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Parabolic Flight Experiment

A tribute to Bob Alden

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Witold Kinsner
PhD, PEng, FEIC, FEC

2016-2017
IEEE Canada President and Region 7 Director

Warm welcome to all IEEE Canada members, volunteers, activists, both young and seasoned!

In the previous issue of the *IEEE Canadian Review* (*ICR*), I described our mission, core values, challenges, and priorities. In this Fall issue of *ICR*, I would like to address some of the challenges with a little more focus.

For the last six generations (over 130 years), IEEE and its predecessors (IRE, 1912-1962, and AIEE, 1884-1961) have been a significant professional organization, enriching our lives, careers, companies, universities and educational institutions, both at home and abroad.

IEEE members have been critical in improving not only engineering and science, but the very humanitarian fabric of the world. Recall the contributions of IEEE's past presidents, some – like Alexander Graham Bell – going back a century and a half. Consider too, the impact of some of the IEEE Nobel laureates such as Guglielmo Marconi and William Shockley. While these contributors are known to many, the tribute should go to all of you who dedicate your

IEEE PRESIDENTS INCLUDE:
- **Alexander Graham Bell** (1891-2)
- **William R. Hewlett** (1954; of Hewlett-Packard)
- **Edward Weston** (1888-9; of Westinghouse)
- **John Tasker Henderson** (1957; a radar developer at Canada's NRC)
- **Robert Tanner** (1972; Bell-Northern Research and Canadian Dept. of Communications)
- **Wallace S. Read** (1996; a president of the Canadian Electricity Association)
- **Raymond D. Findlay** (2002; distinguished researcher at McMaster University)

IEEE NOBEL LAUREATES INCLUDE:
- **Guglielmo Marconi** (1909; development of wireless communications)
- **William Shockley** (1956; inventing the point-contact transistor)
- **Jack St. Clair Kilby** (2000; inventing the integrated circuit)

(continued on page 4)

Chaleureuse bienvenue à tous les membres, bénévoles et militants d'IEEE Canada, tant jeunes qu'expérimentés!

Dans le dernier numéro de la *Revue canadienne de l'IEEE* (*RCI*), j'ai décrit notre mission fondamentale, nos valeurs, nos défis et nos priorités. Dans ce numéro d'automne de la *RCI*, j'aimerais accorder une attention plus soutenue à certains de ces défis.

Pendant les six dernières générations (soit plus de 130 ans), l'IEEE et ses prédécesseurs (l'Institute of Radio Engineers – IRE, 1912-1962, et l'American Institute of Electrical Engineers – AIEE, 1884-1961) ont été des organisations professionnelles d'importance qui ont enrichi nos vies, nos carrières, nos entreprises, nos universités et nos divers établissements d'enseignement, tant chez nous qu'ailleurs dans le monde.

Les membres de l'IEEE ont non seulement fait avancer le génie et la science, mais ils en ont également enrichi les retombées humanitaires. Rappelez-vous les contributions des anciens présidents de l'IEEE dont certains – comme Alexander Graham Bell – remontent à un siècle et

LES PRÉSIDENTS DE L'IEEE INCLUENT:
- **Alexander Graham Bell** (1891-2)
- **William R. Hewlett** (1954; de Hewlett-Packard)
- **Edward Weston** (1888-9; de Westinghouse)
- **John Tasker Henderson** (1957; développeur de radars au CNR Canada)
- **Robert Tanner** (1972; de Recherches Bell-Northern Ltée et du ministère des Communications du Canada)
- **Wallace S. Read** (1996; président de l'Association canadienne de l'électricité)
- **Raymond D. Findlay** (2002; chercheur émérite à l'Université McMaster)

LES MEMBRES DE L'IEEE LAURÉATS DU PRIX NOBEL INCLUENT:
- **Guglielmo Marconi** (1909; développement des communications sans fil)
- **William Shockley** (1956; invention du transistor)
- **Jack St. Clair Kilby** (2000; invention du circuit intégré)

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Parabolic Flight Experiment

To go to Mars, we need to understand how human performance is impacted by reduced gravity ...

(President's Message cont'd from page 3)

time to the growth of IEEE today through your innovation, invention, implementations, modelling, and mentoring of the seventh generation of potential IEEE members and leaders.

As with many other large organizations, IEEE is facing many challenges. We have evolved from a fairly homogeneous organization to very complex in terms of the diversity of our members, geographical membership redistribution, continuous development of new paradigms and technologies, and reaching the limits of older technologies.

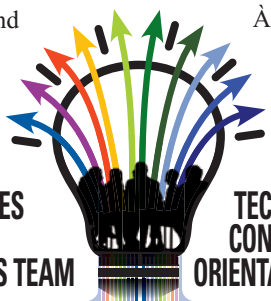
It appears that the next generation of highly-knowledgeable professionals will have to work collaboratively not only with colleagues in their disciplines, but also with colleagues in many related disciplines and the corresponding public and private stakeholders. In addition to solving current internal technical problems, they will have to anticipate related external problems such as public policies and regulatory decisions. Another factor that must be considered is the growing mobile workforce (now more than one third of the global workforce). IEEE Canada is working to prepare for this challenge.

IEEE has been working on many technical challenges related to the emerging technologies, as well as the sunsetting of some technologies and concepts (like Moore's law). The Future Directions Team of IEEE (http://www.ieee.org/about/technologies/index.html) has identified several emerging technologies, summarized to the right.

The IEEE Future Directions Team has also graduated several initiatives that had reached maturity (same URL as above), summarized on the next page.

By visiting their portals, one can follow the continuous progress of the corresponding technical communities. Many IEEE Canada members are already involved in the initiatives.

I am very excited to work with all of you in order to find good solutions to these challenges.



EMERGING TECHNOLOGIES IDENTIFIED BY IEEE FUTURE DIRECTIONS TEAM

- **Big Data** (size, processing, analytics);
- **Brain** (understanding of brain function, reverse-engineering neural circuits, interface the brain with machines);
- **Cyber Security** (cybersecurity and privacy);
- **Digital Senses** (capture, reproduce, synthesize various senses such as sight, hearing, touch, smell, taste to help humans or machines to perceive, understand, and respond to the stimuli for virtual reality, augmented reality, and human augmentation in wearables, consumer healthcare, and smart robots);
- **Green Information and Communications Technology** (energy consumption, atmospheric emissions, e-waste, life cycle management to achieve sustainability);
- **Internet of Things, IoT** (self-configuring and adaptive system to connect all "things");
- **Rebooting Computing** (rethinking the computer from ground up);
- **Smart Cities** (what is needed to prepare for urban population growth);
- **Smart Materials** (phenomenology, reliability, integration, adoption, and standards for materials such as shape memory alloys, piezoelectrics, electro/photo/thermo-chromics, self-healing polymers, magnetics, re-configurable devices/components); and
- **Software Defined Networks** (reinvent network architectures).

TECHNOLOGIES ÉMERGENTES CONSIDÉRÉES PAR LE GROUPE ORIENTATIONS FUTURES DE L'IEEE

- **Métadonnées** (taille, traitement, analyse);
- **Cerveau** (compréhension du fonctionnement du cerveau, ingénierie inverse des circuits neuronaux, interface cerveau-machine);
- **Cybersécurité** (cybersécurité et vie privée);
- **Sens numériques** (capture, reproduction, synthétisation de différents sens – vue, ouïe, toucher, odorat, goût – pour aider les humains ou les machines à percevoir et à comprendre les stimuli en réalité virtuelle, en réalité augmentée et en augmentation humaine liée aux produits portables, à la santé des consommateurs et aux robots intelligents, de même qu'à y répondre);
- **Technologies vertes de l'information et des communications** (consommation énergétique, émissions atmosphériques, déchets électroniques, durabilité par la gestion du cycle de vie);
- **Internet des objets, IdO** (auto-configuration et systèmes adaptatifs de connexion des objets);
- **Réamorçage des systèmes informatiques** (repenser l'ordinateur de façon complète);
- **Villes intelligentes** (lister et combler les besoins liés à l'accroissement de la population urbaine);
- **Matériaux intelligents** (phénoménologie, fiabilité, intégration, adoption et normes pour les matériaux à base d'alliages à mémoire de forme, les matériaux piézoélectriques, les matériaux électro/photo/thermo-chromiques, les matériaux polymères auto-réparateurs, les matériaux magnétiques, les matériaux pour les composants/instruments reconfigurables);
- **Les réseaux définis par logiciels** (réinventer l'architecture des réseaux).

(Message du Président suite de page 3)

demi. Pensez également à l'apport de certains Prix Nobel de l'IEEE tels que Guglielmo Marconi et William Shockley. Bien que ces contributions soient largement connues, nous devons louer le travail de vous tous, qui consacrez votre temps à l'épanouissement de l'IEEEgrâce à votre innovation, à votre invention, à vos améliorations, à votre inspiration et à votre mentorat auprès de la septième génération de membres et de leaders potentiels de l'IEEE.

À l'instar de nombreuses autres grandes organisations, l'IEEE doit relever de nombreux défis. Nous sommes passés en effet d'une organisation assez homogène à une autre très complexe par la diversité de ses membres, leur distribution géographique, l'arrivée continue de nouveaux paradigmes et technologies, et l'atteinte des limites des vieilles technologies.

Tout semble indiquer que la prochaine génération de professionnels très compétents devra travailler en collaboration non seulement avec les collègues de leurs disciplines, mais également avec les collègues de nombreuses disciplines connexes ainsi qu'avec les parties prenantes publiques et privées de leurs projets. En plus de résoudre les problèmes techniques internes actuels, ils devront anticiper les problèmes externes connexes de l'ordre des politiques publiques et des décisions réglementaires.

L'IEEE a travaillé à de nombreux problèmes techniques liés aux technologies émergentes, de même qu'à la temporisation de quelques technologies et concepts (telle la loi de Moore). Le groupe Orientations futures de l'IEEE (http://www.ieee.org/about/technologies/index.html) a relevé différentes technologies émergentes, résumées dans la partie de droite.

Le groupe Orientations futures de l'IEEE a préparé diverses initiatives arrivées à maturité (http://www.ieee.org/about/technologies/index.html), résumées à la page suivante.

Une visite de leurs portails permet de suivre les progrès constants réalisés par les communautés techniques correspondantes. Un grand nombre de membres d'IEEE Canada sont engagés dans ces initiatives.

C'est avec grand enthousiasme que je travaille avec vous tous à la recherche de bonnes solutions à ces problèmes.

Pour vous mettre au fait de plusieurs autres initiatives, j'ai travaillé au Groupe d'étude de l'IEEE sur le portail de données fin d'élaborer un site

To update you on several other initiatives, I have been working on the IEEE Data Portal Task Force to develop an IEEE repository of data for researchers and companies. A beta test system will be available this year.

I have also been working on the Task Force of the Engineering Institute of Canada to develop a new strategy for climate change conferences. The Committee developed a "Sustainable Development of the North" theme, and completed its deliberations with a report on June 21, 2016.

TECHNOLOGY INITIATIVES GRADUATED BY IEEE FUTURE DIRECTIONS TEAM

- **CLOUD COMPUTING** (has become a scalable service consumption and delivery platform);
- **LIFE SCIENCES** (intersection of electrical and computer engineering with life sciences);
- **SMART GRID** (increased use of communications and information technology in the generation, delivery, and consumption of electrical energy); and
- **TRANSPORTATION ELECTRIFICATION** (development and implementation of new technologies for the electrification of transportation)

INITIATIVES TECHNOLOGIQUES CERTIFIÉES PAR LE GROUPE ORIENTATIONS FUTURES DE L'IEEE

- **INFORMATIQUE EN NUAGE** (est devenue une plateforme évolutive de livraison et de consommation de services);
- **SCIENCES DE LA VIE** (intersection des sciences de la vie avec les sciences informatiques et les sciences de la vie);
- **RÉSEAUX INTELLIGENTS** (augmentation de l'utilisation des technologies de l'information et des communications dans la production, la distribution et la consommation d'énergie électrique);
- **ÉLECTRIFICATION DES TRANSPORTS** (développement et mise en application des nouvelles technologies d'électrification des transports)

Another time-consuming activity included the IEEE Canada Bylaws and Operations Manual to make them consistent and current. An Ad-Hoc Committee consisting of the IEEE Canada Group Chairs has been formed to finalize the improvements of the two documents this year.

New Web-based forms have been developed by Maike Luiken to simplify our operations like nominations for various positions.

A new video on IEEE Canada will be released this year, thanks to the effort of our Past President, Amir Aghdam.

Details on many other activities can be found in the reports from the IEEE Canada Officers, Area Chairs, Committee Group Chairs, and from the Section Chairs. Those activities are reported on our Web site, the local Sections sites, as well as in the IEEE Canada Newsletter (Editor: Lena K. Lin). Our *IEEE Canadian Review* Magazine (Editor: Bruce Van Lane) provides critical reviews of various technical developments in Canada. With the considerable effort of Shahram Yousefi, Editor in Chief, and his team, the IEEE *Canadian Journal of Electrical and Computer Engineering* has been growing as a high-quality publication.

Please consider supporting our IEEE Canadian Foundation in their effort to sponsor student activities and experiential-education infrastructure of many Student Branches in Canada. ■

IEEE Canadian Foundation donations support student participation in high-level robotics and other competitions.

Les dons de la Fondation canadienne de l'IEEE soutiennent la participation étudiante à des concours de haut niveau de robotique et autres.

University of Victoria students competing in the 2015 FIRST Tech Challenge World Championships.

Les étudiants de l'Université de Victoria s'affrontant lors du Championnat mondial FIRST Tech Challenge 2015.

The Queen's Space Engineering Team takes a break at the 2015 Mars Society University Rover Challenge.

L'équipe de technique spatiale de l'Université Queen fait une pause durant le 2015 Mars Society University Rover Challenge.

Respectfully submitted,

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

de stockage de données pour les chercheurs et les entreprises. Un système bêta sera rendu disponible cette année.

J'ai également travaillé au groupe d'étude de l'Institut canadien des ingénieurs afin d'élaborer une nouvelle stratégie concernant les conférences sur les changements climatiques. Le Comité a préparé un thème sur le développement durable du Nord et présenté ses délibérations dans un rapport le 21 juin 2016.

Une autre activité assez prenante a été la révision du manuel d'exploitation et des règlements administratifs d'IEEE Canada afin de les rendre cohérents et à jour. Un comité spécial réunissant les présidents de groupe d'IEEE Canada a été formé pour finaliser les améliorations apportées aux deux documents cette année.

Maike Luiken a cré des formulaires Web pour simplifier nos opérations telles que les mises en nomination pour différents postes.

Une nouvelle vidéo sur IEEE Canada sera lancée cette année grâce aux efforts de notre ancien président, Amir Aghdam.

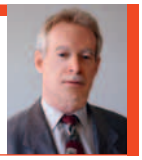
Plus de renseignements sur diverses autres activités sont fournis dans les rapports des dirigeants d'IEEE Canada, des présidents de régions, des présidents de comité de groupe et des présidents de sections. Ces activités sont diffusées sur notre site Web, sur les sites de nos sections locales de même que dans le *Bulletin d'information d'IEEE Canada* (Lena K. Lin, rédactrice en chef). Notre *Revue canadienne de l'IEEE* (Bruce Van Lane, rédacteur en chef) fournit quant à elle des recensions critiques de divers développements techniques au Canada. Enfin, grâce aux efforts considérables de Shahram Yousefi, rédacteur en chef, et de son équipe, *le Journal canadien de génie électrique et informatique* est devenu une publication de grande qualité.

Vous êtes invités à soutenir notre Fondation canadienne de l'IEEE dans son effort de parrainer les activités étudiantes et l'infrastructure d'apprentissage empirique de nombreuses branches étudiantes au Canada. ■

Votre président,

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

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



Bruce Van-Lane, P.Eng.

Espace orbital, cyberespace et espace de solution. Ce numéro explore chacun de ces territoires.

En propulsant leurs occupants en apesanteur, les vols paraboliques sont lourdement équipés pour la recherche. Même si leurs échantillons d'espace s'opposent à de longues expériences, le comportement humain est scruté par les scientifiques, qui analysent ces très courts changements de condition. Il en ira autrement pour le prochain vol sur Mars – principal moteur de tels travaux – vol qui durera des mois.

Le mot « cyberspace » ne faisait pas partie du vocabulaire du regretté Bob Alden. Dans ses écrits, notamment pour *The Institute*, Bob tenait pour acquis que son lectorat s'y connaissait en génie et pouvait comprendre la structure sous-jacente de serveurs interconnectés et de chaînes de données qui constitue « l'autoroute de l'information », un terme qu'il endossait. Sa conception de la façon dont les membres de l'IEEE pouvaient s'organiser et collaborer plus efficacement a légitimé l'emploi du mot « espace » comme métaphore d'une infinité de possibilités en communication électronique, sens que plusieurs ont donné à ce mot.

Certaines réalisations se démarquent dans leurs espaces de solution respectifs. Les grands prix d'IEEE Canada reconnaissent tant la suprématie technique que l'excellence du service. Les jeunes lecteurs gagneront à s'inspirer de la réussite de leurs collègues, tandis que ceux bien établis dans leur carrière sont invités à proposer la candidature d'un d'entre eux.

L'article « Point de vue » de l'Association canadienne de l'électricité, dans le numéro précédent, a inspiré une proposition du Consortium photonique de l'industrie canadienne. L'appel à l'action lancé par ce dernier interpellera des membres actifs dans un large éventail de secteurs d'activité. La proposition du Consortium faisait appel à Dialogues pour un Canada vert, dont le soutien à l'édification d'un réseau est-ouest de distribution électrique est d'actualité.

Je remercie l'équipe dévouée de collaborateurs à la rédaction et de corédacteurs de la *Revue canadienne de l'IEEE*, tout particulièrement Terrance Malkinson, Alexandre Abecassis et Jon Rokne

Je pourrais en dire davantage, mais je crains de manquer d'espace! ■

Outer space, cyber space and solution spaces. In this issue we bring you some of each variety.

While making light of their passengers, parabolic flights carry aboard some very serious science, make no mistake. True, their 30-second space bites prohibit long-duration experiments. But human behaviour lends itself to being studied in such short increments. Even though a flight to Mars – now the driver for much of this research — will be measured in months.

Cyberspace wasn't a term used by the late Bob Alden. Rather, in his writing for *The Institute* and elsewhere, Bob assumed his audience had an engineer's understanding of the underlying structure of interconnected servers and data lines that make up the "Information Highway" – a phrase he clearly accepted. But his imaginings of how members of IEEE could more effectively collaborate and organize themselves certainly gave legitimacy for space as a metaphor for the burgeoning set of new possibilities in electronic communication, which was the sense in which some used the term.

Some achievements shine more brightly in their respective solutions spaces. The IEEE Canada major awards recognize both technical preeminence and service excellence. For younger readers, there is insight to be gained from others' paths to success. For those more established in their careers, consider nominating a colleague.

Last issue's "Viewpoint" from the Canadian Electricity Association inspired a submission from the Canadian Photonics Industry Consortium. The latter's call to action will resonate with members across a wide variety of industries. The former's submission prompted a response from Sustainable Canada Dialogue, whose support for a robust east-west electrical grid is very topical.

I thank the *IEEE Canadian Review*'s committed team of Contributing and Associate Editors, with special gratitude to Terrance Malkinson, Alexandre Abecassis and Jon Rokne.

There is more I could say, but I'm afraid I've run out of space! ■

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Biz-tech Report

by Terrance Malkinson

"Canada's Most Innovative Companies" is the topic of a special report in *Canadian Business* [89(3):33-46 March, 2016. www.canadianbusiness.com]. The report begins with the question "What Does It Mean to be Innovative?" The authors suggest, "Sometimes it is an earth-shaking breakthrough. But mostly it's a constant quest to improve one iteration at a time." Thirteen Canadian leaders in innovative thinking from a variety of industry sectors are profiled.

John Lorinc and Mark Brown provide their perspectives on where the growth is happening in the Canadian employment market in their article "Canada's Top 25 Jobs" [*Canadian Business* 89(5):20-24. May, 2016]. Importantly, the report focuses on jobs that are predicted to craft a career with long-term potential, solid wages, and robust earnings growth, based upon the latest data from Statistics Canada and Employment and Social Development Canada. Interesting insets by Rosemary Counter provide strategies on how to get hired and opportunities associated with relocating yourself. Another inset by Alexandra Bosana provides suggestions on how to get more creative about building your professional online profile.

In a special report in *Canadian Business* [89(6):20-34 June,2016] Mai Nguyen profiles "100 of Canada's Top Female Entrepreneurs." Leading the ranking as Canada's Top Female Entrepreneur is Tonia Jahshan of Steeped Tea. A related feature "Launch, Learn, Repeat" [pp. 37-40] by Joanna Pachner in the same issue of *Canadian Business* profiles Michelle Romanow who has started a wide-range of businesses and is also Canada's youngest Dragon on Dragons' Den.

The summer 2016 issue of *Canadian Business*[89:7/8:25-72] provides the magazine's annual guide to the Canadian stock market. Much more than just a ranking; the report also provides a plethora of important information on risks and opportunities over the next year.

Two Twin Otter planes from Calgary-based Kenn Borek Air [www.borekair.com] recently returned from an emergency medical evacuation at the South Pole. Leaving on June 14 following an "extensive risk analysis" to determine the feasibility of the mission, pilot Wally Dobchuk, with co-pilot Sebastien Trudel and aircraft maintenance engineer Mike McCrae, flew into the South Pole to retrieve two patients. The Calgary-based company, which has travelled from the North Pole to the South Pole and everywhere in between has operated aircraft in Antarctica for more than 30 years. They do not normally schedule flights for this time of year because of darkness and the extreme cold, which hovers at around -60° C.

Artificial intelligence (AI) is fueling the efforts of two Vancouver-based entrepreneurs to give industrial drones the ability to explore distant mining sites, search for missing people in remote locations and even deliver pizza." We are building collision avoidance for industrial drones" said Alexander Harmsen, CEO and co-founder of Iris Automation [www.irisautomation.ca]. Harmsen graduated from UBC last spring, and after a brief stint with NASA's Jet Propulsion Laboratory, he started Iris Automation with fellow graduate James Howard.

An article posted by Stefan Labbé on CBC News July 9, 2016 ["Vancouver entrepreneurs deploy artificial intelligence to help drones avoid mid-air collisions"] describes this race to find the 'holy grail' of drone technology. Once a drone goes beyond line of sight there is no pilot to look out the window and see what's coming. Currently, Transport Canada only allows drone flights within line of sight. "We see this huge need for industrial drones for mining exploration, pipeline inspection, agricultural surveying, forestry, or even package delivery." Iris Automation's solution is an AI computer that blends real-time images and 3D maps to track incoming objects." That's when it hijacks the auto pilot on board and moves the drone out of the way" said Harmsen. Analysts predict the drone market to soar to well over $127 billion as unmanned aerial vehicle technology quickly develops into a "game changer." Harmsen thinks his technology has an advantage." We're making it very affordable, very lightweight, very energy efficient, so that really any of these industrial drones can have these modules on board.

The summer, 2016 issue of *Money Sense*: Canadas Personal Finance Magazine [18(5)] focuses on retirement. Articles include "Do You Know How to Retire?" "5 Steps to the Plan that will be Right for You," "Why You'll Love Working in Retirement," Smarter Ways to Tap OAS and CPP Benefits," and "Canada's Best Places to Live." These articles all include information not just for those near retirement but importantly for those early in their career. The benefits of compounding return-on-investment for those who start early are enormous and are well worth the minor sacrifice necessary early in your career.

The Tsuut'ina First Nation has announced plans for a large commercial development along a 10 km stretch of Calgary's future southwest ring road. [Robson Fletcher CBC News. Posted: Jul 11, 2016. www.cbc.ca]. "Tsuut'ina will be home to one of the largest, if not the largest, First Nations development partnerships in Canada," Chief Roy Whitney said. The project will be privately financed with the initial investments alone totaling hundreds of millions of dollars. Construction will begin within two to three years.

Working with Canderel, a Montreal-based development firm, the First Nation on Calgary's southwest city-limit plans to include: an entertainment, hospitality and retail development, a major innovation and research campus, an integrated health and wellness area, a regional retail and commercial center, "integrated with the administrative and community services of the Tsuut'ina Nation." The Chief said the development is part of a long-term vision to create educational and employment opportunities on the First Nation and will allow generations of Tsuut'ina people to work and flourish, right here at home. ■

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 540 earned publications, and an accomplished triathlete. **malkinst@telus.net**

Canadian Newslog

By **Alexandre Abecassis**

MONTREAL, QC. Aug. 3, 2016. McGill University researchers have developed and launched a new application that will help Canadians living with vision loss to better navigate the world around them. The application was successfully tested in Montréal and benefited from the funding of the Canadian Internet Registration Authority's Community Investment Program. The McGill team has launched an expanded version of the app to include cities across Canada. This application overlays GPS, Google Maps, public transit and other data to provide audible instructions and descriptions to help guide users' movements. The expanded and improved « Autour » app is available to iPhone users now via the Apple Store.

TORONTO, ON. Jul. 27, 2016. Blackhawk Network, a leading prepaid and payments network, announced the launch of its first website for purchasing egifts in Canada. This website will provide shoppers with an online store to purchase a variety of branded egifts, including those in the retail, dining and gaming industries. The egifts can be delivered to recipients by email. The website address is www.GiftCardStore.ca.

VANCOUVER, BC. Jul. 18, 2016. A new personal health record system was launched by the Cowichan Tribes First Nation. The objective of the new system is to increase access to primary care for 400 Cowichan Tribe members. It will allow patients to, *inter alia*, view their health record 24/7 online, receive lab reports, check vital signs, and directly communicate with their care providers through a direct messaging system.

WATERLOO, ON. Jul. 14, 2016. P&P Optica announced that one of its spectrometers will be onboard SpaceX-9 spacecraft when it will leaves Cape Canaveral on July 18th en route to the International Space Station (ISS). The spectrometer is only about 0.3 metres long, has an electronic camera attached, and will be used by scientists aboard the International Space Station.

CALGARY, AB. Jun. 28. Siemens Canada announced that it, along with three charities, will help new residents of Calgary with a donation of more than 200 computers. The computers will be provided to Syrian refugees. Siemens has over 4800 employees in Canada. Three hundred employees have volunteered in the workshops for preparing the computers. The computers will be used to help the refugees keeping in touch with their families and also help them with job searches.

MARKHAM, ON. Jun. 28, 2016. VentureLAB, a not-for-profit Regional Innovation Centre, and Saint Elizabeth, a national health care provider and not-for-profit charitable organization, announced a new partnership with the goal of developing a vibrant health innovation cluster in York Region. The partnership will allow both organizations to expand programs, leveraging transformative solutions to deliver quality healthcare and drive better patient outcomes. Saint Elizabeth, Canada's largest social enterprise, is responsible for many advances in Canadian health care, investing $4 million over two years to achieve these goals; their use of SoapBox, a cloud-based platform that connects leaders with the best ideas from frontline workers; and collaboration with Canadian and international organizations focused on people-powered health innovation.

MARKHAM, ON. Jun. 20, 2016. Katla Labs announced today the release of the application Sidekick. This application is a sensor-based mobile app that auto-launches when the user drives. It is designed to keep drivers safe, informed, and empowered with a rich portfolio of built-in features. For instance, the application alerts the driver in real time if he/she is driving towards an incident. It detects a distress situation and calls an emergency contact, hands-free. The application also communicates with other drivers nearby. It also enables the recording of dashcam videos and helps tracking many elements such as historical commute times, trip mileage, etc.

MONTRÉAL, QC. Jun. 20, 2016. The Centre de technologies avancées BRP – Université de Sherbrooke (CTA) announced that it will present its Can-Am Spyder electric concept vehicle during the Electric Vehicle Symposium and Exposition taking place at the Palais des congrès de Montréal from June 19 to 22, 2016. The vehicle is 100% electric and can achieve a range of 170 km

VANCOUVER, BC. Jun. 17, 2016 Microsoft announced that it has opened the doors of the Microsoft Canada Excellence Centre in Vancouver. This centre is a development facility that will create innovative products for the global market and develop technology talent in BC. This center will allow Microsoft to grow to more than 750 positions and will inject almost $100 million in direct investment in the city annually. Across the province, it will have an estimated economic impact of $180 million each year.

MONTRÉAL, QC. May 25, 2016. Ecole Polytechnique Montréal and Deloitte announced that they are joining forces to revamp Polytechnique's training program in the field of cybersecurity. The course content of the three certificate programs in Cyber Investigation, Online Fraud and IT Network Computer Security has been upgraded to account for current market needs and the changing nature of cybercrimes. The newly updated programs will be offered at the beginning of the Fall 2016 semester.

TORONTO, ON. May 25, 2016. According to the new Global Software Survey from BSA The Software Alliance, computer users in Canada are using unlicensed software at an alarming rate, despite the link between unlicensed software and cyberattacks. The survey found that in Canada the percentage of software installed on computers that was not properly licensed was 24 percent.

TORONTO, ON. May 25, 2016. Redknee Solutions announced the signing of a new multi-year services agreement with lifecell, one of the largest mobile communications operators in Ukraine and part of the Turkcell Group. The contract allows the operator to leverage Redknee's monetization and subscriber management platform to quickly launch new products and services while improving and standardizing service levels across multiple geographic locations. Redknee Solutions provides monetization and subscriber management solutions and services that allow communications service providers, utility companies, auto makers and enterprise businesses of all types to charge for things in new and innovative ways. The solution is available on premise, cloud-based, or as a Software-as-a-Service.

TORONTO, ON. May 18, 2016. Akira announced the launch of a mobile platform that connects patients to family doctors on demand from their smartphone. The app enables patients in Ontario to consult with board-certified physicians by secure mobile text or video, and provides users mobile access to personal health records including clinical notes, prescriptions and test results. The app enables the user to speak with an Ontario-based doctor immediately. Once logged in, the user can begin a text conversation with the doctor, and based on the patient's situation, the doctor can immediately launch a video chat if necessary. The user can start a chat with a doctor. The app can be used « to diagnose and treat many common health problems such as anxiety or depression, urinary tract infections (UTIs), rashes, and the flu ». The app is available through a monthly subscription service which provides unlimited access to the platform's team of doctors and nurse practitioners.

About the Author

Alexandre Abecassis is a patent agent and Partner at Fasken Martineau DuMoulin LLP, Lawyers and Patent and Trademark Agents. Send via e-mail any news clippings you would like to contribute to alexandre.abecassis@ieee.org

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CCECE 2017

The 30th Annual
Canadian Conference on Electrical and Computer Engineering

April 30 to May 3, 2017, Windsor, Canada

https://ccece2017.ieee.ca

"Two Great Nations Innovate the Technology"

Call for Papers and Proposals

The 30th annual IEEE Canadian Conference on Electrical and Computer Engineering (CCECE 2017) will be held in Windsor, Canada from April 30 to May 3, 2017. CCECE 2017 provides a forum to disseminate research advancements and discoveries, network and exchange ideas, strengthen existing partnerships, and foster new collaborations. Its theme "Two Great Nations Innovate the Technology" reflects the close direct impact of ECE research on industrialization and the position of Windsor as a border city to USA. The venue is Caesars Windsor. Papers are invited in the following Tracks:

BIOENGINEERING	Chairs: M. Avanaki (WSU, USA), H. Dajani (U. of Ottawa), A.L. Trejos (Western U.)
COMMUNICATIONS AND NETWORKS	Chairs: A. Anpalagan (Ryerson U.), W. Hamouda (Concordia U.)
COMPUTER AND SOFTWARE TECHNIQUES	Chairs: H. Wu (U. of Windsor), A. Youssef (Concordia U.)
CONTROL AND ROBOTICS	Chairs: X. Chen (U. of Windsor), H. Li (U. of New Brunswick)
DEVICES, CIRCUITS, AND SYSTEMS	Chairs: S. Ardalan (SJSU, USA), S. Chowdhury (U. of Windsor), S. Mirabbasi (UBC)
POWER & ENERGY CIRCUITS AND SYSTEMS	Chairs: N. Kar (U. of Windsor), M. Abdelkhalek, (U. of Windsor)
SIGNAL THEORY AND SIGNAL PROCESSING	Chairs: P. Agathoklis (U. of Victoria), A. Ahmadi (U. of Windsor), S.L. Netto (Fed. U of Rio de Janeiro, Brazil)

Paper submission guidelines

Submitted papers must be unpublished and should not be submitted elsewhere at the same time. Accepted papers should not exceed 6 pages in two-column IEEE Transactions style. Accepted papers longer than 4 pages will be charged $100 for each extra page. Papers should be submitted as PDF files through the paper submission system *(https://edas.info/uploadConferencefile.php?c=22989)*. All submitted papers will be peer reviewed by at least three independent reviewers. Please see the website for further registration details.

Accepted papers will be published in the CCECE 2017 Conference Proceedings and will be eligible for publication in IEEE *Xplore*®, conditional upon meeting additional requirements as detailed on the conference web site. Conference content will also be submitted for inclusion into other Abstracting and Indexing (A&I) databases.

In addition, authors are invited to submit extended versions of their presented conference papers for consideration in the CCECE 2017 Special Issue of the *IEEE Canadian Journal of Electrical and Computer Engineering* (*CJECE*) within four weeks of the conference final day. *CJECE* is indexed on IEEE *Xplore* and accepts submissions via the ScholarOne Manuscript portal. Please see http://journal.ieee.ca/ for more information.

Important Dates

Proposals for Tutorials and Special Sessions:	December 2, 2016
Full paper submission:	January 13, 2017
Acceptance notifications:	February 17, 2017
Final version paper with registration:	March 3, 2017

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Towards a Canadian Photonics Strategy

By
Robert Corriveau
President & Executive Director
Canadian Photonic Industry Consortium

The photonics sector pervades all aspects of our society. Canada can, and should play an important role in global Photonics development and manufacture. It cannot do so, without taking a more strategic view of this domain.

The Federal and Provincial Governments invest approximately $150 million annually on optics, photonics and lasers-related research in universities, government laboratories and other R&D centres while the US Government invests more than US$1.1 billion in photonics each year.

In Europe, the European Commission reserves, within its Horizon 2020 program, 100 million EUROs each year to photonics as a key enabling technology. In addition, each European Country invests in photonic research. As examples, the French laboratories such as CNRS, CEA LETI, ONERA and CNES have research activities in photonics while the Fraunhofer and Max-Plank Institutes are also very active in Germany.

Fully Utilize Government Support

In Canada, the Photonic Industry has access to a small number of Government programs to support their research and commercialization. The Scientific Research and Experimental Development (SR&ED) supports industry R&D. It complements the NRC-Industry Research Assistance Program (IRAP) which provides consulting and research funds.

Canada still needs to develop its own photonics strategy to identify sectors that are critical to the growth of the Canadian economy

The Federal Government has recently created the Build in Canada Innovation Program (BCIP) to help companies bridging the pre-commercialization gap by procuring and testing late stage innovative goods and services within the federal government before taking them to market. It would be important to extend this program to include early development phases to better compare with the US Small Business Innovation Research program.

User Engagement is Critical

Photonic companies need to be more engaged with the user community to develop solutions that provide leadership to key Canadian industries and to provide new export opportunities. With the participation of industrial partners in the technology transfer process, technology flow and transfer between the academic and industrial sectors will increase.

As photonic industries grow in many regions, we need to create regional photonic clusters organizing local activities and networking opportunities and a national cluster to develop collaboration and partnership between the clusters and to organize national and international activities.

Canada still needs to develop its own photonics strategy to identify sectors that are critical to the growth of the Canadian economy and the involvement of industry, academics and R&D centres would be mandatory for such an endeavour. The Canadian Photonic Industry Consortium is uniquely positioned, both in expertise, and impartiality to assist in this mission. ■

About the CPIC

The Canadian Photonic Industry Consortium assists Canadian companies to optimize operations and to improve profits by facilitating and accelerating the application of photonic technologies that improve quality, productivity and profitability. ***http://www.photonscanada.ca/***

Photonics in Canada

Photonics enables us to generate, transmit, measure and use light in a myriad of applications that have already enhanced our daily lives. While the late 20th century was the age of electronics, the early 21st century will belong to photonics.

Canada has always played a major role in the world-wide photonics community. We've invested strongly in photonics research, have made a number of important contributions to photonics technology and are now home to several clusters of photonics companies and research institutions distributed across the country. The Canadian photonics companies are involved in most if not all the application domains.

A ubiquitous technology

The photonics revolution is virtually invisible to the very consumers who have embraced its rapid assimilation into their daily lives. Compact flat-screen, liquid-crystal, LED computers and tablets are now a commodity. CDs, DVDs and now flash memories are the norm for flexible, permanent and temporary storage of data, music and video. Photonics also contributed to the reduction of microelectronic components which increased significantly the capabilities of computers and hardware memory components. Meanwhile, low-cost light-emitting diodes and liquid crystal displays are revolutionizing portable devices such as cell phones and PDAs, enabling incorporation of cameras and full-colour displays suitable for high definition video. Internet and wireless mobility brings us virtually free access to instant information and entertainment through the global fibre optic backbone that connects most cities and towns in the developed world.

Light is an efficient and non-invasive tool for medical diagnosis and treatment and laser-based systems are commonly used for both internal and external surgery. Laser treatments are also increasingly in demand for procedures such as

sight correction, removal of skin and pigment irregularities, and hair removal. Photodynamic therapy, the use of light-activated drugs that are selectively absorbed by malignant cells is faster, more precise and less traumatic than conventional treatments for many cancers. Dentists are replacing conventional high-speed drills with laser-based devices, and are using 3D imagers to produce high precision implants.

High-brightness light-emitting diodes (LEDs) are now the preferred source of all lighting. Solid-state lighting is extensively used for signage, architectural and security applications. LEDs already used extensively in North America's traffic signals also glow from the dashboards and tail lights and head lamps of vehicles, and have become common in the cabins of most trains and planes.

Photonics-based advances that make solar cells more efficient are contributing to the move from fossil fuels to renewable energy sources. Vehicles have now incorporated laser-based devices such as lidars and imagers into their collision-avoidance and rear-view systems. And, for both terrestrial and avionic entertainment and monitoring systems, plastic optical fibres are increasingly displacing traditional copper wiring looms resulting in significant savings in both space and weight.

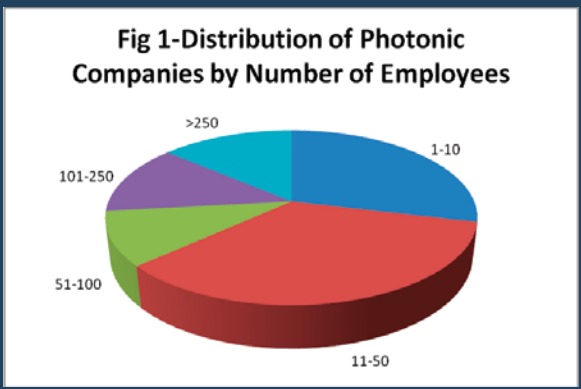
Photonic sensors offer important safety applications too. Embedded in structures such as bridges, they can give early warnings of potential failures. Accurate security systems such as a single optical fibre laid around the multi-kilometre perimeter of a sensitive site can pinpoint intrusion to within a few metres.

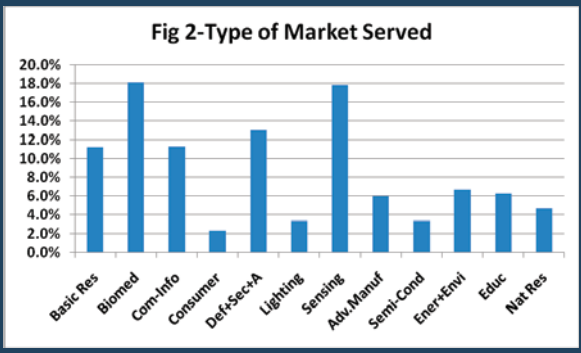
The defence sector invests heavily in photonics-enabled equipment, from advanced sensing technologies such as infrared night vision systems to laser guidance and weaponry. Leading-edge military aircraft and weapons are equipped with compact and accurate fibre optic gyroscopes. The "fly-by-light" concept is becoming a reality.

One major development in advanced manufacturing has been the use of lasers for cutting precision shapes in materials as diverse as metals and clothing fabrics. Laser-positioning and welding have become standard on many modern automobile-production lines. Additive laser manufacturing and 3D-printing are new technologies for weight reduction, tailored and corrosion resistant materials which enable the faster production while reducing the amount of material required. Sophisticated laser-vision systems are rapidly becoming the norm to monitor online production processes and quality control. And as we all know, most of the goods we buy are identified and tracked by laser marking and bar-code scanning.

The Canadian Photonics Industry

As for many countries, Canada's photonics industry is dominated by small companies (Figure 1) and it is interesting to note that 86% of the Canadian photonic sales are done by 20% of the companies. Nearly three quarters of the 400 companies have less than 100 employees while 30% have fewer than 10 employees. These companies employ 25,000 people and are mainly located in Quebec and Ontario for 77%, British Columbia follows with 13%, while 7% are in the Prairies and 3% in the Atlantic region.





Photonics companies' revenues was about $4.6 billion in 2014 and the companies expected an annual growth of 10% in the coming years. About 65% of the revenues accrue from exports, with the United States being the dominant market, accounting for 34% of sales. Europe accounts for 17% of the sales and Asia for 12%.

In the last 5 years, Canadian photonics companies have moved up the "value-chain". These companies range from developers and components manufacturers (e.g., of lasers, fibre optics) to complete photonics-based instruments (fibre lasers, sensors, cameras, projectors, scanning microscopes, etc). Only 24% of these companies develop and sell components: those that do, typically have niche positions in specialty devices such as fibres and filters. The majority of the country's photonics companies (63%) provide subsystems or systems and instruments as their end product.

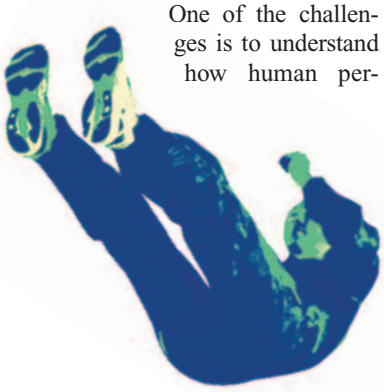
Since the telecom downturn, the Canadian photonics industry has clearly diversified. The biomedical sector and sensing are now the two main drivers of photonic sales as shown in Figure 2. Fewer than 11% of sales are now claimed to address the communications sector, and 13% addresses the defence and security sectors, historically the two main pillars of Canada's photonics community.

It is expected that sales in energy and environment will significantly increase with the trend toward green energy which represents an opportunity for Canada's photonics companies to build global leadership in an area which is core to Canada's economy. Consumer, lighting and semi-conductors which are predominantly high volume, cost-sensitive markets are dominated by Asia. Canadian photonics companies address most end-markets and many of them address several ones: for example, companies that were founded to make devices for telecom now address the life sciences or industrial markets with the same technologies. ■

By **Dario Schor (IEEE Member), Alix Dudley, Trisha Randazzo, Kathleen Samoil, Joshua Nelson, Dr. Angie Bukley, and Dr. Gilles Clement**

Parabolic Flight Experiment

Space agencies across the world are preparing for a return manned mission to Mars in the next 20 years. Such a mission would require at least six months to reach the surface, then provide astronauts some time to perform experiments on Mars, and finally embarking on the long return journey to Earth. This ambitious goal poses many technological, biological, and psychological challenges for all stakeholders. One of the challenges is to understand how human performance is impacted by reduced gravity conditions where the signals from the central nervous system are in conflict with the surrounding visual cues. In order to train future astronauts and develop counter-measures to help them during these long duration missions, a team of students from the International Space University (ISU) devised some experiments to characterize the adaptation process and provide insight into the problem. The experiment was accepted for two parabolic flight campaigns from ESA and CNES in 2014 from Bordeaux, France. The results from these experiments are being reviewed for publications. This article describes the experience and lessons learned from the design of the software components for the flights.



Motivation

Terrestrial gravity shapes the signals used by our central nervous system for orientation and to perform tasks requiring hand-eye coordination. Signals originating from our inner ear give us a sense of balance and orientation – our vestibular sense. We gauge movements and position with what are called proprioceptive feedback. Combining visual cues with these signals allows us to perform sensorimotor tasks like pointing and grasping objects.

In microgravity, the perceived signals are different due to the change in gravitational reference, thus visual cues can become a dominant system for determining spatial orientation. Although other parts of the body are affected, the sensorimotor tasks are still relatively easy in microgravity conditions.

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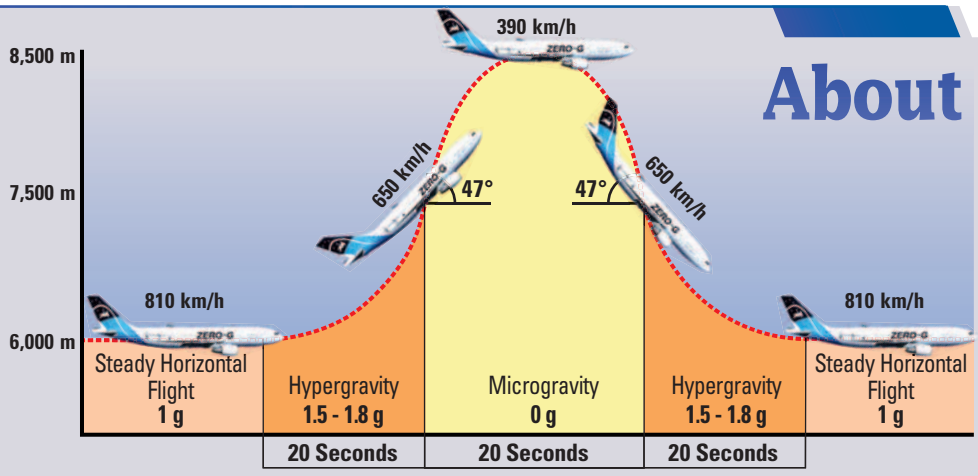


Figure 1: Parabolic Flight

About Parabolic Flights

A parabolic flight is an airplane flight that utilizes specially configured airplanes to execute a maneuver called a parabola that provides 18-22 seconds of microgravity (0 G). In order to get to that state, the aircraft climbs at a steep 47 degree angle with respect to the horizon while experiencing increased gravity forces (1.8 G), then reduces its speed to complete the weightless phase at the apex of the parabola, and finally speeds

Personal Experience During the Flight

By **Dario Schor**

I acted as an operator on the first parabolic flight of the September 2014 campaign and I was both excited and nervous beforehand. I followed all the dietary recommendations and limited my breakfast in case I got sick. Before the first parabola, I tightened straps over my feet to avoid flying out of control while trying to run the experiment.

When the "30 seconds for the first parabola" was heard on the intercom, I braced for the transition from 1 G to 1.8 G. We could see that almost everyone else was lying down on the floor, as we stood for our experiment. Then, there was a sudden transition and everything felt heavier. I stood very still and did not move my head as recommended in the training. I felt a little lightheaded, but nothing out of the ordinary.

The transition from 1.8 G to 0 G was very sudden and felt like someone magically removed the floor from underneath your feet. Everyone on the flight started acting like a child as they floated next to their experiments. Looking around, you could see people posing for pictures or leaving things to float in front of them. Even with the straps, it felt very loose and simple arm movements were not a struggle. Partway through the parabola, one of the test subjects reported the screen went black, so we immediately started addressing the problem. It turned out he was wearing inversion goggles and accidentally hit the power button on the monitor.

The transition back to 1.6 G and then 1 G was less exciting. The key was to always aim our feet toward the ground to avoid falling onto the experiment directly behind us. We annotated the anomaly and prepared for the next parabola.

After a few parabolas, the experiment was running smoothly, I felt more comfortable, and I began loosening the straps on my feet so that I could float while operating the experiment. On a couple of instances I purposely let a pen or my camera float in front of me for a short time during the experiment and then grabbed them before starting the descent. After all the readings about human performance in space, I felt compelled to try moving in different ways during the 0 G and 1.8 G phases to see how my body reacted. The worst experience was tilting my head up and down during the 1.8 G phase, but never to the point where I felt sick.

We spent the last two parabolas in the fun zone at the back of the aircraft. During the first one, I let loose, flipped upside down, and had to get one of the aircraft crew members help me flip back before the end of the 0 G phase. On the second parabola, I held onto a strap and floated while watching Prof. Clement turn and float upside down while wearing inversion goggles. At the end, I felt very tired and thirsty. It is not obvious during the flight, but your body does a lot of work during the hypergravity phases and while it adjusts after each transition.

Overall, a fantastic experience. This was the best 2.5 hour roller coaster in the world. ■

Credit: ESA/Anneke Le'Floch

To go to Mars, we need to understand how human performance is impacted by reduced gravity ...

up in a steep descent to (1.6 G) to complete one parabola. The whole process takes roughly 1 minute as shown in Fig 1. The microgravity phase can achieve a low gravity in the order of 10^{-2} g.

These types of flights are primarily used for research purposes, preparation for long-duration missions, and astronaut training. The main benefits of parabolic flight campaigns are that they can be scheduled with short lead times and provide researchers the capability of interacting with their experiment during and in between flights. In recent years, parabolic flights have also been used in other industries like the film *Apollo 13* and can even be booked by private citizens to experience microgravity.

The European Space Agency executes 31 parabolas per flight. The first parabola, #0, is the test parabola, then the aircraft executes sets of 5 consecutive parabolas with 5-8 minute breaks in between sets. In total, one experiences over 10 minutes of microgravity, which is roughly equivalent to riding the Disney Tower of Terror 250 times. Each research campaign consists of three flights on consecutive days, thus totaling 93 parabolas to obtain more than 30 minutes of microgravity.

The Novespace Airbus A300 aircraft was the third A300 produced, and thus still has a number of additional sensors linked to a control panel inside the aircraft for real-time telemetry. Airbus often sends representatives to sit on the aircraft and collect data during these flights as it provides valuable information about the performance over time - especially when performing atypical

(continued on Page 14)

Parabolic Flight Experiment

The purpose of this study is to evaluate what happens when visual cues are altered under different gravity conditions. The hypothesis is that when introducing altered visual cues, the difficulty for sensorimotor tasks will increase with increased gravity levels. The results of this research help in our

Under normal gravity levels (1 G), it can take a person more than 7-8 days to get used to the inversion goggles.

maneuvers for these experiments. In addition, this aircraft does not have restrooms or the traditional food and beverage service. The washroom stalls are available, but passengers must use special receptacles. Finally, it is worth noting that there are no windows in the laboratory portion of the aircraft to prevent changes in lighting in the cabin or passengers getting sick as a result of noticing the angle at which the aircraft is climbing. The windows located by the seats at the front of the airplane are all shut off with Velcro strips so that they do not move too much during the parabolas.

Many experiments are designed to run for fewer than the maximum number of parabolas. This gives teams flexibility if a problem is encountered that requires some time to be reset or fixed in flight and also allows first-time flyers to relax and enjoy the experience. During this time, it is not recommended to do pirouettes anywhere as one could bump into other passengers or experiments in progress. For this, the Airbus aircraft has a dedicated "fun-zone" area where up to three passengers at a time can go and let loose. In our experiment, we accounted for two such parabolas.

Company/Agency	Aircraft
Canadian Space Agency (CSA) / National Research Council (NRC)	1. Falcon 20
National Aeronautics and Space Administration (NASA)	1. C-131 Samaritan 2. KC-135A 3. KC-135B 4. McDonnell Douglas C-9B 5. Skytrain II
European Space Agency (ESA) / Centre National d'Études Spatiales (CNES)	1. Caravelle 2. Airbus A300 3. Airbus A310
Ecuadorian Civilian Space Agency / Ecuadorian Air Force	1. T-39 Sabreliner
Russia	1. Ilyushin Il-76
Zero Gravity Corporation (ZERO-G)	1. Boeing 727-200
Integrated Spaceflight Services / Swiss Space Systems	1. Airbus A340
Japan Space Exploration Agency (JAXA) / Diamond Air Service	1. Mitsubishi MU-300 2. Glufstream-II

Table 1: Aircraft used for Parabolic Flight Laboratories.

understanding of (i) the roles and weights associated with these three sources of signals, (ii) enable us to characterize the adaptation process, and ultimately (iii) apply this for astronaut training and countermeasures for future long duration missions.

Experiment Overview

The proposed experiment consists of two different tasks to be performed on a parabolic flight to obtain the different gravity levels. The visual cues are altered by using a pair of inversion goggles that use prisms to flip the image upside-down. Under normal gravity levels (1 G), it can take a person over 7-8 days to get used to the inversion goggles, thus getting subjects with little to no experience with them can help understand the initial adaptation phase. Since the inversion goggles restrict the peripheral vision, a pair of osculating goggles was designed to mimic the restricted field of view without inverting the image, thus forcing test subjects to move their head in similar ways for both inverted and non-inverted tests.

The two tasks to be performed in flight are pointing and grasping. The pointing task measures the reaction time, action time, and accuracy with which a test subject can identify and click on a target presented in a touchscreen monitor. The grasping task utilizes a toy shape sorter and interactions through a touchscreen monitor to measure the reaction and action times. Both experiments are designed to be executed by a test subject while an operator monitors the progress.

Microgravity Laboratories

There are four major types of laboratories for microgravity experiments: (i) drop towers, (ii) parabolic flights, (iii) sounding rockets, and (iv) the space station. Drop towers date back to the 1700s (then known as shot towers) and offer a cost effective means of experiencing free-fall for 4-5 seconds of microgravity. These towers are ideal for short duration, small automated experiments, but cannot accommodate human performance experiments. Parabolic flights were proposed in the 1950s and have been in use for medical research and astronaut training since the NASA Mercury program. Sounding rockets also follow a parabolic trajectory with a much higher altitude, thus providing longer exposures of roughly 15 minutes of microgravity, but are only suitable for automated physical sciences experiments. This technology has also been around since the 1950s with Canada playing a major role through its Black Brant program that first launched out of Churchill, Manitoba in 1959. Finally, the International Space Station (and its various predecessors) is a venue for long exposure experiments. This is the most expensive microgravity platform that requires specialized equipment and training.

Experimental Setup

The setup, shown in Fig. 2, consists of a row of three airplane seats where the two test subjects sit on the window and aisle seats such that they can move freely without bumping into their neighbour. In front of the seats, there is a custom aluminium structure connected to the rails holding the seats in place.

The operators for the experiment stand behind the structure facing the test subject. The structure holds a 22-inch ViewSonic TD2220 touchscreen monitor in front of each subject and a laptop for operators to control the experiment. The monitor provides a 5 ms response time that meets the requirements based on the expected response time of subjects during the experiment.

In addition, a 3-axis accelerometer was attached to the structure to log data for post analysis and a power bar with breaker protection was installed to connect to the aircraft power supply.

Figure 2: Experimental Setup on the flight

Credit: ESA/Anneke Le'Floch

A Dell Latitude E5410 running Windows 7 is used to control the experiment while the touchscreen acts as a second monitor for the test subject. The custom software is written in C++ using Microsoft Visual Studio implementing the MFC libraries for the graphical user interface. The commercially available drivers from ViewSonic were used to interface with the touchscreen as a single touch input.

Figure 3: The interface screen

The software interface consists of a main window each for operators and subjects. See Figure 3 above for the operator interface.

The subject screen is displayed in the touch screen monitor in fullscreen mode and consists of an experiment panel and a right navigation panel with two buttons; see Figures 4 and 5.

Before each parabola, the experiment panel displays instructions and serves as the main area for

Pointing experiment

In the pointing experiment, a target is displayed at a random location in the screen. The user must then use their index finger to point to the target. In order to obtain metrics to evaluate the performance, a home button is used in between trials to reset the timers. Once the user presses the target, the home button switches colors and text throughout the trial to indicate the state of the trial and expected user response. This is repeated as many times as possible from 30 seconds before the first parabola in 1 G, through the various phases of the parabola, until returning to 1 G again.

The sequence for one trial is shown in Fig. 4. The user begins by pressing and holding the home button labeled "READY". Once pressed, there is a 0.5 second delay, followed by a 0.5 second period where the shape is displayed on the screen, and finally another 0.5 second delay before the next user interaction. The delays surrounding the appearance and disappearance of the target are used to (i) pace the users through the trials, and (ii) force the user to remember the perceived location instead of using the target as visual feedback to compensate for their movements and attempt a higher accuracy. After the shape disappears, the home button switches to "GO" and the timer for the reaction time starts ticking until the user releases the home button. A new timer is started to measure the time from the release until the perceived location of the target is hit or the user aborts the test. The accuracy is measured as the Euclidean distance between the center of the target location and the position where the user touched the screen. The raw

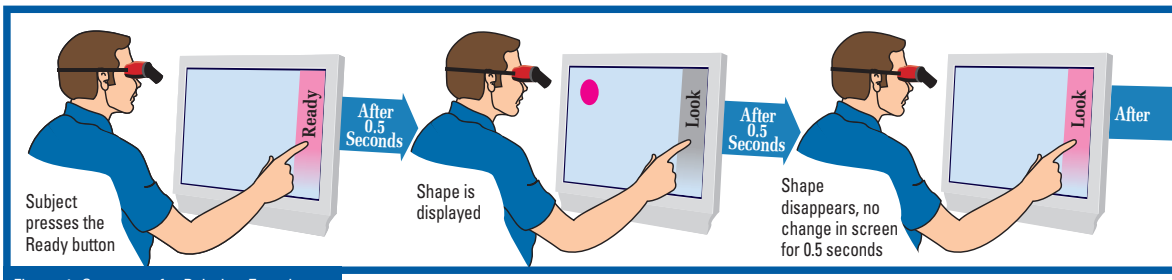


Figure 4: Sequence for Pointing Experiment

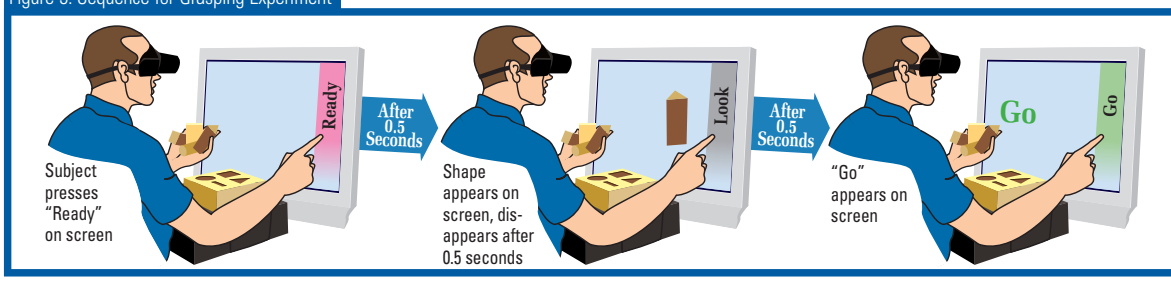


Figure 5: Sequence for Grasping Experiment

trial interactions during the pointing experiment. The subject navigation panel is two inches wide and is filled with two buttons that allow the subject to step through the experiment trials. The main button, known as the home button, is used to control the timing measurements and occupies the majority of the area as it is used very frequently during the flight. The text and background color for this button changes throughout the experiment as described below.

The second button is much smaller and allows the user to terminate a current trial if either they made a mistake in the procedure or felt something would have skewed the results. If the skip button is pressed, the data is still logged, but it is flagged as invalid so that it can be excluded from the analysis.

The operator screen has (i) a menu to select normal or inverted vision, (ii) buttons to select the current parabola, and (iii) a start/stop button to log information during each parabola. In addition, the screen has displays for timers for each parabola and statistics on the number of trials completed or skipped in each parabola. All text and buttons used large fonts to prevent operator error during the flight.

Since the touchscreen drivers configure touch responses as mouse clicks, the subject and operator can create conflicts for each other if clicking on different parts of the screen. To mitigate that, all the operator activities are accessible through keyboard shortcuts so that the subject controls the mouse focus during a parabola.

The software generates two archives during the flight. The first one logs information on each trial completed for the given experiment into a comma-separated file for easy post-processing. The second file is an event log that tracks every interaction with the software from either the operator or test subject. The events include autonomous functions from the software, keystrokes, mouse clicks, and touchscreen interactions. Depending on the action, different parameters are logged to help recreate the events that take place during the flight during post-processing.

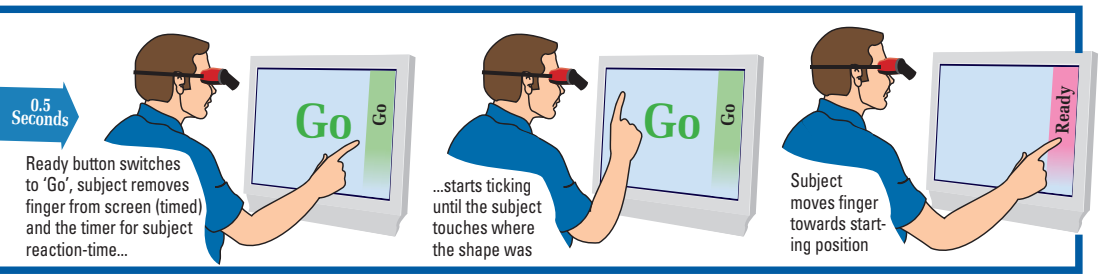
In addition to the data logged by the software, two GoPro cameras are used to record what the subjects and operators are doing. This helps remove bad data for scenarios where something happens outside the software that goes against the experiment protocol, such as a test subject using their left arm to support their right arm when pointing to the screen in the 1.8 G phase.

The Flight Campaign

The following sections describe the major stages of the parabolic flight campaign. The experiences described are specific to the ESA and CNES campaigns, but the high-level concepts can be applied to other organizations. Depending on the experiment, one may get a dedicated flight or share the flight with other researchers. In the case of the ESA campaign in September 2014, there were 11 research teams from different parts of Europe testing different experiments in many fields including cognitive science, human performance, and physical sciences.

Design Process and Major Milestones

For our particular experiment, the design was carried out by a



coordinates are used to estimate patterns in overshooting and undershooting the target.

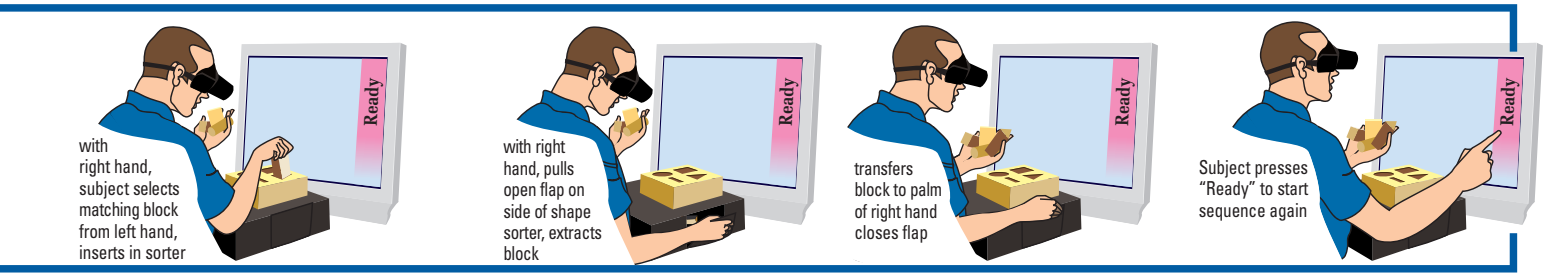
Preliminary Results

The experiment showed consistent results for all gravity levels with normal vision. In normal vision, there were noticeable differences in the target pointing accuracy for 0 G compared to 1 G, while there were only small variations for 1.8 G. However, we did not observe a systematic undershooting in 0 G, as shown in previous experiments on board the Space Shuttle. Thus, the data is in agreement for the hypothesis for hypergravity conditions, but does not follow the pattern for reduced gravity cases.

Grasping experiment

The grasping experiment evaluates the timing required to take a wooden shape and put it through one of the holes of a toy shape sorter. This mimics actions for using tools to fix components in space. The overall physical setup of the airplane seat and screen are reused. For this experiment, the subject holds a tray with a shape sorter with four shapes: a circle, triangle, rectangle, and square.

In order to prevent pieces flying out during portions of the parabola, the tray is secured using backpack-like clips around the test subject's legs and the shape sorter is glued onto the tray. Furthermore, the open faces of the shape sorter are covered



team of International Space University (ISU) students under the direction of Prof. Gilles Clement that included participants from the nine-week intensive graduate level Space Studies Program (SSP) and year-long Masters of Space Studies (MSS) program. The tasks for the project were divided amongst participants. All the structural components were designed and built in Strasbourg, France so that it would be easy and relatively inexpensive to transport them to Bordeaux for the flight. In parallel, the software was designed in Winnipeg, Canada with many online meetings and emails to discuss functionality, user interfaces, and various project management elements.

The preliminary designs were completed by January 2014, when the team held a design review teleconference with two engineers from Magellan Aerospace, Winnipeg who had worked on PMDIS-TRAC and VCF for shuttle mission STS-90. The feedback was incorporated into the design early enough to permit ground-based tests conducted in Strasbourg to test the system and experiment protocols. During this phase, there were different versions of the software released incorporating changes to pace subjects through the experiment and ways to identify invalid test cases.

The next iteration came after another design review held in Montreal, Canada during the SSP 2014 program. At this point, the sequence for the experiment as described in Fig. 4 and Fig. 5 was finalized while also incorporating many of the keyboard shortcuts. Much of this meeting was spent recreating a typical parabola, purposely ignoring the protocol, and testing recovery methods in case something went wrong during the flight.

Medical Checks and Insurance

Once the experiment was accepted and a date confirmed for the flight, the team identified a number of test subjects consisting of ISU classmates including people from Canada, US, France, Germany, Italy, Netherlands, Spain, and Austria. Because of insurance purposes, only European citizens would be allowed to be test subjects, while those from North America would have to act as operators. Each participant received a package of forms to receive clearance to work at the facilities, medical forms to be filled out by their physician, and insurance forms.

Individuals visited their family doctor for a physical equivalent to that of an aircraft pilot - a basic physical and an electrocardiogram. Although there are few conditions that would make someone ineligible to participate, the assessment informs the medical team on board the aircraft about their passengers in case of an emergency.

Setup, Inspection, and Training

The week leading up to the flight, the team arrived in Bordeaux, France and met at the Novespace facility. After completing facility training, the team loaded the experiment onto the Airbus A300 and mounted the seats and aluminium structure to the rails on the plane. After installing the circuit breaker and performing a power-on test, the structure was covered in protective padding. The padding protects individuals and the equipment during the flight as objects shift during parabolas.

Once the setup is complete, it is common to go through the flight protocol a few times and simulate

Parabolic Flight Experiment

It is possible that although the vestibular and proprioceptive signals were weaker in microgravity, visual cues throughout the airplane provided subjects with a relative orientation to their bodies.

Fly Your Thesis!

The Education Office from the European Space Agency (ESA) runs an annual program called "Fly Your Thesis!" that offers graduate students opportunities to conduct microgravity experiments directly related to their thesis in a parabolic flight campaign. The program is open to science and engineering students from ESA Member States. Canada is an ESA Associate Member, thus students in Canadian institutions qualify for these opportunities.

The program uses a two-step selection process to accelerate the timeline from proposal to flight. The first step consists of an annual call for proposals inviting students to submit an idea for an experiment to be conducted in microgravity. A single student or a team of students may complete the proposals, where at least one student utilizes the results for their thesis. The proposal consists of a high level description of the experiment, methodology, equipment, timeline, and budget to demonstrate both the scientific and management elements required to succeed in such projects.

The top 15 teams expand their proposals and are invited to a workshop at the European Space Research and Technology Centre (ESTEC) in the Netherlands. At the end of the workshop, all the teams present their work to a Review Board who selects the top four experiments to fly on board the Novespace Airbus 310 Zero-G aircraft in the fall of the following year. ESA covers the cost of the flight, parts of the experimental hardware, and provides some support for travel and accommodations.

For more information visit: http://www.esa.int/Education/Fly_Your_Thesis

with a Velcro flap so that the shapes can be removed in a controlled fashion after each trial. The subject holds the shapes in their left hand throughout the trial and uses their right hand to place shapes and interact with the screen.

The sequence is similar to the pointing experiment as shown in Fig. 5. The subject presses the "READY" button, waits 0.5 seconds, a shape appears for 0.5 seconds, and then disappears for another 0.5 seconds before instructing the user to "GO" and start the action. The reaction time is measured from the time they are instructed to "GO" until they release the button. The video captures are used to confirm the handling of the shapes before pressing the "READY" button to complete the trial and stop the action timer. The shape selection is random and has only one restriction to prevent the same shape from appearing in successive trials. The pictures of the shapes were taken on three different angles to remove biases from seeing the shape in a position that is easier to place in the shape sorter.

a few parabolas to ensure that both operators and test subjects know what to do. A team member uses a stopwatch to call out phases of the parabola while the team that will fly the experiment performs their corresponding tasks. In addition, during this time, one can simulate a few fault scenarios to practice recovery protocols to reduce the down time if something goes wrong.

These runs serve as a pre-flight specialized training while the airplane is on the runway for both operators and test subjects. For some experiments not involving human subjects, this is an opportunity to collect some controlled data under normal gravity conditions, however, for our experiment, the controlled data was collected during the 1 G phases of the parabolas in flight, thus maintaining the same environmental conditions including noise, temperature, subject medication across all gravity levels.

After completing the setup, a team of 6 engineers and flight personnel from Novespace reviewed the configuration to ensure it was safe. There are two reviews, an informal and a formal review that are conducted a few days apart. The formal review takes place the day before the first flight. Fail to complete that milestone, and the experiment would be removed from the flight. Some of the checks include that (i) there is sufficient padding on all corners and edges of the structure, (ii) the cables for the monitors and laptops are properly secured with zip ties to prevent power losses during the experiment, (iii) that laptops and other tools used during the flight are secured, and (iv) that the emergency switch to power off all equipment is operational. In addition, the team asks lots of questions to ensure there are mitigation procedures in place for many what-if scenarios such as shape sorter pieces getting loose and flying away during a parabola.

Once all the teams complete the inspection, Novespace offers a training session to go over safety procedures for the flight. The training session includes presentations from the aircraft pilot, the medical team on board, and the cabin crew. This session can be thought of as an extended version of the safety video on most commercial flights. The core portion of the presentation focuses on safety recommendations for anyone flying that includes: refraining from certain foods before the flight, avoiding rapid head movements during the hypergravity portion of the flight as they may cause dizziness, and what to do if one feels sick. Finally, after completing the safety discussions, each research team present is introduced and presents a short summary of their experiment so that everyone is aware of what is happening during the flight.

The experiment showed consistent results for all gravity levels with normal vision. We did not see significant differences for different gravity levels in the overall duration of the task. The measured action times decrease with increased gravity levels. Conceivably, the subjects learned the orientation and relative position of the shapes for the sorter box, thus after getting instructions from the screen, they could grab and rotate the shape in one motion, thus reducing the impact of different gravity levels.

General conclusions from both experiments

The preliminary results from both experiments indicate that subjects strongly relied on visual feedback for performing the head-eye coordination tasks, despite that vestibular and proprioceptive signals were weaker in 0 G and stronger in 1.8 G. Relatively small changes were observed in inverted vision compared to normal vision for the various levels of gravity. Further analysis of the data and reviews of the videos are needed to confirm these conclusions.

Canadian Reduced Gravity Experiment Design Challenge

In 2016, the Students for the Exploration and Development of Space (SEDS) group launched the Canadian Reduced Gravity Experiment Design Challenge (CAN-RGX). In this competition, Canadian post-secondary student teams will be selected to design, implement, and test an experiment over 12 consecutive parabolas on board the Falcon-20 aircraft from the National Research Council (NRC), which has been modified for this purpose by the Canadian Space Agency (CSA). The competition enables students to develop technical and project management skills, conduct an experiment in microgravity, and, ultimately, have a direct impact in space exploration and development in Canada.

Teams interested in participating submit a letter of intent in September and a full proposal by the end of November. The four teams selected are notified in December of the same year. Those selected experience the typical space-industry project phases and must submit documents for each major milestone;preliminary designs, critical designs, and an integration and testing plan.

The CAN-RGX selection criterion includes the technical description, scientific merit, budget and funding plans, and outreach plans. The competition funds most of the costs associated with the flight except for $2500 per team and experiment fees, thus teams are encouraged to apply for university grants and seek corporate sponsorship. Finally, the outreach component includes disseminating the experience through both social media and presentations to a variety of audiences.

For more information visit http://www.seds.ca/projects/canrgx

After completing the formal training, all test subjects meet one-on-one with the flight doctor. This gives each individual a chance to review the hazards and risks associated with the particular experiment, and then sign the informed consent for participating in the test. For this experiment, inversion goggles are considered a hazard that can make subjects dizzy in normal gravity conditions. Thus, when combined with the parabolic flight, they can increase the risk of getting sick during the flight.

The Flight

On the day of the flight, the team meets at the Novespace facility before 7:30 am. Those flying that day put on their flight suits and head over to see the medical staff for a last check up before takeoff. Individuals have the option of getting a shot of scopolamine to prevent motion sickness. First-time flyers are encouraged to receive the medication, while experienced flyers sometimes opt-out as they know how to prepare their bodies for the effects of the flight.

Meanwhile, team members not flying that day will go to the aircraft to go through a pre-flight checklist that includes testing all equipment and confirming all parts are in designated spots. This includes carrying writing utensils, screen cleaners for the touchscreen monitors, hard candies or mints to combat the dry mouth side effect of the scopolamine, and other tools for fixing the experimental setup if needed during the flight.

Credit: ESA

At 8:45 am, the team members flying will board the plane and sit in the front of the cabin for take-off. Unlike commercial flights, there are no security checks, boarding passes, baggage, or assigned seats. All experiments are powered off for takeoff. The plane takes off at 9:30 am and once it reaches 10,000 feet, the seatbelt light is turned off, power is provided to all experiments, and the fun begins. Although the airplane is still climbing and travelling to a designated airspace, the passengers get up, move toward the back of the cabin, and begin powering on their equipment. This allows teams to perform one last check of the setup before the first parabola.

The plan is to perform parabola #0 as a test where experiments are first tested in microgravity. Then, there is a short couple min-

Parabolic Flight Experiment

Canadian Space Summit

By Dario Schor (IEEE Member) and Wayne Ellis

The Canadian Space Summit is a two-day conference attracting stakeholders from all disciplines in the space community including industry, academia, government, military, and many space enthusiasts. With over 150 attendees annually, the summit is an excellent place to learn about the latest Canadian space projects and network with industry professionals.

The summit is organized by the Canadian Space Society – a non-profit/charitable organization composed of both professionals and enthusiast volunteers interested in the development of Canada's space industry.

Each year, the summit features a group of renowned keynote speakers, thematic sessions, and public events geared to all audiences. The themes for the sessions highlight the diversity of Canada's contributions to space:

Life Sciences – Studying human health, physiological, and cognitive behaviors related to space exploration and discoveries from space-based research.

Education and Outreach – Discussing projects from elementary, secondary, and post-secondary programs and their participation in space missions such as the Canadian Satellite Design Challenge.

Astronomy – Focusing current and conceptual designs for space telescope structures, detectors, receivers, and optics.

Space Applications – Covering topics related to satellite missions, space debris, on-orbit servicing, and space situational awareness.

Space Commercialization – Pitching ideas and opportunities for commercial enterprises and discussing trends on the future of the Canadian space industry.

Planetary Exploration – Combining remote sensing technologies for Earth and other planets, as well as robotic and human exploration of the Solar System.

Lunar Exploration – Narrowing the scope of planetary exploration to focus on the Moon, our nearest neighbour, as a platform to develop technologies for further exploration.

Law and Policy – Presenting legal issues surrounding exploration, exploitation, habitation, cooperation, and liability in space.

Art and Culture – Examining the links between space art and technology to explain how space art continues to evolve and inspire the next generation of explorers.

The 15th annual Canadian Space Summit will be hosted in Winnipeg, Manitoba from November 13-15, 2016 at the Inn at the Forks. The theme for this year is "At the Centre of It All" which highlights many of Manitoba's contributions to space from the launch of the first Black Brant suborbital rocket from Churchill, Manitoba in 1959 through the development of components for Mars rovers and buses for the RADARSAT Constellation Mission. The public events will include, among other things, industry tours and hands-on workshops for pre-university students. Please see the website for more details: **http://www.css.ca/**

IEEE Canada is proud to be one of the sponsors for the 15th Canadian Space Summit in Winnipeg, MB.

utes before commencing six sets of five parabolas each (totaling 31 parabolas in one flight). The sets are separated by 5-8 minute breaks where experiments can be reset or configured to evaluate other variables.

The crew makes announcements over the intercom leading up to each phase of the parabola:

- The warning "30 seconds to next parabola" is heard to set the experiments on and brace for the next parabola.
- "3, 2, 1, pull-up" announced before starting the climb where one experiences 1.8 G. At this point, there is a sudden transition from 1 G to 1.8 G where most passengers lay on the floor and avoid making any sudden head movements that could make them feel dizzy. The operators for our experiment stayed standing and would brace themselves over the structure to support their bodies while still being able to operate the software as needed.
- The countdown to the 0 G phase is done in terms of angles with respect to the horizon, "20 degrees, 30 degrees, 40 degrees, 3, 2, 1, injection!" This is the most difficult transition as we go from 1.8 G to 0 G in a fraction of a second.
- After roughly 20 seconds, the reverse countdown starts "40 degrees, 30 degrees, 20 degrees" and a quick force pulls all passengers to the ground. It is important to hold onto something before this transition to prevent injuries from the fall.
- Finally, no announcement is made after returning to 1 G.

After completing all 31 parabolas, the experiments are powered off, and there are a few minutes to relax while flying back towards the airport. At this point, the aircraft crew handed out water bottles and chocolate bars to all passengers. During this time, we backed up all the results into memory sticks and took down some notes on key things to improve for the next day. The airplane lands around 12:30 pm and preparations start for the next flight.

Post-Flight

After landing, the passengers get off the plane and proceed back to the Novespace facilities where the ground crew is waiting with lunch. The team discusses the key observations, any issues during the flight, and performs a preliminary assessment of the data to see how many of the 31 parabolas were successful at collecting the necessary data. Possible losses of data could be attributed to either equipment failure or a team member getting sick during the flight.

The summary of the experiment is presented at a post-flight briefing with all the research teams and aircraft crew. During this time, special requests for the next day can be made if one group needs a few more seconds between parabolas or sets of parabolas to reset their test. ■

Concluding Remarks

The campaign was able to provide a large interdisciplinary and international team an opportunity to collaborate together to further our understanding of the human body for space exploration. The technical and non-technical lessons learned are applicable in all aspects of our future careers and included being able to experience the full design process from the experiment design, building the various components, ground tests, design reviews, testing in flight, and finally analyzing and interpreting the results. One of the highlights was working within a multidisciplinary team that included engineers, physicist, nurses, neuroscientists, lawyers, and others, thus being able to discuss all aspects of the projects from multiple perspectives. Finally, for a group of aspiring space professionals, this was a first-hand exposure to working in microgravity that provided us with a better understanding of what astronauts experience, a greater appreciation for the accomplishments in space flight, and a source of motivation to help advance technology for humanity. ■

Back row left to right: Olivier Renard, Nathan Wong, Alix Dudley, Dario Schor, Angie Bukley, Gilles Clement, Trisha Randazzo, Joshua Nelson, Anja Schuster, Gabriele Librandi
Front row left to right: Kathleen Samoil and Valentina Boccia

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Transformational Infrastructure: **The Work of Nation Building**

Response to Guest Editorial by Hon. Sergio Marchi, Canadian Electricity Assn., published in Spring 2016 issue, #75.

It is difficult, almost impossible, to underestimate the role of electricity in the transition to a low carbon economy. As we move away from hydrocarbons for heating and transportation, the most likely alternative will be electricity. Not uniquely, of course — passive heating and energy efficiency should be preferred whenever possible — but dominantly. In fact low-carbon future scenarios include, without exception, much greater electricity use and fuel efficiency. There are many reasons why electricity is at the heart of low carbon transitions.

Electricity from renewable sources is becoming more and more competitive with respect to alternatives. The most recent tender from Hydro-Québec, for example, was as low as 6.4 ¢/kWh, and prices are still falling. Electricity is also much more efficient than fuel for performing work; an electric car, for example, requires about four times less energy than a fuel-based one to move from point A to point B. Similarly, with heat pumps, electricity can deliver two or three times more heat per watt than natural gas.

As Sergio Marchi rightly points out, the constitution attributes jurisdiction over energy to provinces which have, historically, perceived a need to ensure production inside their territory. This has led to a fragmented market with widely varying rates and energy sources as we move from province to province, preventing Canada as a whole from benefitting as much as it should from its renewable energy resources. This is even truer today as hydro dams scattered around the country constitute immense energy storage facilities that can be leveraged to increase significantly the part of intermittent renewable energies on the network. With a strong East-West national grid, it would be easier than in almost any other country to reach a target of 90 or even 100 % renewable electricity over the next 20 years. Yet, this transformation is unlikely to occur without a national leadership that breaks the traditional provincial-centric position about electricity generation and demonstrates the advantage of thinking more globally in this sector, as is done by other national or transnational groups around the world.

> **With a strong East-West national grid, it would be easier than in almost any other country to reach a target of 90 or even 100 % renewable electricity over the next 20 years.**

Innovation, as underlined in Sergio Marchi's editorial, is crucial, but, more important, are political will, vision and leadership. The absence of deep electricity integration between provinces is not caused by technical constraints but simply because nobody managed to drive the concept through. This is why it is essential for the Federal level to fully play its role in supporting an increase in interprovincial electricity trade and promoting low-carbon emission energy production.

This would go a long way in the development of a rich low-carbon economy for Canada in addition to foster the investments in innovation discussed by Sergio Marchi. ■

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***Catherine Potvin**, FRSC, Canada Research Chair on Climate Change Mitigation and Tropical Forests and Professor of Biology at McGill University.*

***Normand Mousseau**, Professor of Physics and University Research Chair in Complex Materials, Energy and Natural Resources at Université de Montréal.*

*Catherine Potvin is the founder and leader of Sustainable Canada Dialogue, a group of 60 scholars from across Canada, of which Normand Mousseau is part, that has offered a national action plan on climate change (*http://www.sustainablecanadadialogues.ca/en/*).*

IEEE Canada Members inducted as 2016 Fellows, Canadian Academy of Engineering

- Christophe Caloz - *École Polytechnique Montréal*
- Ambrish Chandra *Université du Québec*
- Jie Chen *University of Alberta*
- Liping Fang *Ryerson University*
- Jason Gu *Dalhousie University*
- Nazir Kherani *University of Toronto*
- Witold Kinsner *University of Manitoba*
- Deepa Kundur *University of Toronto*
- Michel Nakhla *Carleton University*
- Milica Radisic *University of Toronto*
- Manoj Sachdev *University of Waterloo*
- Vinay Sharma, *London Hydro*
- Antonio Vannelli *University of Guelph*
- Zhou Wang *University of Waterloo*
- Jiejun Zhang *National Research Council*

IEEE Canada IHTC 2017 — International Humanitarian Tech. Conference

TORONTO, CANADA – JULY 20-22, 2017 WWW.IHTC2017.IEEE.CA

Photo: U.S. Coast Guard, Nyxolyno Cangemi

Photo: OLE Nepal, Om Yadav

Student Design Contest

Design projects seeking to solve Humanitarian issues using Technology done from July '15 to June '17 are welcomed. Judging to be based on innovation, feasibility, relevance to real-world problems and cost-effectivness.

The theme of IHTC 2017 is "Innovate and Collaborate for Sustainable Development" with emphasis on policies, practices, and technologies aimed at building resilient communities. IHTC 2017 is a unique conference that will focus on humanitarian applications of technologies, aligning with Sustainable Development Goals of the United Nation: Mainly, sustainable development of communities, health, disaster mitigation and management; and engineering education with an emphasis on humanitarian issues. The conference will feature outstanding keynote speakers, workshops, a student paper/design competition, and peer-reviewed papers.

CALL FOR PAPERS

The technical program committee invites you to submit a 200-300 word abstract of a paper in any of the following track areas.

Technologies for:

1. Poverty alleviation, achieving food security and improved nutrition and promote sustainable agriculture.
2. Effective management of refugees, (re)settlements and integration
3. Ensuring healthy lives and promote well-being for all at all ages
4. Quality education and promote lifelong learning opportunities for all
5. Sustainable management of water and sanitation for all
6. Affordable, reliable, sustainable and modern energy for all
7. Making cities and human settlements safe, resilient and sustainable
8. Disaster mitigation, management, relief, and recovery
9. Combating climate change and its impacts
10. Social impacts of technology
11. Data and personal security humanitarian technology
12. Humanitarian and educational technologies
13. Community engagement

IMPORTANT DATES

Deadline for Abstract Submission	**Dec. 10, 2016**
Notification of Abstract Acceptance	**Dec. 31, 2016**
5-page IEEE format Full Paper Due	**Jan. 15, 2017**
Reviewers' Feedback to Authors	**Apr. 30, 2017**
Submission of camera-ready papers	**May 31, 2017**

TUTORIALS, WORKSHOPS, PANELS

Proposals are invited for half-day tutorials, workshop on new and emerging topics within the scope of the conference.

Please describe the content, importance and timeliness, the speaker(s), brief CVs, and where appropriate, topics each will cover. For further info, contact: **xavier@ieee.org**

Proposals due March 31, 2017

SUBMISSIONS

All materials to be uploaded by registering with: http://edas.info

Please use PDF format for both papers/paper abstracts, as well as proposals for tutorials, workshops and panels. Detailed information on paper format and submission procedure can be found on the conference website.

WHO SHOULD ATTEND?

The target audience for the conference includes researchers, practitioners and students in the fields of sustainability, human development, education, disaster relief, STEM fields and management sciences as well as interested professionals and anyone wanting to contribute their talents on the humanitarian and sustainable development fields.

Exhibition: Showcase your products and services to Canadian and international audiences. For more details please go to:

http://www.ihtc2017.ieee.ca/patronage-exhibition

For detailed up-to-date information, visit the Conference web site:

http://www.ihtc2017.ieee.ca

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Major Awards

IEEE CANADA ACHIEVEMENT AWARDS

A.G.L. MCNAUGHTON GOLD MEDAL
for exemplary contributions to the engineering profession

R.A. FESSENDEN MEDAL
for important contributions to the field of telecommunications engineering

POWER MEDAL
for important contributions to the field of electric power engineering

C.C. GOTLIEB (COMPUTER) MEDAL
for important contributions to the field of computer engineering and science

OUTSTANDING ENGINEER AWARD
for outstanding contributions to Electrical and Electronics Engineering

J.M. HAM (OUTSTANDING ENGINEERING EDUCATOR) MEDAL
for outstanding contributions to engineering education

ROBERT H. TANNER INDUSTRY LEADERSHIP AWARD
for important leadership contributions in Canadian industry where there is significant activity in areas of interest to IEEE

IEEE CANADA SERVICE AWARDS

W.S. READ OUTSTANDING SERVICE AWARD
for outstanding and sustained service to IEEE Canada and the Institute

J.J. ARCHAMBAULT EASTERN CANADA MERIT AWARD
for meritorious service in eastern Canada at the local IEEE Section and Area level

M.B. BROUGHTON CENTRAL CANADA MERIT AWARD
for meritorious service in central Canada at the local IEEE Section and Area level

E.F. GLASS WESTERN CANADA MERIT AWARD
for meritorious service in western Canada at the local IEEE Section and Area level

Les Prix Majeurs

PRIX DE DISTINCTION HONORIFIQUE DE L'IEEE CANADA

MÉDAILLE D'OR A.G.L. MCNAUGHTON
pour contributions exemplaires à la profession d'ingénieur

MÉDAILLE R.A. FESSENDEN
pour contributions importantes dans le domaine du génie des télécommunications

MÉDAILLE EN PUISSANCE
pour contributions importantes dans le domaine du génie électrique

MÉDAILLE C.C. GOTLIEB (MÉDAILLE EN INFORMATIQUE)
pour contributions importantes en informatique

PRIX D'EXCELLENCE EN INGÉNIERIE
pour contributions exceptionnelles au génie électrique et électronique

MÉDAILLE J.M. HAM (MÉDAILLE D'EXCELLENCE EN ENSEIGNEMENT DU GÉNIE)
pour contributions exceptionnelles à l'éducation en génie

PRIX LEADERSHIP INDUSTRIEL ROBERT H. TANNER
pour contributions importantes au niveau du leadership dans l'industrie canadienne où il y a une activité significative dans des domaines d'intérêt de l'IEEE

PRIX POUR ÉTATS DE SERVICES DE L'IEEE CANADA

PRIX D'EXCELLENCE DE SERVICE W.S. READ
pour service exceptionnel et soutenu à l'IEEE Canada et à l'institut

PRIX D'EXCELLENCE J.J. ARCHAMBAULT DE L'EST DU CANADA
pour service méritoire dans l'est du Canada au niveau des sections et zones locales de l'IEEE

PRIX D'EXCELLENCE M.B. BROUGHTON DU CENTRE DU CANADA
pour service méritoire dans le centre du Canada au niveau des sections et zones locales de l'IEEE

PRIX D'EXCELLENCE E.F. GLASS DE L'OUEST DU CANADA
pour service méritoire dans l'ouest du Canada au niveau des sections et zones locales de l'IEEE

2016 IEEE CANADA A.G.L. MCNAUGHTON GOLD MEDAL
MÉDAILLE D'OR A.G.L. MCNAUGHTON DE I'IEEE CANADA 2016

For outstanding contributions in the field of robotics and automation including research and development and founding of high-technology companies
Pour contributions exceptionnelles à la recherche et au développement en robotique et en automatique et pour la création d'entreprises de haute technologie

Andrew Goldenberg

Andrew Goldenberg (LFIEEE) is the founder (1982) of the field of Robotics at the University of Toronto where he has been a Professor of Mechanical and Industrial Engineering, cross-appointed in the Institute of Biomaterials & Biomedical Engineering, and now a Professor Emeritus. He is also an Adjunct Professor at Ryerson University, Toronto, and a guest/visiting professor at three prestigious universities in the P.R. China. He is the founder and current President of Engineering Services Inc. (ESI), which develops leading-edge robotics-based automation.

Dr. Goldenberg has made significant contributions to theory of robot kinematics, dynamics and control. He is one of the most prolific developers of robotic technology in a wide variety of fields such as security, manufacturing, medical surgery, and nuclear. He is a world-wide recognized expert, concurrently active in academic research (46 Ph.D., 64 M.A.Sc., 81 patents granted/applied, 128 archival journal papers, 294 papers in major conferences, 15 book chapters with more than 4500 citations in leading journals) and commercial enterprises. In May

2015 the scope of his robotics commercialization efforts has expanded with the acquisition of ESI by Shenzhen ANZER Intelligent Engineering Co., Ltd., a P. R. China consortium.

As an employee of SPAR Aerospace Ltd. of Toronto, he played a key role in the development of the first Space Shuttle Remote Manipulator System (Canadarm).

Dr. Goldenberg's accolades include Fellow of ASME, Fellow of Engineering Institute of Canada (EIC), Fellow of CAE, and Fellow of AAAS. He is the recipient of the 2010 PEO Engineering Medal for Entrepreneurship and the 2013 Sir John Kennedy Medal, the highest honour awarded by the EIC. ■

Andrew Goldenberg (LFIEEE) a lancé en 1982 la formation en robotique à l'Université de Toronto où il est actuellement professeur émérite après y avoir été professeur de génie mécanique et de génie industriel nommé conjointement à l'Institut des biomatériaux et de génie biomédical. Il est également professeur adjoint à l'Université Ryerson, à Toronto, et professeur invité dans trois prestigieuses universités chinoises. Il est le fondateur et l'actuel président de l'entreprise Engineering Services Inc. (ESI), qui se spécialise dans la robotique de pointe.

M. Goldenberg a contribué de façon significative à l'avancée de la théorie (cinématique, dynamique et contrôle) sur les robots. Il est l'un des plus prolifiques développeurs de technologies pour robots dans divers domaines comme la sécurité, la fabrication, la chirurgie médicale et le nucléaire. Son expertise est reconnue à l'échelle internationale, étant actif tant comme chercheur (il a supervisé 46 étudiants au doctorat et 64 étudiants à la maîtrise, obtenu 81 brevets, signé 128 articles de revues d'archives et 15 chapitres de livres, prononcé 294 conférences et été cité 4 500 fois dans des revues prestigieuses) que comme entrepreneur dynamique. En mai 2015, à la suite de l'acquisition d'ESI par le consortium chinois Shenzhen ANZER Intelligent Engineering Co., Ltd., il y a eu expansion du champ de commercialisation de ses produits de la robotique.

En tant qu'employé de SPAR Aerospace Ltd. à Toronto, il a joué un rôle clé dans le développement de Canadarm, le premier bras canadien pour la télémanipulation de navettes spatiales.

M. Goldenberg est Fellow de l'ASME, Fellow de l'Institut canadien des ingénieurs (ICI), Fellow de la CAE et Fellow de l'AAAS. Il est le récipiendaire de la médaille d'entrepreneuriat du PEO 2010 et de la médaille Sir John Kennedy 2013, la plus haute distinction remise par l'ICI. ■

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PAST WINNERS/ ANCIENS LAURÉATS

- Mohamed Kamel (2015),
- Raouf Boutaba (2014),
- Jamal Deen (2013),
- John W. Bandler (2012),
- Gregor v. Bochmann (2011),
- Alberto Leon-Garcia (2010),
- Wolfgang Hoefer (2009),
- Colin A. Franklin (2008),
- Raymond D. Findlay (2007),
- Hussein Mouftah (2006),
- Anthony B. Sturton (2005),
- Renato G Bosisio (2004),
- Tas Venetsanopoulos (2003),
- Prakash Bhartia (2002),
- Om Malik (2001),
- Nicolas D. Georganas (2000),
- Mohamed E. El-Hawary (1999),
- Chandra M. Kudsia (1998),
- Thomas David Collett (1997),
- John Plant (1996),
- Vijay K. Bhargava (1995),
- Roy Billinton (1994),
- Ray Bartnikas (1993),
- M. Val OíDonovan (1992),
- William J.M. Moore (1991),
- 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).

2016 IEEE CANADA R.A. FESSENDEN MEDAL
MÉDAILLE R.A. FESSENDEN DE L'IEEE CANADA 2016

For outstanding contributions to wireless sensor networks for the Internet of Things
Pour contributions exceptionnelles aux réseaux de capteurs sans fil pour l'Internet des objets

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 telecommunication networks, including ad hoc and sensor networks related to the Internet of Things. He is currently developing a solution to securely charge electric vehicles within smart grid environments, allowing users to locate the nearest charging station using a mobile device, then book and pay for it. An internationally acclaimed scholar, Dr. Mouftah has authored or co-authored 10 books, 144 industrial reports and more than 1,400

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 éminent et titulaire d'une chaire de recherche de niveau 1 à l'École de science informatique et de génie électrique de l'Université d'Ottawa. Il a été professeur et directeur adjoint au Département de génie électrique et informatique de l'Université Queens. Il compte également six années d'expérience en industrie chez Bell Northern Research, à Ottawa.

M. Mouftah développe la prochaine génération de technologies qui serviront de fondations aux futures villes intelligentes. Il a grandement contribué à l'avancée des connaissances sur les réseaux de télécommunications, y compris les réseaux ad hoc et les réseaux de capteurs pour l'Internet des objets. Il travaille actuellement à une solution pour la recharge sécurisée des véhicules électriques au sein des réseaux intelligents. Le but est de permettre qu'à partir de son dispositif mobile l'usager puisse localiser la station de recharge la plus proche, la réserver et payer le service. M. Mouftah est reconnu à l'échelle internationale. Il est l'auteur ou le coauteur de 10 livres, de 144 rapports industriels, de plus de 1 400 articles, et il est titulaire de 14 brevets et de 6 inventions divulguées.

M. Mouftah est Fellow 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. À plusieurs occasions il a agi comme bénévole pour l'IEEE. Au sein d'IEEE Canada, il a été le président du comité régional des prix et reconnaissances. Au sein de la société des communications de l'IEEE, il a servi comme rédacteur en chef de l'IEEE Communications Magazine et directeur de l'éducation, et il a été nommé conférencier distingué. Il a également été membre du bureau des gouverneurs. ■

SPONSORED BY / COMMANDITÉ PAR **TELUS**

PAST WINNERS/ ANCIENS LAURÉATS

- 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)

2016 IEEE CANADA POWER MEDAL
MÉDAILLE D'ÉLECTRICITÉ DE L'IEEE CANADA 2016

For outstanding contributions to power engineering research and education
Pour contributions exceptionnelles à la formation et à la recherche en ingénierie de puissance

Claudio Canizares

Claudio Cañizares (FIEEE) is a Professor in the Electrical and Computer Engineering(ECE)Department of the University of Waterloo, where he has held various academic and administrative positions since 1993, and currently serves as the Hydro One Endowed Chair and the Associate Chair Research of the ECE Department. He is also Associate Director of the Waterloo Institute for Sustainable Energy. He received the Electrical Engineer degree from the Escuela Politécnica Nacional (EPN) in Quito-Ecuador in 1984, where he held different teaching and administrative positions between 1983 and 1993, and his MSc (1988) and PhD (1991) degrees from the University of Wisconsin-Madison.

Dr. Cañizares' leadership in improving the operation of competitive energy markets and smart grids is widely respected across IEEE Power & Energy Society (PES). His particular areas of expertise focus on the study of stability, modeling, simulation, control, optimization, and computational issues in large and small grids and energy systems. In these areas, he has collaborated with industry and university researchers in Canada and abroad, supervising/co-supervising many research fellows and graduate students.

Dr. Cañizares has authored/co-authored a large number of journal and conference papers, as well as various technical reports, book chapters, disclosures and patents, and has been invited to make multiple keynote speeches, seminars, and presentations at many institutions and conferences world-wide. He is a Fellow of the IEEE, the Royal Society of Canada and of the Canadian Academy of Engineering, and has been the recipient of various IEEE PES Technical Council and Committee awards and recognitions. ■

Claudio Cañizares (FIEEE) est professeur au Département de génie électrique et informatique de l'Université de Waterloo. Depuis 1993, il y a occupé divers postes d'enseignement et de recherche, de même qu'administratifs. Il est actuellement titulaire de la chaire de recherche financée par Hydro One et président adjoint (recherche) au Département de génie électrique et informatique. Il est également directeur adjoint de l'Institut de Waterloo pour l'énergie durable. Il a obtenu son diplôme d'ingénieur en génie électrique à la Escuela Politécnica Nacional (EPN) de Quito en Équateur en 1984. Il y a été enseignant et administrateur entre 1983 et 1993. Il a obtenu sa maîtrise (1988) et son doctorat (1991) à l'Université du Wisconsin-Madison.

Le leadership de M. Cañizares dans l'amélioration du fonctionnement des marchés compétitifs de l'énergie et des réseaux intelligents est reconnu au sein de la Power & Energy Society de l'IEEE. Ses champs d'expertise couvrent l'étude de la stabilité, la modélisation, la simulation, le contrôle, l'optimisation et les contraintes informatiques des systèmes énergétiques et des réseaux à petite et à grande échelle. Il a ainsi supervisé ou cosupervisé au Canada et ailleurs plusieurs travaux de recherche d'étudiants diplômés tant en milieu industriel qu'en milieu universitaire.

M. Cañizares est l'auteur ou le coauteur de plusieurs articles de revue et conférences, de divers rapports techniques, de chapitres de livres, de brevets, et il a été conférencier invité à plusieurs reprises partout dans le monde. Il est Fellow de l'IEEE, de la Société royale du Canada et de l'Académie canadienne du génie. Il a été le récipiendaire de plusieurs prix et distinctions de la Power & Energy Society de l'IEEE. ■

PAST WINNERS/ ANCIENS LAURÉATS

- 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)

2016 IEEE CANADA OUTSTANDING ENGINEER MEDAL
PRIX D'EXCELLENCE EN GÉNIE DE L'IEEE CANADA 2016

For outstanding contributions to synthetic aperture radar imaging and moving target indication systems development
Pour contributions exceptionnelles à l'imagerie radar à synthèse d'ouverture et au développement des systèmes d'indication de cibles mobiles

Anthony Damini

Anthony Damini (SMIEEE) obtained his Bachelor's and Master's degrees in Electrical Engineering from McMaster University, Hamilton, Ontario. In 1989, he joined the Department of National Defence as a Defence Scientist. Since then, he has spent time as lead of several scientific groups and manager of Radar Systems at Defence Research and Development Canada (DRDC), responsible for setting technical direction and overseeing R&D. Currently, he is the lead of the Tactical Radar group within DRDC, responsible for imaging and moving target indication technologies.

Anthony has a proven track record in concept development and technology transition, enabled by his approach to cost-effective rapid prototyping, early field testing and risk reduction. He has made numerous pioneering contributions by conceiving of and leading the development of several diverse sensing technologies which were successfully transferred to industry. The technologies are dual use with applications to both defence and societal needs, and have led to increased demand for sensing R&D in government,

academia and industry. He serves as one of the principal advisors to national defence on airborne sensing and integrated intelligence, surveillance, and reconnaissance architectures.

His specific research interests include real-time systems and signal processing for synthetic aperture radar, ground moving target indicator radar, moving target imaging, phased array radar, and adaptive sensor resource management.

Anthony has authored or co-authored more than 75 conference/journal papers, book chapters and internal reports. He has served as both a member and Chair of several international panels and working groups in the areas of sensors and signal processing on behalf of Canada. ■

Anthony Damini (SMIEEE) a obtenu son baccalauréat et sa maîtrise en génie électrique à l'Université McMaster. En 1989, il rejoint le ministère de la Défense nationale comme scientifique de la défense. Depuis, il a dirigé plusieurs groupes et géré (orientation technique et supervision R-D) le système radar de recherche et développement pour la défense Canada (RDDC) où il est actuellement le chef de file du groupe de stratégies radar responsable des technologies d'imagerie et d'indication de cibles mobiles.

Anthony a une expérience éprouvée dans le développement du concept et la transition technologique, ce qui permet un prototypage rapide à faible coût et des tests sur le terrain avec risques réduits. Il a à son actif plusieurs contributions novatrices en matière de conception et de développement de technologies de détection qui ont été transférées avec succès à l'industrie. Ces technologies sont utiles tant pour la défense que pour le civil et ont conduit à l'augmentation des projets de R-D en technologie de détection au gouvernement, dans les universités et les industries. Il est l'un des principaux conseillers de la défense nationale en matière de détection aéroportée, d'intelligence intégrée, de surveillance et de reconnaissance d'architectures.

En matière de recherche, Anthony s'intéresse aux systèmes temps réel et au traitement du signal pour les radars à synthèse d'ouverture, les radars d'indication de cibles mobiles terrestres, les radars à commande de phase et la gestion adaptative des ressources des capteurs. Il est l'auteur ou le coauteur de plus de 75 articles de revue/conférences, de chapitres de livres et de rapports internes. En tant que représentant du Canada, il a été membre et président de plusieurs comités et groupes de travail internationaux dans le domaine des capteurs et celui du traitement du signal. ■

PAST WINNERS/ ANCIENS LAURÉATS

- 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)

2016 IEEE CANADA J.M. HAM OUTSTANDING ENGINEERING EDUCATOR MEDAL
MÉDAILLE D'EXCELLENCE EN ENSEIGNEMENT DU GÉNIE J.M. HAM DE L'IEEE CANADA 2016

For outstanding contributions in data analytics and sustainable ICT engineering education and research
Pour contributions exceptionnelles à l'enseignement et à la recherche en analyse de données et en génie des TIC

Mohamed Cheriet

Mohamed Cheriet (SMIEEE) is a professor in the Department of Automation Engineering at the École de Technologie Supérieure at the University of Quebec in Montreal, where he has worked since 1992. He received his M.Sc. and Ph.D. in computer science from the University of Pierre & Marie Curie (Paris VI). Dr. Cheriet is also the founder and director of Synchromedia, which targets multimedia communications in telepresence applications.

Dr. Cheriet is leading the way in building sustainable ICT infrastructure for education, research and smart cities, developing low-carbon technologies and creating open, sustainable broadband. As a Tier 1 Canada Research Chair on Sustainable and Smart Eco-Cloud, he has established the first smart university campus in Canada, creating a model for next-generation ICT infrastructure in universities and smart cities. He was Principal Investigator of the GreenStar project, the world's first zero-carbon Internet and cloud infrastructure, which uses low-carbon technologies including wind- and solar-powered networks to provide sustainable broadband

provisioning — and ensure ICT's carbon footprint does not increase as the world becomes more reliant on communication technologies.

Dr. Cheriet is the founder and former Chair of the IEEE Montreal Chapter of Computational Intelligent Systems (CIS) and Steering Committee Member of the IEEE Green ICT Initiative. As an expert in computational intelligence, pattern recognition and machine learning, he has published more than 350 technical papers and serves on the editorial boards of several renowned journals and international conferences. Dr. Cheriet is the recipient of the 2012 Queen Elizabeth II Diamond Jubilee Medal. ■

Mohamed Cheriet (SMIEEE) est depuis 1992 professeur au Département de génie de la production automatisée de l'École de technologie supérieure, à l'UQAM. Il est diplômé (M. Sc. et Ph. D.) en informatique de l'Université Pierre et Marie Curie (Paris VI) et est le fondateur et le directeur de Synchromedia, qui cible les communications multimédias dans les applications de téléprésence.

M. Cheriet ouvre la voie à la construction d'infrastructures de TIC durables pour l'éducation, la recherche et les villes intelligentes, au développement de technologies à faible émission de carbone et à la création de larges bandes ouvertes. Il est le titulaire de la chaire de recherche du Canada de niveau 1 sur la durabilité écologique d'éco-cloud et a établi le premier campus universitaire intelligent au Canada créant ainsi un modèle pour les prochaines générations d'infrastructures de TIC dans les universités et les villes intelligentes. M. Cheriet a été le chercheur principal du projet GreenStar, le tout premier projet mondial d'infrastructures en nuage et d'Internet zéro carbone utilisant les technologies à faible émission de carbone afin de garantir un approvisionnement durable à large bande et de limiter l'empreinte carbone des TIC malgré l'augmentation de la dépendance mondiale aux technologies de la communication.

M. Cheriet est le fondateur et l'ancien président du chapitre d'IEEE Montréal sur les systèmes informatiques intelligents et est membre du comité directeur de l'initiative TIC vertes de l'IEEE. En tant qu'expert en intelligence informatique, en reconnaissance de formes et en apprentissage machine, il a publié plus de 350 articles et a siégé au comité de rédaction de plusieurs revues et conférences internationales. Il est le récipiendaire en 2012 de la médaille du jubilé de diamant de la reine Elizabeth II. ■

SPONSORED BY / COMMANDITÉ PAR **CANADIAN HEADS OF ECE/DIRECTEURS CANADIENS DE GEI**

PAST WINNERS/ ANCIENS LAURÉATS

- Yahia Antar (2015),
- Jamal Deen (2014),
- Leslie Rusch (2013),
- Safa Kasap (2012),
- Keith W. Hipel (2011),
- Vijay Bhargava (2010),
- John Cartledge (2009),
- Andreas Antoniou (2008),
- David V. Plant (2007),
- Paresh C.Sen (2006),
- Kostas Plataniotis (2005),
- Hoang LeHuy (2004),
- V. Ramachandran (2003),
- John E. Quaicoe (2002),
- Roy Billinton (2001),
- Clarence W. de Silva (2000),
- Robert H. MacPhie (1999),
- K.D. Srivastava (1998),
- R. Venkatesan (1997),
- M. A. Rahman (1996),
- Robert ridge (1995),
- Mohinder S. Sachdev (1994)

2016 IEEE CANADA W.S. READ OUTSTANDING SERVICE MEDAL
PRIX D'EXCELLENCE DE SERVICE W.S. READ DE L'IEEE CANADA 2016

For sustained dedication and outstanding service to IEEE Canada and its members
Pour son dévouement soutenu et son service exceptionnel à IEEE Canada et à ses membres

Sreeraman Rajan

Sreeraman Rajan (SMIEEE) is the Canada Research Chair in Sensor Systems at Carleton University. Previously, he worked as a defence scientist at Defence Research Development Canada-Ottawa Research Centre. He also developed signal processing algorithms at JDS Uniphase, led the channel monitoring team at Ceyba Inc, developed algorithms for non-invasive medical devices at Biopeak and developed systems for control of nuclear power at Bhabha Atomic Research Centre in India. He holds adjunct professorship at the University of Ottawa and the Royal Military College of Canada.

Dr. Rajan has been an IEEE member since 1990, most recently serving as Area East Chair of IEEE Canada. Prior to that, he served as Treasurer, Vice-Chair and Chair of the IEEE Ottawa Section, and was a member of the IEEE Canada Conference Advisory Committee. He quickly developed a reputation for boosting participation in workshops and conferences by creating quality programming, and for spearheading the revival of the Engineering in Medicine and Biology Society (EMBS) Chapter, which went on to win Best Ottawa Chapter three times and received the Outstanding Chapter Award from IEEE EMBS in 2011.

An Associate Editor for IEEE Canada's Canadian Journal on Electrical and Computer Engineering, Rajan is also a notable author: He has published 25 journal papers, 70 conference papers and 15 technical reports, and has one patent, one pending patent and two disclosures of invention. He received a 2012 IEEE MGA Achievement Award and was also honoured that year by the Government of Canada with the Queen Elizabeth II Diamond Jubilee Medal. ■

Sreeraman Rajan (SMIEEE) est titulaire de la Chaire de recherche du Canada sur les systèmes de détection à l'Université Carleton et a été scientifique à Recherche et développement pour la défense Canada - Ottawa. Il a créé des algorithmes de traitement du signal à JDS Uniphase, dirigé l'équipe de surveillance de canaux de CeybaInc, créé des algorithmes pour des appareils médicaux non invasifs à Biopeak et créé des systèmes de contrôle de la puissance nucléaire au Centre de recherche atomique de Bhabha, en Inde. Il est professeur auxiliaire à l'Université d'Ottawa et au Collège militaire royal du Canada.

M. Rajan est membre de l'IEEE depuis 1990. Il a présidé récemment la zone Canada de l'Est de l'IEEE. Avant cela, il a été trésorier, vice-président et président de la section d'Ottawa de l'IEEE ainsi que membre du Comité consultatif du congrès d'IEEE Canada. Réputé pour promouvoir la participation aux ateliers et conférences en créant des programmes de qualité, on lui attribue également d'avoir renouvelé le chapitre de l'Engineering in Medicine and Biology Society (EMBS), qui a remporté par trois fois le prix du meilleur chapitre d'Ottawa et reçu le prix du chapitre exceptionnel (IEEE EMBS) en 2011.

Coéditeur du *Journal canadien de génie électrique et informatique* d'IEEE Canada, Rajan est un auteur renommé : il a publié 25 articles de revues, 70 textes de conférences et 15 rapports techniques. Il possède un brevet, un brevet en instance et deux exposés d'une invention. Il a reçu en 2012 le prix de distinction honorifique du bureau des activités géographiques des membres de l'IEEE (MGA) et a été honoré cette même année en recevant du gouvernement du Canada la médaille du jubilé de diamant de la reine Elizabeth II. ■

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

PAST WINNERS/ ANCIENS LAURÉATS

- 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)

2016 IEEE CANADA E.F. GLASS WESTERN CANADA MERIT MEDAL
PRIX D'EXCELLENCE E.F. GLASS DE L'OUEST DU CANADA DE L'IEEE CANADA 2016

For sustained contributions to Western Canada sections
Pour sa contribution soutenue aux sections de l'Ouest du Canada

Rasheek Rifaat

Rasheek Rifaat (LFIEEE) has his B.Sc. from Cairo University and M.Eng. from McGill University. Currently he is a Technical Director-Electrical at Jacobs Canada, where he has been working for 25 years. His Canadian engineering work history expands over 40 years in Calgary, Regina and Montreal. Since 1976, he has been an active IEEE member and in 2014 was elevated to Fellow Grade for "contributions to protection of industrial power systems." He is notably engaged in the IEEE Standards for Recommended Practices for Industrial and Commercial Power Systems. He is currently the chair of Standards Working Group - Protection & Coordination (Series 3004) and the Vice Chair of the Industrial & Commercial Power Systems (I&CPS) Department of the IEEE/IAS.

Rasheek's dedicated support to related IEEE technical conferences, tutorials, seminars and events reflects profound appreciation for the importance of these activities — critical for advancement of the electrical engineering profession and inter-generation transfer of engineering knowledge. His contributions have been particularly strong in Western Canada. He chaired two I&CPS Technical Conferences (2009/2015) and was the Treasurer of EPEC 2014, all held in Calgary. He is currently the Vice Chair of IEEE Southern Alberta Section's Joint PES/IAS Chapter, which has received several awards and recognitions since 2010. He has been instrumental in devising the evening seminars and events shared by the Southern Alberta and Northern Canada Sections. In January 2016 he joined the IEEE Canada Board as Regional Treasurer.

Rasheek is registered as P.Eng. in Alberta, Saskatchewan and Ontario and is a member of the Energy Industry Electrical Engineering Association. ■

Rasheek Rifaat (LFIEEE), B. Sc. (Université du Caire) et M. Ing. (Université McGill), est directeur technique en électricité à Jacobs Canada, où il travaille depuis 25 ans. Sa carrière d'ingénieur s'étend au Canada sur 40 ans, de Calgary et Regina à Montréal. Membre actif de l'IEEE depuis 1976, il a été nommé associé en 2014 pour « sa contribution à la protection des systèmes d'alimentation industriels. » Engagé dans l'élaboration des normes de l'IEEE en matière de systèmes d'alimentation industriels et commerciaux, il est président du Groupe de travail sur les normes – protection et coordination (série 3004) et vice-président du département des systèmes industriels et commerciaux de l'IEEE/IAS (Industry Applications Society).

Par son soutien dévoué aux conférences et aux tutoriels techniques de l'IEEE, de même qu'à ses séminaires et événements, Rasheek a démontré sa profonde reconnaissance de l'importance de ces activités – critiques pour l'avancement de la profession d'ingénieur électrique et le transfert intergénérationnel des connaissances en génie. Cette contribution a été particulièrement marquante dans l'Ouest du Canada. Il a présidé deux congrès techniques sur les systèmes d'alimentation industriels et commerciaux (I&CPS), en 2009 et en 2015, et il a été trésorier du congrès sur l'alimentation électrique et l'énergie (EPEC) en 2014, à Calgary. Il est vice-président de la section conjointe PES (Power and Energy Society)-IAS de la section Sud de l'Alberta de l'IEEE, qui a reçu différents prix et reconnaissances depuis 2010. Il a joué un rôle clé dans la conception des séminaires en soirée et des activités partagés par les sections Sud de l'Alberta et Nord du Canada. En janvier 2016, il s'est joint au conseil d'IEEE Canada comme trésorier régional.

Rasheek est enregistré comme ingénieur en Alberta, en Saskatchewan et en Ontario, et il est membre de l'Energy Industry Electrical Engineering Association. ■

PAST WINNERS/ ANCIENS LAURÉATS

- 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)

2016 IEEE CANADA M.B. BROUGHTON CENTRAL CANADA MERIT MEDAL
PRIX D'EXCELLENCE M.B. BROUGHTON DU CENTRE DU CANADA DE L'IEEE CANADA 2016

For exemplary service to IEEE Central Canada Sections
Pour service exemplaire aux sections du Canada central de l'IEEE

Alagan Anpalagan

Alagan Anpalagan (SMIEEE) is a professor in the Department of Electrical and Computer Engineering at Ryerson University, where he directs a research group working on radio resource management (RRM) and radio access and networking (RAN) within the WINCORE Lab. He holds a Ph.D. in electrical engineering from the University of Toronto, and is currently Vice-Chair of IEEE Special Interest Group on Green and Sustainable Networking and Computing with Cognition and Cooperation.

Dr. Anpalagan has left a lasting legacy by fostering a sense of cohesion and unity among the Region's Central Sections, most notably during his tenure as IEEE Canada Central Area Chair (2012-2014). Leading up to that position, he served as IEEE Toronto Section Chair and IEEE Communications Society (ComSoc) Chapter Chair, as well as Technical Program Committee Chair for the Canadian Conference on Electrical and Computer Engineering (2004 and 2008). As Technical Program Chair, he introduced changes that attracted substantially greater submissions. In 2009 he was appointed for a two-year term

as IEEE Canada's Professional Activities Committee Chair, and then subsequently began serving as Central Area Chair, increasing section collaboration through developing strong relationships and building trust.

Dr. Anpalagan is the recipient of the Dean's Teaching Award at Ryerson, and is a two-time winner of the Faculty Scholastic, Research and Creativity Award and two-time winner of the Faculty Service Award. As editor of several IEEE publications, he received the Exemplary Editor Award from IEEE ComSoc and Editor-in-Chief Top10 Choice Award in Transactions on Emerging Telecommunications Technology. He has also co-authored three books. ■

Alagan Anpalagan (SMIEEE) enseigne au Département de génie électrique et informatique de l'Université Ryerson, où il dirige, au laboratoire WINCORE, un groupe de recherche sur la gestion des ressources radio et sur l'accès à la radio et le réseautage. Titulaire d'un doctorat en génie électrique de l'Université de Toronto, il est vice-président du groupe d'intérêt spécial de l'IEEE sur le réseautage vert et durable et la cognition et la coopération en informatique.

M. Anpalagan a laissé un héritage durable en encourageant la cohésion et l'unité des sections du Canada central de l'IEEE lorsqu'il présidait ce dernier (2012-2014). Auparavant, il a présidé la section Toronto de l'IEEE et la section Société de communications de l'IEEE, de même que le Comité du programme technique du Congrès canadien de génie électrique et informatique (2004 et 2008). Comme président du programme technique, il a fait des améliorations qui ont attiré un nombre élevé de propositions. Après avoir présidé le Comité d'activités professionnelles de l'IEEE Canada (2009-2011), il a présidé le Canada central de l'IEEE avec le souci de stimuler la collaboration entre les sections en bâtissant des relations solides basées sur la confiance.

M. Anpalagan a reçu le prix d'enseignement du doyen de l'Université Ryerson, à deux reprises le prix des études, de la recherche et de la créativité de la Faculté et à deux reprises le prix du service de la Faculté. Ayant dirigé diverses publications de l'IEEE, il a reçu le prix de l'éditeur exemplaire de la Société de communications de l'IEEE et le prix des dix meilleurs rédacteurs en chef du domaine des transactions en technologie de télécommunication émergente. Il est coauteur de trois ouvrages. ■

PAST WINNERS/ ANCIENS LAURÉATS

- Alexei Botchkarev (2015),
- Rob Kamranpoor (2014),
- David Hepburn (2013),
- Patrick Finnigan (2012),
- Maike Luiken (2011),
- J.M. (Sean) Dunne (2010),
- David Whyte (2009),
- Janet Bradley (2008),
- Vilayil I. John (2007),
- Scott Lowell (2006),
- Ronald Potts (2005),
- Pelle Westlind (2004),
- Luc Matteau (2003),
- Ashfaq (Kash) Husain (2001),
- Bruno Di Stefano (1998),
- Haran Karmaker (1997),
- Mervyn Blythe Broughton (1996),
- Tom East (1991)

2016 IEEE CANADA J.J. ARCHAMBAULT EASTERN CANADA MERIT MEDAL
PRIX D'EXCELLENCE J.J. ARCHAMBAULT DE L'EST DU CANADA DE L'IEEE CANADA 2016

For exemplary service to IEEE Canadian Atlantic Section and Area level
Pour service exemplaire à la section Canada atlantique de l'IEEE et à son domaine

Jianjun (Jason) Gu

Jason Gu (SMIEEE) is a professor of Robotics and Assistive Technology in the Department of Electrical and Computer Engineering at Dalhousie University, where he also directs the robotics laboratory for biomedical, rehabilitation and assistive technology. He received his B.S degree in Electrical Engineering and Information Science at the University of Science and Technology of China in 1992 and his Master's degree in Biomedical Engineering at Shanghai Jiaotong University in 1995 and earned his Ph.D. degree in the area of Rehabilitation Medicine and Electrical and Computer Engineering in 2001 from University of Alberta. His research areas include: biomedical engineering, bio-signal processing, rehabilitation engineering, neural networks, robotics, mechatronics and control.

Dr. Gu's relationship with IEEE started as an IEEE Canadian Atlantic Section (CAS) student branch counselor, garnering recognition in 2004 as an IEEE Outstanding Branch Counselor. He continued to dedicate himself to leadership roles in IEEE CAS, becoming vice chair and chair, and successfully organizing IEEE

Electrical Power and Energy Conferences 2010 and 2013. He established new processes for evaluating and organizing conference paper and poster sessions to enhance participants' experiences. More recently he chaired the 2015 IEEE Canadian Conference on Electrical and Computer Engineering. He was awarded IEEE CAS's Murugan Award (2014) and IEEE CAS Distinguished Service Award (2015) due to his unique effectiveness and efficiency in leadership.

A Fellow of Engineering Institute of Canada, Dr. Gu has published more than 250 journal papers, book chapters and conference papers. He was a recipient of the best paper award in ICCSE 2003 and IEEE ICIA 2014. ■

Jason Gu (SMIEEE) enseigne la robotique et la technologie d'assistance à l'Université Dalhousie, où il dirige le laboratoire de robotique en technologie de biomédecine, réhabilitation et assistance. Bachelier en génie électrique et science de l'information de l'Université des sciences et technologies de Chine (1992) et maître en génie biomédical de l'Université de Shanghai Jiaotong (1995), il a obtenu un doctorat en médecine de réhabilitation et en génie électronique et informatique de l'Université de l'Alberta (2001). Son domaine couvre le génie biomédical, le traitement du signal biologique, le génie de la réadaptation, les réseaux neuronaux, la robotique, la mécatronique et le contrôle.

M. Gu a connu l'IEEE alors qu'il conseillait la section Canada atlantique (SCA) de l'IEEE en matière étudiante, ce qui lui a valu d'être reconnu en 2004 comme un conseiller à la direction exceptionnel. Il est devenu ensuite vice-président puis président de la section et a organisé avec succès les Congrès d'électricité et d'énergie de l'IEEE de 2010 et 2013. Il a modifié les processus d'évaluation et d'organisation des communications et séances de présentation par affiches pour améliorer l'expérience des participants et a présidé en 2015 le Congrès canadien de génie électrique et informatique de l'IEEE. Il a reçu le prix Murugan de la SCA de l'IEEE (2014) et le prix de reconnaissance pour services exceptionnels à la SCA de l'IEEE (2015) en raison de son leadership efficace et efficient.

Boursier de l'Institut canadien des ingénieurs, M. Gu a publié plus de 250 articles de revues, chapitres de livres et communications. Il a reçu le prix du meilleur article au Congrès international de science et de génie informatique (2003) et au Congrès international d'information et d'automatisation organisé conjointement avec l'IEEE en 2014. ■

PAST WINNERS/ ANCIENS LAURÉATS

- Lori Hogan (2015),
- Anader Benjamin-Seeyar (2014),
- Paul Thorburn (2013),
- Elmer Bourque (2012),
- Amir G. Aghdam (2011),
- Dennis Peters (2010),
- John Grefford (2009),
- Saman Adham (2008),
- Dominic Rivard (2007),
- Gilles Baril (2006),
- Andre Morin (2005),
- Xavier Maldague (2004),
- Ferial El-Hawary (2003),
- Eric Holdrinet (2002),
- Glen Rockett (2001),
- Paul Fortier (2000),
- Paul Robinson (1999),
- Bob Creighton (1997),
- Rejean Arseneau (1995),
- Guy Olivier (1994),
- Kenneth A. Butt (1991)

IEEE Canada Members elected as 2016 IEEE Fellows

YIU TONG CHAN (FIEEE) – Kingston, ON
for development of efficient localization and tracking algorithms

JIE CHEN (FIEEE) – Edmonton, AB
for contributions to low-power and biomedical ultrasound circuits and devices

C. Y. CHUNG (FIEEE) – Saskatoon, SK
for contributions to power system stability and control

GABOR FICHTINGER (FIEEE) – Kingston, ON
for contributions to medical robotics and computer-assisted intervention

F. STUART FOSTER (FIEEE) – Toronto, ON
for contributions to the development and commercialization of ultrasound technology

DIMITRIOS HATZINAKOS (FIEEE) – Toronto, ON
for contributions to signal processing techniques for communications, multimedia and biometrics

BLAKE LLOYD (FIEEE) – Mississauga, ON
for development of non-intrusive diagnostics for electrical motors and generators

VINCENT WONG (FIEEE) – Vancouver, BC
for contributions to mobility management in wireless networks and demand side management in smart grid

LIANG-LIANG XIE (FIEEE) – Waterloo, ON
for contributions to fundamental limits of feedback control systems and wireless networks

Membres de l'IEEE Canada élus Fellows d'IEEE 2016

YIU TONG CHAN (FIEEE) – Kingston, ON
pour le développement d'algorithmes efficaces de localisation et de suivi

JIE CHEN (FIEEE) – Edmonton, AB
pour contributions aux circuits et dispositifs biomédicaux faibles puissances à ultrasons

C. Y. CHUNG (FIEEE) – Saskatoon, SK
pour contributions au contrôle et à la stabilité des alimentations électriques

GABOR FICHTINGER (FIEEE) – Kingston, ON
pour contributions à la robotique médicale et aux interventions assistées par ordinateur

F. STUART FOSTER (FIEEE) – Toronto, ON
pour contributions au développement et à la commercialisation des technologies à ultrasons

DIMITRIOS HATZINAKOS (FIEEE) – Toronto, ON
pour contributions aux techniques de traitement des signaux pour les communications, le multimédia et la biométrie

BLAKE LLOYD (FIEEE) – Mississauga, ON
pour le développement du diagnostic non invasif des moteurs et des générateurs électriques

VINCENT WONG (FIEEE) – Vancouver, BC
pour contributions à la gestion de la mobilité dans les réseaux sans fil et à la régulation de la demande dans les réseaux intelligents

LIANG-LIANG XIE (FIEEE) – Waterloo, ON
pour contributions aux limites fondamentales des systèmes de contrôle par rétroaction et des réseaux sans fil

IEEE AWARDS 2016

IEEE HERMAN HALPERIN ELECTRIC TRANSMISSION AND DISTRIBUTION AWARD

GEORGE ANDERS (FIEEE) – Woodbridge, Ontario
for contributions to advances in computational methods for the thermal rating of electric power cables

IEEE RICHARD HAROLD KAUFMANN AWARD

G.S. PETER CASTLE (LFIEEE) – London, Ontario
for developments of applied electrostatic devices and processes in industry, agriculture, and environmental protection

IEEE DONALD O. PEDERSON AWARD IN SOLID-STATE CIRCUITS

MILES A. COPELAND (FIEEE) – Ottawa, Ontario
for contributions to the design and application of switched-capacitor and RF signal processing circuits

IEEE MEDALS 2016

IEEE JAMES H. MULLIGAN, JR. EDUCATION MEDAL

SIMON S. HAYKIN (LFIEEE) – Hamilton, Ontario
for contributions to engineering education in adaptive signal processing and communication.

IEEE/RSE JAMES CLERK MAXWELL MEDAL

GEOFFREY HINTON – Toronto, Ontario
for pioneering and sustained contributions to machine learning, including developments in deep neural networks.

PRIX DE L'IEEE 2016

PRIX TRANSMISSION ET DISTRIBUTION DE L'ÉNERGIE ÉLECTRIQUE HERMAN HALPERIN DE L'IEEE

GEORGE ANDERS (FIEEE) – Woodbridge, Ontario
pour contributions à l'avancée des méthodes de calcul pour l'évaluation thermique des câbles électriques

PRIX RICHARD HAROLD KAUFMANN DE L'IEEE

G.S. PETER CASTLE (LFIEEE) – London, Ontario
pour le développement des dispositifs à électrostatique appliquée et des procédés industriels, agricoles et de protection de l'environnement

PRIX CIRCUITS À L'ÉTAT SOLIDE DONALD O. PEDERSON DE L'IEEE

MILES A. COPELAND (FIEEE) – Ottawa, Ontario
pour contributions au développement des circuits à condensateurs commutés et des circuits RF de traitement du signal

MÉDAILLES DE L'IEEE 2016

MÉDAILLE D'ENSEIGNEMENT JAMES H. MULLIGAN, JR. DE L'IEEE

SIMON S. HAYKIN (LFIEEE) – Hamilton, Ontario
pour contributions à la formation des ingénieurs en traitement adaptatif du signal et en communication

MÉDAILLE JAMES CLERK MAXWELL DE L'IEEE/RSE

GEOFFREY HINTON – Toronto, Ontario
pour contributions pionnières et durables en apprentissage machine et en réseaux de neurones profonds.

IEEE Canada Members elected as 2016 EIC Fellows

ALEXEI BOTCHKAREV (SMIEEE) – Toronto, Ontario
for his exceptional contributions to complex information management systems in health care and aerospace and service to the profession

KEITH BROWN (SMIEEE) – Toronto, Ontario
for his leadership and service to the nuclear and electrical engineering professions and his unstinting and reliable pursuit of excellence

IBRAHIM GEDEON (SMIEEE) – Edmonton, Alberta
for his exceptional leadership and contributions to the development of internet protocol television and IT for health care

WOLFGANG HOEFER (LFIEEE) – Victoria, British Columbia
for his exceptional contributions to electromagnetic field theory and its engineering applications from radio to optical frequencies

FARROKH JANABI-SHARIFI (SMIEEE) – Toronto, Ontario
for his outstanding contributions to advanced opto-wmechatronic systems and application to robots

HUGH H.T. LIU (MIEEE) – Toronto, Ontario
for his exceptional contributions to aircraft systems and controls including autonomous unmanned systems and fault-tolerant controls

HA NGUYEN (SMIEEE) – Saskatoon, Saskatchewan
for his outstanding contributions to the field of digital communications and engineering education

Membres d'IEEE Canada élus Fellows de l'ICI 2016

ALEXEI BOTCHKAREV (SMIEEE) – Toronto, Ontario
pour ses contributions exceptionnelles aux systèmes complexes de gestion de l'information dans le domaine de la santé et dans l'aérospatiale et pour les services rendus à la profession

KEITH BROWN (SMIEEE) – Toronto, Ontario
pour son leadership et son engagement pour les professions du génie électrique et nucléaire et pour sa poursuite de l'excellence

IBRAHIM GEDEON (SMIEEE) – Edmonton, Alberta
pour son leadership exceptionnel et ses contributions au développement de la télévision par Internet et des TI dans le domaine de la santé

WOLFGANG HOEFER (LFIEEE) – Victoria, British Columbia
pour ses contributions exceptionnelles à la théorie du champ électromagnétique dans ses applications d'ingénierie allant des radiofréquences jusqu'au fréquences optiques

FARROKH JANABI-SHARIFI (SMIEEE) – Toronto, Ontario
pour ses contributions exceptionnelles aux systèmes opto-mécatroniques appliqués aux robots

HUGH H.T. LIU (MIEEE) – Toronto, Ontario
pour ses contributions exceptionnelles aux systèmes aéronautiques, aux contrôles des systèmes autonomes sans pilote et aux contrôles avec tolérance de pannes

HA NGUYEN (SMIEEE) – Saskatoon, Saskatchewan
pour ses contributions exceptionnelles dans le domaine des communications numériques et dans la formation des ingénieurs

IN MEMORIUM — MOHAMED KAMEL
À LA MÉMOIRE DE MOHAMED KAMEL

In late 2015, the pattern recognition and intelligent systems community was saddened by the loss of McNaughton Gold Medalist Dr. Mohamed Kamel, who received the award in the spring of that year.

Dr. Kamel pioneered the introduction of the concepts of cooperative and multi-clustering, feature-based aggregation and document index graph. He successfully applied these techniques to a diverse range of engineering problems, including data mining, financial document processing and robotics.

His career started at NRC Canada, receiving an inventor award for his work on bar codes. He joined the Faculty of Engineering at the University of Waterloo in 1985, becoming a Canada Research Chair with the department of Electrical and Computer Engineering in 2004. He later became a University Research Chair in Cooperative Intelligent Systems, and Director of the Centre for Pattern Analysis and Machine Intelligence. He retired in 2015 as Professor Emeritus.

Dr. Kamel's passing has had profound impact. A great mentor for many in IEEE Kitchener Waterloo Section, colleagues and associates within his department still report a sense of deep loss, many months after. Internationally, he is also mourned.

À la fin de 2015, la communauté des systèmes intelligents et de reconnaissance des formes a été tristement secouée par le décès de M. Mohamed Kamel, médaillé d'or McNaughton depuis le printemps précédent.

M. Kamel est l'un des premiers à avoir introduit les concepts de classification multiple coopérative, d'agrégation par similarité d'attributs et d'indexage graphique de documents, techniques qu'il appliqua à un vaste éventail de problèmes d'ingénierie, notamment au forage de données, au traitement de documents financiers et à la robotique.

Sa carrière a débuté au CNRC, oùson travail sur les codes-barreslui a valu un prix d'invention. Il passa en 1985 à la Faculté de génie de l'Université de Waterloo, où il dirigea une chaire de recherche au Département de génie électrique et informatique en 2004, puis une chaire de recherche en systèmes intelligents coopératifs. Il dirigeait le Centre for Pattern Analysis and Machine Intelligence avant de prendre sa retraite en 2015 comme professeur émérite.

Le départ de M. Kamel a créé une onde de choc. Ce mentor respecté au sein de la section Kitchener Waterloo de l'IEEE inspire encore un profond sentiment de perte àses collègues et associés, plusieurs mois plus tard. Il est aussi regretté sur la scène internationale.

Who Will You Nominate for 2017?

The accomplishments of our 9 Major Award recipients speak for themselves, as summarized in their foregoing biographies. But it was words on a nomination form that launched each of their journeys to the IEEE Canada podium.

Why nominate? When we celebrate the successes of our colleagues, we can also celebrate our membership in this most special of Regions in IEEE, Region 7, also known as IEEE Canada — special because we are the only Region whose geographic boundaries totally encompass a single country, and only that country.

To find the best and the brightest, IEEE Canada depends upon nominations from across our diverse spectrum of technical interests, in both established fields and those just emerging. We also recognize those who give of their time and energy to help sustain and grow our organization. Without the countless unpaid hours, there would be no IEEE Canada to give out Awards. While experience gained in volunteering is its own reward, a public "thank-you" never hurts. If an IEEE colleague has made a difference, let us know how.

See http://www.ieee.ca/awards/nominate.htm
Nominations and endorsements must be received by **November 30, 2016**

Qui nommerez-vous en 2017?

Les réalisations de nos 9 récipiendaires des prix majeurs parlent d'elles-mêmes, comme on peut le constater dans les résumés biographiques précédent. Mais ce sont les mots écrits sur les formulaires de mise en candidature qui les ont menés au podium de l'IEEE Canada.

Pourquoi proposer un candidat ou une candidate? Lorsque nous célébrons les succès de nos collègues, nous pouvons également célébrer notre appartenance à la plus spéciale des régions de l'IEEE, la région 7, que l'on connaît comme étant l'IEEE Canada—spéciale parce que nous sommes la seule région dont les frontières géographiques englobent totalement un pays, et seulement ce pays.

Afin de trouver les meilleurs candidat(e)s, l'IEEE Canada compte sur les candidatures provenant des différents secteurs techniques, de domaines établis ou émergents. Nous reconnaissons également ceux qui donnent temps et énergie à notre organisation. Sans ces heures innombrables de bénévolat, il n'y aurait pas d'IEEE Canada pour décerner des prix. Même si l'expérience de bénévolat constitue pour chacun sa propre récompense, un « merci » formulé en public ne fait jamais de tort. Si vous connaissez un(e) collègue de l'IEEE qui s'est démarqué(e), dites-le nous.

Consultez le site https://www.ieee.ca/fr/prix/icanprix.htm
Les mises en candidatures et les appuis doivent être reçus d'ici le **30 novembre 2016**

C.C. GOTLIEB (COMPUTER) MEDAL
MÉDAILLE C.C. GOTLIEB (MÉDAILLE EN INFORMATIQUE)

for important contributions to the field of computer engineering and science
pour contributions importantes en informatique

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)

ROBERT H. TANNER INDUSTRY LEADERSHIP AWARD
PRIX LEADERSHIP INDUSTRIEL ROBERT H. TANNER

for important leadership contributions in Canadian industry where there is significant activity in areas of interest to IEEE
pour contributions importantes au niveau du leadership dans l'industrie canadienne où il y a une activité significative dans des domaines d'intérêt de l'IEEE

PAST WINNERS/ ANCIENS LAURÉATS

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

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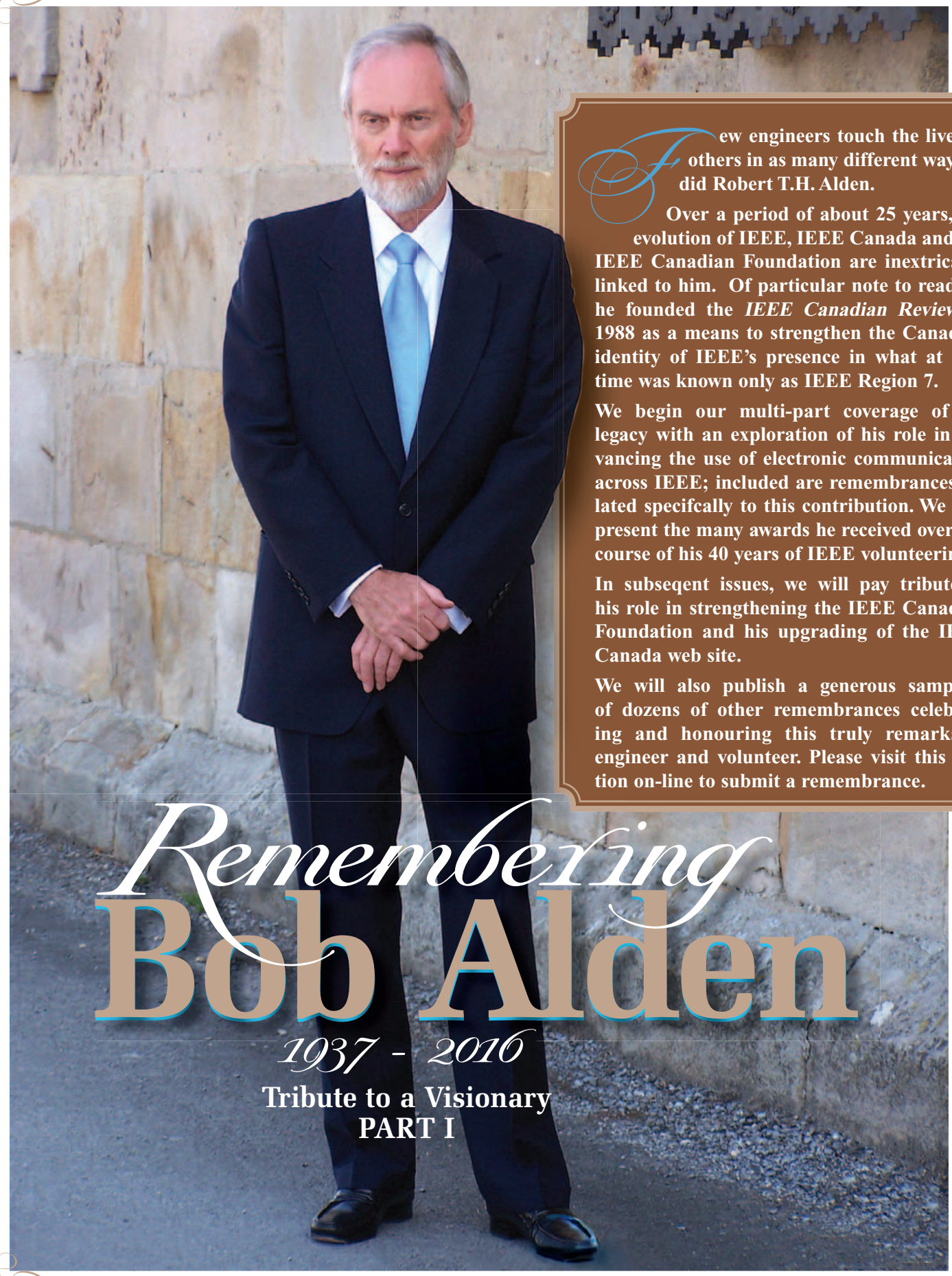

Few engineers touch the lives of others in as many different ways as did Robert T.H. Alden.

Over a period of about 25 years, the evolution of IEEE, IEEE Canada and the IEEE Canadian Foundation are inextricably linked to him. Of particular note to readers, he founded the *IEEE Canadian Review* in 1988 as a means to strengthen the Canadian identity of IEEE's presence in what at that time was known only as IEEE Region 7.

We begin our multi-part coverage of his legacy with an exploration of his role in advancing the use of electronic communication across IEEE; included are remembrances related specifcally to this contribution. We also present the many awards he received over the course of his 40 years of IEEE volunteering.

In subseqent issues, we will pay tribute to his role in strengthening the IEEE Canadian Foundation and his upgrading of the IEEE Canada web site.

We will also publish a generous sampling of dozens of other remembrances celebrating and honouring this truly remarkable engineer and volunteer. Please visit this section on-line to submit a remembrance.

Remembering Bob Alden

1937 - 2016

Tribute to a Visionary
PART I

IEEE the institute
www.ieee.org

A look in the rear-view mirror ...

For 10 years starting in late 1992, Bob Alden's column "Traveling the Information Highway" was a fixture of *The Institute*. It was a reflection of his unique skill set.

In these roughly 75 articles, Bob set out a vision of what electronic communication could achieve for individual members and IEEE as a whole, even as the technology evolved at ever-faster rates. But that vision was informed by his own direct experience: internet connection, e-mail, HTML basics, FTP, list servers, search engines, page scripts – for all of these he passed on his own tips and those of others in very practical terms.

In this section, we've excerpted portions of columns that particularly illustrate his vision of a new world of connectedness and information sharing.

Bob's last column was May 2002, in which he requests IEEE members make their views known on better serving the diverse needs of members and volunteers through IT. His credit note at the end of each column is revealing. Over the 10 years, it progressively identified him as: chair of the IEEE E-mail Committee, chair of the IEEE Electronic Communications Steering Committee, and the IEEE Electronic Communications Advisor. In signing off for the last time, Bob simply describes himself as "an IEEE volunteer interested in electronic services among other aspects of the IEEE scene". Such modesty typifies his entire volunteer and professional career. ■

This section would not have been possible without the efforts of Amanda Davis, senior editorial assistant at The Institute. *Going back 25 years into any archive is a challenge, and she kindly went back many times!*

I have known Bob for 30 years; he has always been the IEEE leader that displayed a unique ability to communicate what the average person considered techno talk into something useful.

His skill and more importantly commitment to communicate what we do is truly unique and shines a light on a path that we can only strive to model ourselves after. His articles on the Internet were years ahead of their time. ■

Ibrahim Gedeon
IEEE Northern Canada Section

Traveling the Information Highway

How to turn on to IEEE's e-mail service

with Bob Alden

January/February 1993

E-mail is making its way to the IEEE, you were told in the last issue of *The Institute* [November/December 1992]. Now we want to tell our members how they may use it to contact each other, the Institute›s staff, and many of the organization›s entities. They can also use it to request and receive services electronically.

Members may access the IEEE's e-mail, begun in 1990 via the ieee.org node on Internet, through the local electronic mail capability they find most convenient... Provided at the outset, was a forwarding service to simplify the myriad of computer mailbox addresses. The service relies on several so-called aliases ...

PERSONAL ALIASES. Of the form "i.name@ieee.org", personal aliases can be requested by IEEE volunteers (members) For example, the personal alias "m.sloan@ieee.org" is that of 1993 IEEE President Martha Sloan...

SECTION ALIASES...
SOCIETY ALIASES...
STUDENT BRANCH ALIASES...
INFORMATION ALIASES...
SERVICE ALIASES...
REQUESTS TO STAFF...

NEED FOR VOLUNTEERS. Now the IEEE is developing an electronic mail contact network, and it needs volunteers to help... Please contact your local Section executive if you are willing to help put such a system in place. We expect that IEEE members will make increasing use of e-mail once the usefullness becomes apparent.

–Robert T.H. Alden

Robert T.H. (Bob) Alden is the chair of the IEEE E-mail Committee, and a former IEEE vice president. In his other life, he is the director of the Power Research Laboratory at McMaster University in Hamilton, Ontario, Canada. He welcomes your input via email.

Commentary — Jon Rokne, IEEE VP, Publications and Services, 2010, Associate Editor, *IEEE Canadian Review*

Both in his column for The Institute and in his writings for the *IEEE Canadian Review*, Bob Alden had a vision of how the future of information would develop.

His main interest was the future of communicating technical information. Already in 1994 he realized that the future of such communication would be strongly linked to the Internet that was growing rapidly (please see column opposite). One of his ideas was that articles would be stored and accessible electronically over the Internet and he foresaw that the content would be available in a distributed manner using links from a stored article to other articles stored elsewhere on the Internet. This would mean that instead of repeating the content of a referred article there would simply be a hyperlink to the content of that article.

The hyperlink idea has been implemented in a variety of ways; some of his other ideas are still being developed. For example if one reads a current article referring to "Clinton" and if the article discusses politics then the article would most likely be referring to Hillary Clinton and automatically a hyperlink could provide information on her. As Bob stated in 1994: "Clicking on certain icons provides a graphics window with the relevant drawing (or appropriate media display). The Discussion contains highlighted words. We can click and bring up relevant results from other articles. The Conclusion completes the article. Additional items such as acknowledgements, bibliography, appendices, author biographies, etc. can be viewed by clicking on highlighted words." The full implementation of this idea involves semantic disambiguation (i.e. which "Clinton") that currently is researched.

When he was the Chair of the IEEE Electronic Communications Steering Committee he presented a brief to the Board of the IEEE that became the IEEE Internet Project. This brief envisioned that the services, membership communications and publications in the IEEE domain become available over the Internet. Details on how this was to be done and what the conditions were for use were spelled out in detail. His notion of open access was discussed as well as the kinds of restrictions that were to be placed on certain contents. His work with this committee was foundational to the development of the IEEE web presence. It also led to the development of what became the *Xplore* database that now supports roughly half of the budget of IEEE.

Bob was a true visionary in the domain of information dissemination. His forward-looking ideas and his enthusiasm for the field will be sorely missed. ■

I knew Bob Alden through his articles on Internet tools, published periodically in the Institute, from the 1980s decade on. As a Latin American volunteer, I was impressed by the value of those publications for the current communication status of the IEEE, with widely dispersed sections around the world needing to get in touch, some in remote locations.

At the beginning of the 1990 decade, I became a candidate for Region 9 Director-Elect and started to use those tools, otherwise my campaign would not be successful. In 1993, I became R9 Director-Elect and started to serve, in 1994, on the Board committees and meet most of the IEEE main top volunteers, among them, my friend Bob Alden.

In 1996, I took R9 office and the first order of business was to invite Bob Alden to give a course on Internet tools for all R9 section chairs, held in San Jose de Costa Rica, during the 1996 Regional Meeting. He presented it very well, helping meet an important communication goal of the Region 9 — to have 100% of the sections connected through e-mail.

About 12 years after that, I was very pleased to meet Bob again, when I became IEEE Foundation Director, in 2008, and he was the IEEE Canada representative in the Foundation Board. There, we worked together in the Board and in several Board committees.

Bob was a very good friend of mine. A great man, very competent and humble. A special person, an excellent example of character to be followed. I was fortunate to have known him.

I really miss Bob Alden. Requiescat in pace, my friend! ■

Antonio C Bastos
Brasil

I first met Bob Alden when IEEE held a board meeting in Calgary in 1994. Bob was chairing a Regional Activities Board meeting (now called Member and Geographic Activities Board) on the Internet Super Highway. I quickly learned this was Bob's passion and he was very instrumental in bringing IEEE into/onto the Web. Bob's other passion was volunteering for IEEE. Whether it was the IEEE Canada Board, the global organization or the IEEE Canadian Foundation — he was one of the most dedicated volunteers I have had the pleasure of knowing and working with. He also was very interested in developing other volunteers. When chatting with him, he was on the lookout for others' interests, and encouraging them to seek out opportunities to grow.

Bob's "Traveling the Information Highway" column focused attention on the need to quickly adopt this new technology. He was also often called upon by IEEE headquarters in the 1990s for advice on the establishment of e-mail services for all IEEE volunteers and members. I am certain that Bob will soon be providing his new e-mail alias to us once he gets all organized. ■

Rob Anderson
IEEE Southern Alberta Section

Traveling the Information Highway

September 1994

The Web: A new way to deliver technical information

with Bob Alden

This article is prompted by Bob Lucky's "Reflections" article (IEEE Spectrum, May 1994, page 18) entitled "Keeping up." We had an e-mail chat after I read that article. We concluded that it is sad that IEEE spends so much effort producing technical articles that so few of our members read ...

Don't misunderstand me. Technical articles are important for our members, for our industry, and for the IEEE. It is the quality of the technical content in IEEE publications and the consistency of this quality that has given the IEEE its well-deserved reputation as the premier technical society in the world ...

Let's look at what we do now, then how the Information Highway can lead us to a new way of doing our business of producing technical articles.

CURRENT FORMAT. ...Each article is supposed to stand alone. Each generally contains an Introduction, Background, Theory, Results, Discussion, Conclusions, References, etc ... Many Theory sections repeat, inconsistently, what someone else already wrote ...

FUTURE FORMAT. Using hypertext (and hypermedia to include graphics and even sound), we can produce articles that are available on a compact disk or over the network using a web server ...

What might a technical article look like if written in hypertext? First of all, there is never one article but a set of articles that are dynamically linked and updated. Each article is about a page in length. We first scan (read quickly) the entire article to see what is there and whether we are interested. If we are hooked, we go back to the beginning and read carefully to understand the details.

The Introduction is short and states what is to be done, why, and generally how. It also contains a review of the necessary background that is short because key words are highlighted. Each highlighted word is a link to another article. There is no list of references at the end of the article because any reference is immediately available. Clicking on a highlighted word brings that article to our screen to read. We can read that background article if we wish, and go further back if necessary. Returning to our original article, we continue to read.

The Theory section may be next. In cases where the article uses previously developed theory, a few short sentences put that theory into perspective, and clicking on the appropriate highlighted word takes us to the original theory development. There will be a reference to Nomenclature. Again, clicking on the highlighted word provides the Nomenclature list. This is consistent for this set of articles. Perhaps such an article is only written by a task force of the relevant technical committee.

The Results section is succinct and explains the significance. Clicking on certain icons provides a graphics window with the relevant drawing (or appropriate media display). The Discussion contains highlighted words. We can click and bring up relevant results from other articles. The Conclusion completes the article. Additional items such as acknowledgements, bibliography, appendices, author biographies, etc. can be viewed by clicking on highlighted words.

THE WEB. What is the result of this electronic construction? It is a resource that is set up to help us find the information we need. Higher-level surveys of the literature organize material by subject area. This leads the reader into specific technical specialties. The cross linking of web structures (as the name implies) enable many entries to the same specific area from different starting points...

Producing this kind of new format for technical articles will not be easy. Is it worth the effort? Are there better ways to use these developing technologies for our own benefit? How can we improve our organization and distribution of technical material? Your input is needed. If IEEE is to serve your needs in this area, we need to know what you want and how you want it. –Robert T.H. Alden

Traveling the Information Highway

October 1996

IEEE societies use the Web to effect change

with Bob Alden

In August I took part in the Chapters Congress of the IEEE Power Engineering Society (PES)... This was the first time an IEEE technical society has held this kind of event.

I was invited to be the facilitator on the topic of electronic communications, and together with Harold Ruchelman -- a volunteer with considerable experience in producing section and chapter newsletters -- we shared the topic of communicating with members and potential members. ...

Let's look at what they wanted PES and/or IEEE to do for them at the local chapter level.

Basic and advanced training in EC techniques. In the basic category for members: how to use e-mail and Web software to communicate and obtain information; how to use mailing lists and discussion groups properly. In the advanced category for volunteers: how to set up and manage mailing lists and discussion ...

- **Facilities.** Provide IEEE-managed servers for chapters to keep and maintain their own Web pages. Support development of e-mail discussion groups for chapters, working groups and technical committees. Make tools available to assist chapter volunteers in maintaining and disseminating information. ... Put more information on the Web -- Distinguished Lecturer Program, conference manuals, chapter manuals, directories, etc. Put membership applications on the Web.

BOTTOM LINE. ...I came away with the feeling that I witnessed a major rebirth of a society, in which those "grassroots" members knew what they wanted to do as volunteers, discussed what was important to them, made some critical priority choices and went back to their chapters to help move their society ahead. ...the society management has begun to use the Internet to change the way PES does business, and the chapter volunteers made it clear they not only approve, but want similar changes at the local level, and they came up with clear guidelines for implementation.

Robert T.H. (Bob) Alden is the chair of the IEEE Electronic Communications Steering Committee, and a former IEEE vice president.

Acco

2010 EIC John B Stirling Medal of the Engineering Institute of Canada

"For his concept, planning and implementation of a strategy that culminated in creating IEEE Canada as a Member Society of the EIC while retaining its relationship within IEEE as Region 7; and for continuing with the development of IEEE Canada by implementing major improvements to its website, a major awards program and integration with the IEEE Canadian Foundation;" presented at the Annual EIC Awards Banquet in Ottawa on February 27, 2010.

2005 Fellow of the Engineering Institute of Canada

presented at the Annual EIC Awards Banquet in Ottawa on March 5, 2005.

2005 Fellow of the Institute of Electrical and Electronics Engineers

"For contributions to eigenvalue analysis of power system stability"

IEEE Larry K. Wilson Transnational Award

"For exceptional leadership in the promotion of electronic mail worldwide and promoting IEEE as a leader in the use of communications technology," awarded by the 1992 IEEE Regional Activities Board.

2002 IEEE Haraden Pratt Award

"For outstanding and sustained leadership in many areas of the IEEE especially in the use of electronic communication," recommended by the IEEE Awards Board to the IEEE Board of Directors and sponsored by the IEEE Foundation, awarded at the 2002 IEEE Honors Ceremony held in Toronto, Ontario, on June 22, 2002.

2009 IEEE History Committee

"Recognizes the contributions to the history activities of IEEE by Robert Alden whose efforts have increased the recognition by the general public of technical achievements in IEEE's fields, and enhanced the appreciation of these achievements and their contributions to humanity"

IEEE Third Millennium Medal

"In recognition and appreciation of valued services and outstanding contributions," nominated by the Canadian Region of the IEEE, awarded at the Canadian Conference on Electrical and Computer Engineering held in Halifax, Nova Scotia, on May 8, 2000.

Blades

1999 William W. Middleton Distinguished Service Award

"For challenging IEEE volunteers and staff to maximize their use of electronic communications in all IEEE activities," presented at the triennial IEEE Sections Congress held in Minneapolis, Minnesota, October 8-11, 1999.

Service and Leadership with IEEE Toronto Section

presented by Bruno DiStefano at October 25, 2014 Annual General Meeting of IEEE Toronto Section

IEEE Canadian Foundation Dr. Robert T.H. Alden Scholarship

"In recognition and appreciation of valued services and contributions" (presented jointly by IEEE Toronto Section and the IEEE Canadian Foundation, established on the occasion of the Toronto Section Centennial in 2003). To the left of Bob is Bruno DiStefano; at right, Wallas Khella; their contributions were also recognized by establishment of scholarships.

IEEE Region 7 Outstanding Service Award

"For outstanding service as Region 7 Director and for pioneering efforts in establishing the *IEEE Canadian Review*, the IEEE Canadian Foundation and IEEE Canada," presented at the Canadian Conference on Electrical and Computer Engineering held in Edmonton, Alberta, May 8-12, 1999. Also awarded to Ray Findlay that same year.

50 Years of Active Membership

Presented by Keith Brown in 2013 at Toronto Section event.

What's New in the Literature?

by Terrance Malkinson

A business report in MIT Technology Review "AI Takes Off" [119(3):61-69. May/June, 2016] provides a series of articles on how companies are looking to artificial intelligence as a tool to benefit their business. Artificial intelligence in this report is defined as "an evolving constellation of technologies that enable computers to simulate elements of human thinking including learning and reasoning." As described in the report since its origins in 1914 AI has had its ups and downs but is now evolving into a powerful business approach utilized in many applications and is poised for major breakthroughs. Current applications and prospects for the future are provided by the authors. Further information is available on the MIT Technology Review website -www.technologyreview.com/business

The world's longest and deepest rail tunnel opened in Switzerland in June, 2016. This 57 km twin-bore Gotthard base tunnel [www.bbc.com/news/world-europe-36423250] provides a high-speed rail link under the Swiss Alps between northern and southern Europe. The primary purpose of the tunnel is to facilitate the rapid, cost-effective, and environmentally responsible transport of freight and passengers across the Alps. Taking 17 years to construct and costing more than $12B the project was endorsed by Swiss voters in a referendum in 1992. Workers maintained Swiss tradition, bringing the massive project in on time and on budget. This is an important component of a larger Swiss strategy to transition all freight travelling through Switzerland from road to rail. It is predicted that 260 freight trains and 65 passenger trains will pass through the tunnel each day in a journey taking as little as 17 minutes. It is likely that we will soon witness many more massive tunneling projects as innovations in engineering technologies make their construction efficient and cost-effective. While on the topic of railways,the cover story of the June, 2016 issue of Railway Age [www.railwayage.com] focuses on the "Bright Future of Passenger Rail in America." This Rail guide details North American initiatives, improving rail infrastructure and service.

The cover story of *Discover* provides a study of "Inside Einstein's Brain: How His Thought Experiments Changed Physics" [pp.26-31. June, 2016 www.discovermagazine.com]. Andy Berger discusses how Albert Einstein's theories changed the rulebook of physics and this was all the result of his unique creative thinking abilities. The author provides insights into how he and others were able to think creatively. Central to this was their ability to keep their thoughts clear of unnecessary information. Thoughts were "populated with only items essential to his experiments." In today's world where many of us are overwhelmed by information overload this is an important concept for you to consider particularly for those whose career success requires creativity and innovative thinking.

Ron Clemons provides information to help you determine the 3D-printing technologies and materials that are best for your application in *Machine Design*. [88(5):38-44. May, 2016. www.machinedesign.com]. There is no single technology well-suited for every application. The author provides a list of seven considerations that you can use to help you qualify and disqualify processes and materials for your unique 3D printing projects.

"Increase your Return on Failure" is the title of an article by Julian Birkinshaw and Martine Haas [*Harvard Business Review*. 94(5):88-93. May, 2016 www.hbr.org] that discusses how to most effectively learn from failure. The article begins with the large print headline – "One of the Most Important- and Most Deeply Entrenched-Reasons Why Established Companies Struggle to Grow is Fear of Failure." Ironically as the authors discuss that although many companies claim to embrace failure as an integral part of the innovation process, the reality is that near-zero tolerance of it blocks them from pursuing new ideas. The authors provide three steps that you can take to improve your organizations return on failure. Success emanates from sharing those lessons learned from failure experiences across the entire organization and regularly reviewing your overall approach to failure to make sure you are achieving the correct balance.

McKinsey & Company published its March 2016 "Global Survey of Economic Conditions" [www.mckinsey.com]. This article offers insights into what executives are thinking about where national and global economies are heading. Caution and uncertainty are the predominant themes; primarily a result of slowing growth in China. Survey respondents (n=2772) tended to be pessimistic with 48% expecting global conditions are worse while 21% believe global conditions are better, and 31% believing that conditions remained the same compared with predictions made six months ago. Expectations vary greatly by region and by industry. Executives from developed markets were more likely to be negative than those from their emerging market peers.

As we progress through life it is inevitable that you will be exposed to incivility. Christine Porath in her managing yourself feature article "An Antidote to Incivility" [*Harvard Business Review*. 94(4):108-117. April, 2016 www.hbr.org] explores the prevalence of incivility and identifies tactics that you can use to minimize the effects of rudeness on performance and your health. Results from over 20 years of her research reveals that 98% of the thousands of workers surveyed had experienced uncivil behavior. Interestingly, only a small 15% of respondents were satisfied with how their employer handled incivility. Strategies are presented that you can use to handle incivility. Effectively used when you encounter rude behavior these strategies will make you more assertive and confident – perhaps even saving your job and preserving your health.

Today over 700,000 people are killed each year by drug resistant infections. Should this trend continue it is estimated that deaths could reach 10M by the year 2050. In the leader to the article "The Grim Prospect" the editors of The Economist state "Drug-resistance is not only one of the clearest examples of evolution in action, it also the one with the biggest human cost….and it is getting worse". [*The Economist*. Volume 419 Number 8990. pp. 19-21. May, 2016. www.economist.com]. The threat is that of antibiotic resistance creating "superbugs" for which there is no treatment. The danger has been known for a long time with Alexander Fleming, the discoverer of Penicillin warning of the dangers of resistance almost as soon as the drug had been shown to be a success. The authors provide an in-depth analysis of the problem.

Graham Winfrey provides analysis of four of today's hottest industries for entrepreneurial people wanting to start a business. ["The Best Industries for Starting a Business Right Now." *Inc.* February, 2016. Page 24. www.inc.com/best-industries-in-2016]. A link is provided to the full list. Profiles cover topics such as: why the industry is hot, skills needed, barriers to entry, the downside, competition, and growth. ■

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

EPEC 2015 finds tutorials a lesson in marketing

Think of the last time you chose a restaurant on a special occasion. For the discerning diner, the main course offerings are important, for sure. But the deciding factor might just be some of the secondary menu items. What's the salad bar like? How creative are the desserts?

Head "chef" Maike Luiken and her team at the fall 2015 Electrical Power and Energy Conference in London decided to add open and free tutorials to the menu. The result?

"We attracted a greater number of proposals," says Luiken. "A potentially larger audience created more interest from presenters." She explains that by being very careful in which proposals are accepted, the quality of presentations can be very high. "It was a very successful model," she says.

She also credits the success of the conference in part to the outstanding efforts of a team of close to 30 volunteers. When the unexpected happened on site – as is the case in every conference – out-of-town organizing committee members suddenly became "local" organizing committee members, she says. While everyone one of them went "above and beyond," special mention is due Dennis Michaelson, whose webmaster's familiarity with the schedule/program was invaluable prior to the event, and in helping things run smoothly during the conference itself. Student volunteers also made a huge contribution, Luiken says. While appreciation is extended to all, the following four took on multiple roles: Manar Jammal (student event); Hessam Jouybari (photography); Elena Uchiteleva (chaired WIE panel) ;Elizabeth Tomaszewski (chaired computational methods session); Yue Li (renewable energy tour). The latter two wrote accounts of their experience, links to which will be posted on the web page for this article. ■

Participants of the Renewable Energy Tour of EPEC 2015 at the Enbridge Sarnia Solar Farm. *From L to R: Branislav Djokic (*National Research Council*); Xun Long (*FortisAlberta*); Sean Dunne (*2015 Chair IEEE Peterborough Section*); Jon Paschal (*Cumberland & Western Resources*); Doug Fyfe (*Univ. of Waterloo*); Allan VanDamme (*London Hydro*); Victor Pupkevich (*Univ. of Western Ontario*); JP Frydrychowicz (*EngCap Management*); Greg Sheil (*London Hydro*); Jameson Wood (*Carleton Univ.*); Carmen Cardozo (*CentraleSupélec, France*); Samy Akkari (*CentraleSupélec, France*); Yue Li (*Univ. of Western Ontario*)*

IEEE Canadian Review

La revue canadienne de l'IEEE

The *IEEE Canadian Review* is published three times per year: mid March, end of June and mid October.

Its **principal objectives** are:

To inform Canadian members of IEEE on issues related to the impacts of technology, and its role in supporting economic development and societal benefits within Canada. To foster growth in the size and quality of Canada's pool of technology professionals to serve our increasingly knowledge-based economy.

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