, the objectives at Sections Congress are not to attract more members, but to grow the community, by encouraging section leaders to create chapters, or host summer schools. Again,Sections Congress was a unique opportunity to do so!

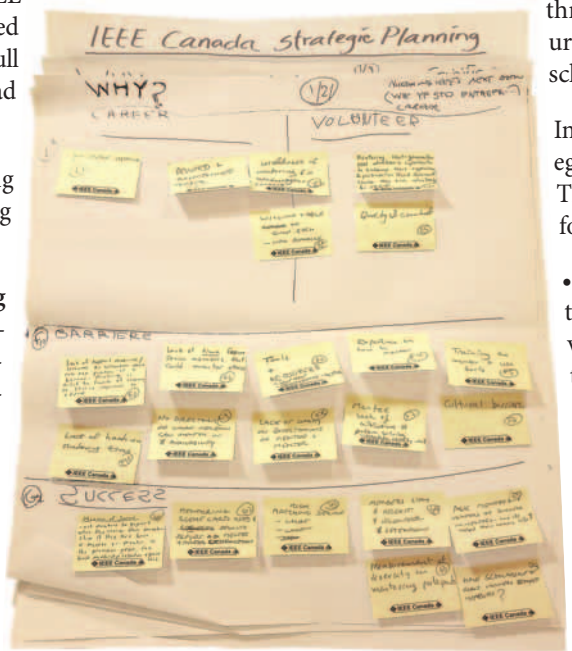
At the end of the day, looking back at my experience at Sections Congress 2017, I can say it was efficient and effective in terms of my objectives, but also, as always, a very rewarding experience meeting old friends and meeting new IEEE volunteers from around the globe!

Charting IEEE Canada's Course Ahead

INSPIRED BY A WEEKEND of engaging workshops, panels and presentations, the IEEE Canada contingent remained in Sydney for another full day to chart a course ahead for our region.

The strategic planning session yielded the following top priorities:

- **Formalize mentoring programs** for more effective volunteer recruitment and recognition, as well as establishing quality control. Mount mentoring events to supplement one-on-one efforts
- **Increase conference bidding** by greater coordination with section chairs and IEEE societies. Promote greater collaboration with local tourism offices.



The result of one of the approximately 30 small-group discussions that took place during the strategic planning session at SC '17.

- **Create more industry-focussed content** in the IEEE Canadian Review.
- **Greater public visibility** through media exposure and engagements in schools.

In total, roughly 30 strategies were identified. These were developed by focusing on four areas:

- recruitment and training of volunteers, value and relevance to members, internal and external communication
- mentoring, diversity, YPs
- greater relevance to industry
- conference planning and delivery

For each focus area, subtopics were discussed in eight groups, facilitated by the following experienced volunteers: Raed Abdullah, Amir Aghdam, Dan Coode, Michael Lamoureux, Murray MacDonald, Scott Melvin, Elena Uchiteleva and Christoper Whitt.

Guiding the day's activities was Fabrice Labeau, who led a wrap-up session to prioritize identified strategies. President Witold Kinsner and President-Elect Maike Luiken led planning of the event.

The Sydney session built on a shorter session that followed IEEE Canada's Spring Board meeting in Windsor and a subsequent survey of experienced volunteers within the region to determine Strengths, Weaknesses, Opportunites and Threats.

Humanitarian Appeal

BY **DALE TARDIFF**

THIS WAS MY FIRST TIME to attend Sections Congress. I attended as the Primary Section Delegate from Southern Alberta Section (SAS). The congress was worthwhile for the information presented and the people I met. Shan Pandher also attended from SAS as the secondary delegate, coming away with some good ideas for the section.

SC was very informative, with booths and presentations covering a large variety of IEEE services volunteers can take advantage of. The major tools and services were presented in large-group sessions. Small-group sessions were more specifically targeted.

Of particular interest to me going in was to learn about projects that sections can undertake to engage their members. There was such a small-group session Shan and I attended; it turned out to be very popular. By the end, we had several good ideas for possible section projects. For SAS, a humanitarian outreach project would have wide appeal.

IEEE's Mobile Outreach VEhicle (MOVE) program assists in natural disasters with short-term communications



In addition to this small-group session, there was also a breakout session on MOVE; a community outreach project sponsored by IEEE USA. This started as a section project where members outfitted a vehicle to provide some communications and limited power to assist communities facing a natural disaster. When not providing disaster assistance, it is used for community outreach to bring more awareness of IEEE to the general public.

More information is at http://move.ieeeusa.org/

Other presentations included information on the major IEEE boards (e.g. Technical Activities, Educational Activities) and what they offer for sections.

I also found the networking at SC very valuable. I had discussions with Section representatives from IEEE Canada and around the world, and compared section issues and solutions with them. All sections encounter similar problems with the ups and downs of member involvement and it is good to compare ideas and understand your particular section is not alone.

The MGA Outstanding Section awards are also presented at Sections Congress. Two awards went to Region 7. I am proud to announce that the Southern Alberta Section won the Outstanding Medium Section award, and London Section won the Outstanding Small Section Award. Congratulations to the London Section; and many thanks to the members and volunteers of both sections that have made this recognition possible.

Dale Tardiff
Innovative Power Solutions, Inc.
Section Chair, Southern Alberta

All about ideas

BY **GUILLAUME BOISSET**

SECTIONS CONGRESS WAS a tremendous success. It allowed us to explore how we can offer more opportunities to our members here in Vancouver and all across Canada. The Vancouver delegation met delegates from all over the world to share ideas and best practices. We saw a presentation on the IEEE Xtreme 24-Hour Programming Competition, and how it is now a major success that we want to encourage all students and professors to contribute to. There were presentations on how to make IEEE Day a greater success. We intend this year to organize an IEEE Day event across four sections (Vancouver, Victoria, Seattle, Portland) to generate a greater sense of community. There was the IEEE Move Humanitarian Truck Initiative; we will investigate how to launch a similar program here in Canada. There were many other programs that were presented that we can bring back to improve the experience and opportunities for IEEE members here. Many thanks to Witold Kinsner, Maike Luiken and all the IEEE Canada executive for organizing R7 participation in this event.

Guillaume Boisset
Sierra Wireless
Section Vice-Chair, Vancouver

Breadth, depth and reach of IEEE

BY **P. TRAVIS JARDINE,**

BEING RELATIVELY NEW TO the IEEE community, I did not know what to expect at the 2017 Sections Congress. My exposure to the organization had been mainly through technical conferences confined to the narrow scope of my field of academic research. By the end of the first day, I gained a greater appreciation for the breadth, depth, and reach of the IEEE and the important role it plays in advancing science and technology around the globe.

Of particularly interest to me were presentations by members of the IEEE Society on Social Implications of Technology (SSIT), specifically those of Mr. Paul Cunningham. During these presentations I learned of the sustainable development initiatives being spearheaded by IEEE in Africa and Central America. I had no idea that IEEE was making that kind of impact.

I also had the opportunity to meet a lot of interesting and fun people. In particular, I attended several networking events organized by IEEE Young Professionals (YP), and found the activities engaged in by many of those attending to be highly motivating.

Finally, our Region held a strategic planning session at the tail end of the Sections Congress. During this time we put forth ideas that will help us set a trajectory that is aligned with IEEE's goals for the future. I returned home with a better perspective on where my Section stands and a handful of ideas to help us improve.

P. Travis Jardine,
Royal Military College of Canada
Section Secretary, Kingston

Recommendations response BY CHRISTOPHER WHITT continued from page 40 »

Experiencing Sections Congress again, it is clear that we have a huge amount of energy and resources. With any organization of our size, change can sometimes seem slow – but looking through the recommendations from 1999-2014, it's amazing how many of those ideas are now implemented.

Voting on the top three recommendations worldwide is a privilege for only primary delegates, one from each section (MGA, regional and secondary section delegates do not vote). During the closing ceremony on Sunday afternoon, the top three voted recommendations were revealed. Again – just as in SC2014 in Amsterdam--one of our R7 recommendations was top voted. Congratulations, and thanks to all of the section and region volunteers that participated in the process!

Christopher Whitt
JASCO Applied Sciences
East Area Chair, IEEE Canada
SC '17 Recommendations Development Coordinator

» Recommendations response BY AMY PINCHUK continued from page 41

employees, and encourage active participation in the local section/chapters.

Sections Congress 2017 gave me ideas, tools, and increased energy to put towards the Montreal Section.

Amy Pinchuk
InField Scientific Inc.
Section Chair IEEE Montreal

Recommendations response BY MURRAY MACDONALD continued from page 41 »

for a day. Teach a man to fish and you feed him for a lifetime."

One session that hit on my passion was a presentation entitled "Inspiring a New Generation of Engineers: Resources to Empower Educators and Parents in Your Section." This was based on the IEEE Teacher In-Service Program (TISP) and was presented by Dr. Elizabeth Burd from the University of Newcastle. Dr. Burd has experience doing TISP workshops in England, Europe, Australia, and India. She covered the range of resources currently available on the TryEngineering and TryComputing websites, describing how these can be used. Among these resources are 134 lesson plans aligned with curriculum documentation. A number of these are already translated into other languages.

One key takeaway from Dr. Burd's presentation for me was the need to focus on promoting these resources with teachers versus trying to deliver them directly to the students. Teachers are trained and very capable in delivering educational programs. However, many do not have the background to be comfortable with delivering STEM programming. IEEE volunteers (a very limited resource) will gain the most leverage by helping put these resources into the teachers' hands and supporting them to improve their curriculum offerings. Dr. Burd described how successful she has been with workshops for teachers in Australia and in Southeast Asia. We in Region 7 can emulate this to deliver the IEEE message and have an impact. These TryEngineering resources are also available to parents and that may be an untapped delivery channel for our volunteers.

All session presentations are now available on the SC2017 website. You can also search the SC2017 Event Showcase page on IEEE.tv to find videos of some sessions. Members will be interested in the range of information available.

Murray MacDonald
Murray MacDonald Consulting
Central Area Chair, IEEE Canada

***N.Ed.*: Thanks to all our contributors for taking the time to send in their impressions. Much appreciation as well to Jonathan Palmer and Ritu Malhotra from North Saskatchewan Section for their help in writing the introduction. A thank-you also to Chien Dat Nguyen Dinh for help in gathering reports.**

TISP and STEM Outreach in Region 7

There are STEM outreach activities somewhere in Canada just about 52 weeks a year.

The easiest way to join the action is through our IEEE Canada Teacher In-Service Program (TISP) Committee, headed by Dirk Werle (dwerle@ca.inter.net). The majority of sections have TISP Groups. See http://tisp.ieee.ca for details.

Some section affinity groups organize STEM outreach events. In some instances, affinity groups and TISP committees jointly organize events A recent example of this was at a teachers' "super conference" last month in Vancouver; that section's TISP and WIE groups engaged with hundreds of attendees at their booth.

Collaboration with other professional associations has proved very succesful for TISP volunteers in London, Peterborough, Ottawa and Canadian Atlantic sections.

The longest running STEM engagement in IEEE Canada is participation in the Science Teachers' Association of Ontario annual conference. Initiated by Hamilton Section member Dave Hepburn in the mid 2000s, he was subsequently joined by Patrick Finnigan of Toronto Section. Since formation of IEEE Canada's TISP Committee in 2008, the booth is now staffed by additional volunteers from London, Peterborough and Ottawa sections; workshops are also now part of the program.



Photo: Mooney Sherman and Rossitza Marinova

Wind turbine design was the lesson plan at this teacher workshop organized by Northern Can. Section's Mooney Sherman and Rossitza Marinova.

Direct engagement with pre-university students is another aspect of R7 STEM activity. The University of Manitoba's Summer Space Camp and Research Discovery Spring Camp for Indigneous High School Students introduce participants to life-changing career options.

Some specific section STEM initiatives will be explored in subsequent issues of this magazine. ■



The 2017 WIE International Leadership Conference

– IEEE Canada members bring home ideas and inspiration

By **Vawn Himmelsbach**

Women in STEM fields have always faced unique challenges. They're often far outnumbered by men, may handle work situations differently than their male counterparts, and have historically been viewed as less gifted in these fields, sometimes resulting in fewer career opportunities. And they're often underrepresented in leadership roles.

A 2014 global study of leadership in the private sector put some hard numbers to the problem. Surveying 22,000 firms, the Peterson Institute for International Economics found that almost 60 percent had no female board members. Half had no female C-suite executives and fewer than five percent had a female CEO. The situation is exacerbated for women in STEM fields; the survey found female representation on boards and in corporate leadership positions at technology-related firms was lower than other industries such as healthcare and finance. However, firms that include women in leadership roles tend to be more profitable, according to the research, and diversity in general is likely linked to higher performance.

Helping to develop the next generation of female leaders was front and centre at the 2017 IEEE Women in Engineering (WIE) International Leadership Conference (ILC), held May 22-23 in San Jose, Calif. IEEE WIE was founded in 1994 to promote the advancement of women in IEEE fields of interest, as well as encourage girls to pursue careers in science and engineering. The ILC, which attracted 1,500 global attendees this year, was launched in 2014.



> "As an executive volunteer, these sessions helped me to define and to shape my leadership style, to understand what leadership means, and to become a better leader," says Uchiteleva. "It's also interesting to see the obstacles that other leaders face and learn how they overcome them."
>
> *Elena Uchiteleva, Chair, WIE Canada Committee, IEEE Canada, Group Committe Chair, Member Services*

WIE ILC helps to inspire, engage and advance women in engineering by featuring female speakers in senior leadership positions, and offers numerous tracks exploring various aspects of leadership skills. It's also an excellent means for women to network and learn first-hand what opportunities exist in various WIE committees and subcommittees, says IEEE WIE Canada Regional Coordinator, Elena Uchiteleva.

This year's attendees had access to keynote sessions and tracks on leadership, innovation, empowerment, disruptive technology and entrepreneurship, as well as transforming technical talks and workshops on topics ranging from conquering stress to breaking through bias. They also had access to a career fair, pitch bootcamp and networking reception at the San Jose Tech Museum. Numerous industry reps were on hand looking to recruit a diverse workforce and discuss emerging technologies.

"For me personally, the executive leadership track was the most relevant and most important," says Uchiteleva, a Ph.D. candidate in wireless communications at the University of Western Ontario. "This track is aimed at helping to develop stronger female leaders in engineering specifically, and consisted of multiple inspiring and insightful talks."

One message that stood out for Uchiteleva is that leadership is a choice; nobody is born a leader - you choose to become one. Candy Barone, CEO and founder of You Empowered Strong, explained in her presentation that successful leaders see opportunities rather than obligations. She also spoke about emotional intelligence — how to turn fears into motivation and how to shift from time-management to focus-management.

Another notable session was a panel on "Defining Leadership" with five speakers who hold management roles in Google, Texas Instruments, Qualcomm, Applied Materials, Inc. and the U.S. Army Reserve. The panel discussed what leadership means to them, their leadership style, how to influence people, how to handle stressful situations and how to achieve challenging goals.

"As an executive volunteer at the IEEE, these sessions helped me to define and shape my leadership style, to acquire more profound understanding of what leadership means, and to eventually become a better leader," says Uchiteleva.

Some would say Uchiteleva already has a leadership track record quite firmly established: she is the recipient of the 2017 IEEE Canada Women in Engineering Prize and the 2017 Claudette MacKay-Lassonde Graduate Engineering Ambassador Award from the Canadian Engineering Memorial Foundation. But, there is always more to discover, she notes. "At WIE ILC I saw difficulties other leaders faced and how they overcame them."

Aside from personal and professional development, WIE ILC provided an opportunity for WIE volunteers to build links with their peers and share insights.

"This conference is all about networking — it's a great platform for meeting other IEEE WIE members and volunteers from all over the world. With some of them I've communicated only by email, and finally got to meet those people in person," Uchiteleva says.

The networking benefits are shared by all the WIE Canada volunteers that attend WIE ILC, according to Uchiteleva.

"Since they have a chance to talk to representatives from other regions and chairs of other groups, our volunteers can glean best practices, the most successful events that have been organized and what we can bring back here to Canada. They come away inspired to organize more impactful events, such as summits or workshops at other conferences."

Attendance at international conferences has higher travel costs than participation in events mounted in Region 7 (R7), so this generally limits how many IEEE Canada volunteers can benefit from them. However, WIE volunteers can apply for travel grants to attend WIE ILC, up to US$1,000. This year R7 also provided support for local chairs, with three grants of $500.

"IEEE Canada is very supportive of WIE," says Uchiteleva. She notes how current IEEE Canada President Dr. Witold Kinsner has emphasized integration of WIE activities into planning of regional activities. President-Elect Dr. Maike Luiken, founder of London Section's WIE group, has "never turned down an invitation" to speak at WIE Canada events Uchiteleva has organized.

The larger IEEE WIE community has also been very responsive to Uchiteleva's requests. For the WIE Canada Congress in Mississauga in September 2016, she invited speakers such as current IEEE WIE Committee Chair Dr. Bozenna Pasik-Duncan, past chair Nita Patel and WIE Committee member Jennifer Ng Ain Kin. Attending meant significant travel for some of them. But, they all showed up.

"Having these high-profile WIE volunteers talk about their experiences really boosted attendance," Uchiteleva says gratefully. "We really appreciated the effort they made to come and present."



"This really encourages me to be more passionate about what I'm doing. I need to do more, I need to inspire female students and younger generations ... The whole environment was really motivating, intelligent, powerful."

Nasim Abdollahi,
Chair, WIE Winnipeg Section.

Nasim Abdollahi, from WIE Winnipeg Section, first heard about WIE ILC from Section past chair, Dr. Puyan Mojabi, who highly recommended attending. Then during the Mississauga WIE Congress, she met Nita Patel, chair of WIE

Dr. Ana Luisa Trejos

IEEE Women in Engineering Inspiring Member of the Year (Honourable Mention)



DR. ANA LUISA TREJOS (SMIEEE) from London Section received worldwide recognition through honourable mention for the IEEE Women in Engineering Inspiring Member of the Year Award. Her citation includes dedication to WIE, advocacy for women in STEM and outstanding achievements in engineering.

Since 2013, Dr. Trejos has been Assistant Professor at Western University and Associate Scientist at Lawson Health Research. Her research interests include devices for minimally invasive surgery and the development of systems for surgical training and motor skills assessment. She owns four patents for surgical devices, has written 25 journal papers and 36 conference papers, and is a recipient of 19 awards, including the Alexander Graham Bell Canada Graduate Scholarship from the Natural Sciences and Engineering Research Council of Canada. She serves on multiple committees and is a sought-after speaker at industry conferences.

Trejos has been a WIE member since 2009. As Vice-Chair of the WIE London AG, she has helped to revive the group, which had been inactive for many years; today, it's one of the most active WIE groups in Canada.

Outside the IEEE, Trejos contributes to numerous community outreach programs that promote women in engineering, by developing outreach activities for elementary and high school girls and providing support to undergraduate female students through mentoring. Her approach is to share her passion about engineering and spark interest in this profession— all while diminishing stereotypes about the role of women in STEM. ■



> "If we leave it to happen by itself, it won't! We need to have an active role in implementing gender equality in every aspect of our lives, and teach it to the next generation."
>
> *Dr. Samira A. Rahimi, Chair, WIE Quebec Section*

ILC. Her interest was piqued; she applied for volunteering and received a travel grant, allowing her to make the trip to San Jose. Abdollahi, who is completing her PhD at the University of Manitoba, is conducting research into microwave imaging for biomedical applications.

At WIE ILC, she learned about the latest research by tech giants like Apple, Microsoft, Intel and Google, which was eye-opening. It also inspired her.

"I met so many strong women; they have done so much to inspire young females to pursue engineering and science," says Abdollahi.

A keynote speaker that stood out for Abdollahi was Peggy Johnson, Executive Vice-President of Business Development with Microsoft, who spoke about the evolution of non-traditional career paths and staying true to your authentic self. At one point in her career, she was the only female engineer working for Qualcomm, which came with its challenges.

Abdollahi walked away from the conference with a new role model in Johnson.

Alise Wang

IEEE Women in Engineering Inspiring Student of the Year (Honourable Mention)



ALISE WANG (IEEE WIE University of Ottawa SBAG) received worldwide recognition through an honourable mention for the IEEE Women in Engineering Inspiring Student Member of the Year Award, for her leadership and contributions to the IEEE WIE and IEEE communities.

Though Wang is only in her third year as an undergraduate engineering student, she has been involved with the SB WIE uOttawa since 2015 and, as one of the most active executive members, was elected to fulfill the role of SB WIE uOttawa Chair in 2016.

Driven by her interest in humanitarian projects, Wang has helped to organize major Canadian IEEE conferences, such as IHTC and EPEC, as well as the WIE Canada Outreach & Networking Event at EPEC 2016. She also volunteered to run the WIE promotional booth at EPEC 2016 and EMBS ISC 2016, helping to increase WIE membership.

Wang advocates for women by volunteering as a workshop coordinator for ANCWT (Advancing New Canadian Women in Technology), a pilot program designed to assist women refugees and newcomers from Syria in gaining work experience. She has also contributed to several community outreach programs, including the uOttawa Kin Club, and is a member of Engineers Without Borders.

Wang is organizer of the WIE uOttawa Big Eng Little Eng Mentorship Program, a school-wide mentorship program involving more than 140 students to date — providing a vital support network for first-year female students and helping to increase the retention rate of women in engineering. ■

Dr. Samira A. Rahimi, from IEEE Quebec Section, also attended WIE ILC through a travel grant. Dr. Rahimi called it "an inspirational event" where she strengthened her leadership and networking skills, as well as job-search skills.

A postdoctoral researcher at Université Laval's Faculty of Medicine, Rahimi has been focused on healthcare systems for years. With a background in industrial and system engineering, she tackles health-related decision-making problems and helps both health professionals and their patients to work together to make informed value-congruent decisions about patients' health. She is currently part of a prenatal screening study to detect chromosome abnormalities using maternal blood, aided by personalized genomics. Her specific research has to do with shared decision making in having the test performed.

Rahimi's research is interdisciplinary, and presenting engineering material can be challenging — particularly when trying to make it understandable and interesting to non-engineers. "These sessions helped me to learn skills on how to communicate engineering and technical terms to colleagues without my background," she says.

At ILC, Rahimi learned about the latest in healthcare technologies and e-health initiatives, and had a chance to hone her soft skills, including improving her leadership capabilities. "I was thrilled by meeting many strong female leaders in different industries including healthcare — I've gained from their experiences."

Rahimi is an active campaigner for gender equality and an active advocate for women STEM students, professionals and entrepreneurs. She is founder and chair of IEEE WIE Quebec Section, and winner of the 2015 IEEE Canada Women in Engineering Prize.

"We cannot go further in gender equality unless we move to the action cycle," Rahimi says. "If we leave it to happen by itself, it won't! We need to have an active role in implementing gender equality in every aspect of our lives, and teach it to the next generation."



> "Coming out of this conference, you make yourself a promise to do something."
>
> *Janet Davis, IEEE Ottawa Section*

Janet Davis, from IEEE Ottawa Section, attended WIE ILC for her second time. "It's good to re-inspire you, to get you re-energized," she says. A senior engineering manager at network strategy and technology company Ciena, Davis found the leadership track particularly useful, since it was focused specifically on women in engineering fields. "It dealt with different situations, focusing on how you as a woman would handle them," she says.

One workshop that resonated with her was the Technical Women's Leadership Journey, a leadership development program for female engineers, developed by female engineers. This training program is a partnership between WIE and the Centre for Creative Leadership, designed to empower women to break through mid-career barriers and rise to senior technical and leadership roles. The program has been successfully piloted in Silicon Valley and is now available to WIE groups and companies globally.

"I came out of that saying, 'That's really cool and we should try to get that course here at work,'" says Davis. "Coming out of this conference, you make yourself a promise to do something."

International WIE events like this one help to broaden the horizons of section volunteers towards opportunities for further involvement.

"When they're in university, a lot of younger women have career and moral support from friends, they create a club and do a lot of activities. Then afterward they go off to their new jobs where they're now a minority within a minority (of engineers). They no longer have a sisterhood connecting them — that's where we see there's a big gap."



"If you want to engage at a global level you need to meet the people. If members can attend these workshops or the local WIE summits, they can build their network. There's no better way to make contact than to be present."

Jennifer Ng Ain Kin, Ottawa Section; IEEE WIE Committee

Jennifer Ng Ain Kin, long-serving IEEE volunteer with Ottawa Section, was also a repeat attendee at ILC. "If you want to engage at a global level you need to meet the people," she says. "If members can attend these workshops or the local WIE summits, they can build their network. There's no better way to make contact than to be present."

As an IEEE WIE Committee member who works with volunteers at an international level, Ng Ain Kin knows a thing or two about building networks. She's also been doing it for 27 years with IEEE, starting out in 1990 and volunteering in myriad capacities over the years. Ng Ain Kin is currently responsible for regulatory affairs — advertising and promotion, for Abbott Vascular in California, a division of global healthcare company Abbott.

The WIE ILC conference has evolved, she says, from speakers at the CEO level to all other types of women's leadership. And this year there was a big focus on mentoring. "There was a lot of professional coaching, more than I have seen before," says Ng Ain Kin.

"Mentoring is something I've done for a long time; I've done it for my alma mater, McGill University, for almost a decade. Funny enough, most of my mentees are male," she says. Ng Ain Kin has also mentored for IEEE, whose mentorship program is now run through the IEEE Collabratec online community. WIE doesn't currently have a mentorship program at the international level.

Ng Ain Kin never had a formal mentor herself. "I think it's something inherent in women — we might be shy to say we need help," she says. "I had professors that guided me. I recognized they were mentors, but I never actually signed up for a mentor."

Shortly after she moved back to Ottawa after working in New Hampshire, Ng Ain Kin mentored the WIE affinity group within Carleton University's IEEE student branch, helping to explore opportunities within the Teacher In-Service Program. There, she served as Ottawa Section WIE Chair, and helped to advance the profile of IEEE Ottawa Section members that were active in WIE.

In 2010, her mentoring work was recognized by the Canadian Advanced Technology Alliance WIT (Women in Technology) group through an award publicized in *Computer World* and the *IEEE Canadian Review*. She was active in several pre-university initiatives of the IEEE Educational Activities Board from 2011-2014, and in January 2015 joined the IEEE WIE committee, helping to promote WIE and its activities throughout the 10 Regions of IEEE.

Ng Ain Kin has created partnerships locally in Canada with groups such as Women In Science and Engineering and NSERC, and has also seen how IEEE WIE builds partnerships at an international level.

In many ways, she is representative of the way in which IEEE would like to move forward. She is not an academic; she's from industry, and meeting the needs of those who work in industry is increasingly recognized as a priority by IEEE. Many of Ng Ain Kin's mentees have been those interested in making a career move from academia to industry.

Ng Ain Kin's three-year WIE Committee term comes to an end this year. During her first two years, she contributed by creating an environment that has increased membership. "You can't just tell the plant to grow, you have to provide the right atmosphere and settings," she says.

One of the challenges is that women typically join WIE as a student, she says, but membership wanes after graduation. "When they're in university, a lot of younger women have career and moral support from friends, they create a club and do a lot of activities," says Ng Ain Kin. "Then afterward they go off to their new jobs where they're now a minority within a minority (of engineers). They no longer have a sisterhood connecting them — that's where we see there's a big gap."

"I have created and supported activities that I look back at and I'm very proud of. The newsletter is going well, membership is higher, engagement is there, we have a new website, we're up to date. Three years is the perfect term for this volunteer role … if I cannot finish, my peers will continue on my work. La relève est là et prête … "

And conferences such as WIE ILC give her peers plenty of ideas — and inspiration — on how to do just that. ■

Vawn Himmelsbach is a freelance writer who has written about business and technology for more than 20 years.

(President's Message cont'd from page 5)

speakers. We are very appreciative of the effort the organizing committee and the volunteers dedicated to the conference and the associated events.

The IEEE International Humanitarian Technology Conference (IHTC '17) took place in Toronto, July 20-21, 2017, hosted by Ryerson University. The conference brought international experts in sustainable development and other humanitarian-related areas together with participants eager to learn how best to give of their time and energy. Our thanks to the organizers and volunteers whose strong efforts have continued this conference's further growth in reputation and reach.

Just last month, the IEEE Energy and Power Engineering Conference (EPEC '17) was held October 20-22, in Saskatoon. Building on the success enjoyed by previous organizing committees, this year's event included well-attended industry sessions and a WIE session. Its forward-looking keynotes addressed two of the most critical challenges facing power engineers: cyber-physical security of the grid and increasing its resilience. The leadership of IEEE Canada is most grateful to South Saskatchewan and North Saskatchewan Sections for all their hard work in organizing the event.

IEEE Canada Board Meetings

The first 2017 IEEE Canada Spring Board Meeting took place in Windsor, ON, Canada, April 29-30, 2017. The Board approved establishing a Vice Chair in all its major committees. A Spring Training Session preceded the Board meeting. It focused on volunteer training, training on Webex, Collabratec, membership development and industry relations.

A second Board meeting was held in August immediately before the start of Sections Congress (SC '17) in Sydney, Australia; a comprehensive report about SC '17 is presented beginning on page 40. A key element of the Sydney Board meeting was a welcoming by Conference Advisory Committee Chair Raed Abdullah of representatives from Destination Canada, attending SC '17 to help promote our Region as an excellent conference location. A third Board meeting was held just as this magazine was going to press, and will be reported on in my next and final President's message.

Recommendations Development Process for SC '17

In preparation for SC '17, Christopher Whitt and Maike Luiken led development of recommendations coming from our Region to be voted upon in Sydney. This process started before the Spring Board Meeting in Windsor, was an important activity there, and continued afterwards as a subset of the recommendations were selected for further editing at the June IEEE Board meeting. The efforts of Christopher Whitt, Maike Luiken and the many Section volunteers involved are most appreciated.

IEEE Canada Strategic Planning Session and Discussion on Diversity

On the day following the conclusion of SC '17, IEEE Canada held a full-day strategic planning session; my gratitude to Maike Luiken who helped me plan the event, to the eight senior IEEE Canada volunteers who facilitated table discussions, and to Fabrice Labeau, who led the day's activities. This is described in detail on page 43. At the end of the day's planned agenda, it was suggested that IEEE Canada respond in some fashion to issues around diversity in technology workplaces; the impetus for the discussion was media coverage of a Google employee's internal memo condemning that company's diversity policy, and how the company responded. IEEE Canada's strong support for WIE in this region—one aspect of diversity—is seen by means of the funding that made the activity described in the article on page 46 possible, as well as numerous other activities. The

(Message du Président suite de p. 5)

génie électrique et informatique (CCECE 17) s'est déroulée du 1er au 3 mai 2017 à Windsor, à l'hôtel Ceasars Windsor. La cérémonie de remise des prix (R7) a eu lieu durant le gala. De nombreuses bonnes présentations et conférences principales ont marqué l'événement. Nous tenons à souligner le travail du comité organisateur et le dévouement des bénévoles lors de la conférence et des événements afférents.

La Conférence internationale de technologies humanitaires (IHTC 17) a eu lieu à Toronto les 20 et 21 juillet 2017, sous l'égide de l'Université Ryerson. Elle a réuni des experts internationaux du développement durable et d'autres problématiques humanitaires. Merci aux organisateurs et aux bénévoles dont les efforts combinés ont permis à cette conférence de continuer à gagner en notoriété et en rayonnement.

La Conférence sur l'énergie l'électrique (EPEC 2017) s'est déroulée le mois dernier du 20 au 22 octobre à Saskatoon. Forte des succès précédents, cette dernière édition a attiré de nombreux participants, notamment aux séances de l'industrie et WIE. Ses grandes conférences tournées vers l'avenir traitaient de deux défis cruciaux qui se posent aux mécaniciens de machines fixes : la sécurité des systèmes cyber-physiques du réseau et la manière d'accroître sa résilience. Les dirigeants de l'IEEE Canada remercient les sections Saskatchewan Nord et Saskatchewan Sud de tout le travail accompli pour organiser la conférence.

Réunions du CA de l'IEEE Canada

La première réunion du conseil d'administration de l'IEEE Canada du printemps 2017 a eu lieu à Windsor, en Ontario, au Canada, les 29 et 30 avril 2017. Le CA a accepté de doter tous les principaux comités d'une vice-présidence. Une séance de formation a précédé la réunion. Elle portait en particulier sur la formation des bénévoles, la formation sur Webex, Collabratec, le recrutement de membres et les relations avec l'industrie.

Une deuxième réunion du CA a eu lieu en août immédiatement avant le début du Congrès des sections (SC 17) à Sydney, en Australie; vous trouverez un rapport détaillé du congrès à la page 40. Un des éléments clés de la réunion du CA à Sydney a été l'accueil par le président du comité consultatif de la Conférence, Raed Abdullah, des représentants de Destination Canada venus participer à SC 17 pour aider à promouvoir notre région comme un excellent lieu de conférence. Une troisième réunion du CA a eu lieu au moment où cette revue allait sous presse. J'en ferai un compte rendu dans mon prochain et dernier message du président.

Processus de préparation des recommandations pour SC 17

En vue de SC 17, Christopher Whitt et Maike Luiken ont rassemblé des recommandations de notre région en vue de les soumettre au vote à Sydney. Ce processus a débuté avant la réunion du CA de l'IEEE Canada du printemps à Windsor, a suscité beaucoup d'activité à la réunion et s'est poursuivi après cette dernière étant donné qu'un sous-ensemble de recommandations avait été sélectionné en vue d'une présentation à la réunion du CA de l'IEEE en juin. Les efforts de Christopher Whitt, de Maike Luiken et des nombreux bénévoles de la section ont été très appréciés.

Séance de planification stratégique de l'IEEE Canada et discussion sur la diversité

Le lendemain de la clôture de SC 17, l'IEEE Canada a tenu une séance de planification stratégique d'une journée. Je remercie Maike Luiken, qui m'a aidé à préparer la rencontre, de même que les huit bénévoles d'expérience de l'IEEE Canada, qui ont facilité le déroulement des tables rondes, et Fabrice Labeau, qui a dirigé les activités de la journée. Vous en trouverez un compte rendu détaillé à la page 43. À la fin de la journée, il a été suggéré que l'IEEE Canada prenne position au sujet des problèmes de diversité dans les milieux de travail technologiques; le déclencheur de cette discussion a été la couverture médiatique d'une note de service d'un employé de Google condamnant la politique de diversité de cette entreprise et de la réaction de l'entreprise. L'important appui donné par l'IEEE Canada à WIE dans cette région – un aspect de la diversité – se reflète dans le financement qui a rendu possibles l'activité décrite dans l'article

Editor-in-Chief of this publication is planning a series of articles together with Fabrice Labeau addressing specific issues in diversity across a range of affected groups.

5 IEEE Election Results

Unoffical results from this fall's election were released Oct. 6. Pending acceptance of the Tellers' Committee report by the IEEE Board of Directors in late November, Jason Gu will be 2018-2019 IEEE Canada President-Elect and IEEE Region 7 Director-Elect. We congratulate him, and thank Adam Skorek for his campaign; everyone who runs for election in this organization makes an immense contribution simply by doing so. The IEEE President-Elect 2018-2019 will be José Moura from Region 2, the same caveat applying.

6 A thank-you and a reminder

In closing, I would like to thank all the Canadian volunteers for their effort in making IEEE more relevant to the work and interests of our members. I would also like to issue a challenge: bring one new talented member to IEEE Canada. Perhaps this call to action is not even a "challenge" but a "reminder" that many of us were inspired to join IEEE by our advisors and colleagues. ■

Respectfully submitted,

Witold Kinsner,
PhD, PEng, FEIC, FEC, FCAE
2016-2017 IEEE Canada President
2016-2017 IEEE Region 7 Director

Reference: [1] Witold Kinsner, "Expanding the body of knowledge concept for professional practitioners," in Proc. 6th Conference of the Canadian Engineering Education Association, CEEA 2015 (Hamilton, ON; May 31-June 3, 2015). Paper 172, 12 pp., 2015.

de la page 46 et de nombreuses autres. Le rédacteur en chef de cette publication prépare une série d'articles avec Fabrice Labeau sur certaines problématiques de diversité pesant sur un vaste éventail de groupes.

5 Résultats de l'élection à l'IEEE

Des résultats non officiels de l'élection de cet automne ont été diffusés le 6 octobre. Sous réserve de l'acceptation du rapport du comité des finances par le CA de l'IEEE à la fin de novembre, Jason Gu sera le président élu de l'IEEE Canada pour 2018-2019 et le directeur élu de la Région 7 de l'IEEE. Nous le félicitons et nous remercions Adam Skorek pour sa campagne; chaque candidat à une élection dans cette organisation fait une immense contribution par le simple fait de se présenter. Le président élu de l'IEEE pour 2018-2019 sera José Moura, de la Région 2 (la même restriction s'applique).

6 Merci et rappel

Enfin, je tiens à remercier tous les bénévoles canadiens pour leur effort à faire de l'IEEE une organisation plus pertinente pour le travail et les champs d'intérêt de nos membres. J'aimerais également vous lancer un défi : invitez une nouvelle personne talentueuse à devenir membre de l'IEEE Canada. Cet appel à l'action n'est pas tant un défi qu'un rappel : plusieurs d'entre nous n'ont-ils pas été inspirés à se joindre à l'IEEE par leurs conseillers ou leurs collègues? ■

Respectueusement soumis,

Witold Kinsner,
Ph.D., ing., FEIC, FEC, FCAE
Président d'IEEE Canada pour 2016-2017
Directeur de la région 7 de l'IEEE pour 2016-2017

Référence: [1] Witold Kinsner, « Expanding the body of knowledge concept for professional practitioners », actes de la 6e Conférence de l'Association canadienne de l'éducation en génie, ACEG 2015 (Hamilton, Ontario; 31 mai au 3 juin 2015), doc. 172, 12 p., 2015.

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